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Integrating national and regional innovation policy: the case of Gauteng in South Africa

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INTEGRATING NATIONAL AND REGIONAL INNOVATION POLICY: THE CASE OF GAUTENG IN SOUTH AFRICA

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A research report submitted to the Wits Business School in the University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Management in Innovation Studies

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ABSTRACT

Innovation policy is a crucial driver for development, especially in developing countries. Developing countries are characterised by weak and fragmented innovation systems that pose an even greater challenge to integrating innovation policy. The key and most persistent weakness identified in South Africa's national innovation system has been its lack of vertical and horizontal policy integration and coherence. Regions in South Africa are increasingly becoming active in developing, designing and implementing their own innovation policies. This creates an urgent need for integrating national and regional innovation policies and programmes. The basis for the study was an assessment of the extent of integration between national and regional innovation policies in South Africa and the Gauteng region in particular.

The study employed both a qualitative and quantitative research approach and the methodology applied was content analysis as well as semi-structured interviews with key informants at the national and regional level. While there was no specific innovation framework regarding the question of integration across different regions due to restrictions, this study employed a more general framework utilising the policy studies to investigate this issue. The framework was based on three categories: complementary policy goals, priorities and scope; policy structures and procedures for policy integration; and mechanisms and policy instruments to steer integration.

The findings of the study suggest that there is weak integration between South Africa's national innovation policy and Gauteng's regional innovation policy based on the framework selected for analysing policy integration. The finding revealed that there is significant lack of integration between national and regional policy structures and procedures; and mechanisms and policy instruments in promoting innovation policy.

Moreover, the findings showed that South Africa's national innovation policy is embedded in a linear, narrow path of supply-driven technology and has a top-down perspective approach. Overall, there is an opportunity for South Africa and Gauteng to improve innovation policy integration by prioritising strong leadership and commitment at the political level; establishing specific coordination mechanisms; and improving interactions between national and regional levels through policy

experimentation. To achieve these objectives, functional regions should be targeted and used for improving quality of policy-relevant evidence.

DECLARATION

I declare that this research report is my own unaided work. It is submitted in partial fulfilment of the requirements for the degree of Master of Management in Innovation Studies at the Wits Business School in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

Portia Idah Raphasha

Date:

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GLOSSARY OF TERMS

1. **Innovation** is defined as the use of new knowledge through interactive learning processes and not necessarily the knowledge through frontier science. This view suggests that innovation is a process that is continuously cumulative and involves both radical and incremental forms of innovation. Innovation does not automatically guarantee economic success or social benefit (Marcelle: 2012).

2. According to Edquist (1997), **Innovation system** refers to all the "important economic, social, political, organisational, and other factors that influence the development, diffusion, and use of innovations". Edquist considers organisations (e.g. formal structures) and institutions (sets of routines, habits, rules or established practices that regulate the interactions amongst actors and organisations) as components of an innovation system.

3. Lundvall (1992) provided the most explicit but narrow definition of **National system of innovation** as the "the elements and relationships which interact in the production, and diffusion of new, and economically useful, knowledge ... and are either located within or rooted inside the borders of a nation state".

4. **Innovation policy** is defined as a public action that influences technical change and other kinds of innovations. Edquist (2001) defines innovation policy as a plan of action to guide decisions and actions with a view to influencing innovation processes or performance. Innovation policy includes elements of R&D policy, technology policy, infrastructure policy, industrial policy and sectoral policies.

5. A **Region** as a concept is not limited in a definition by a determinate size. It is homogeneous in terms of specific criteria and possesses some characteristics of internal cohesion. A region is generally understood in a broad sense as a spatial entity which fulfils certain criteria at a subnational level where a system of governance exists. Regions may be homogenous, functional or administrative.

6. A **Developing country** is defined as a low-income, lower middle-income or an upper middle-income country according to the World Bank's classification.

7. **Multi-level governance** is defined as an arrangement where there is sharing of policy competencies and budgetary resources across various resources in a given policy domain. This arrangement allows actors, organisations and policies at different levels of territorial aggregation to be coordinated in order to achieve coherent policies and programmes (Schmitter 2004).

LIST OF ABBREVIATIONS

DST – Department of Science and Technology

GDED – Gauteng Department of Economic Development

GIKES – Gauteng Innovation Knowledge Economy Strategy

NSI – National System of Innovation

OECD – Organisation for Economic Co-operation and Development

R&D - Research and development

STI – Science, Technology and Innovation

TYIP – Ten Year Innovation Plan

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CHAPTER 1: INTRODUCTION

This introductory chapter presents the synopsis of the research at hand by outlining the background to the study, problem statement and the purpose of the study. Consideration is given to the significance and limitations of the study. Lastly, the chapter provides definitions of terms used in this research and ends with a layout of the entire study.

1.1 PURPOSE OF THE STUDY

The purpose of this research is to assess the extent of integration between national and regional innovation policy in South Africa in general and its Gauteng region in particular. The next section presents the context of the study.

1.2 CONTEXT OF THE STUDY

Developing countries face the challenge of competing effectively with developed countries in a globalised marketplace. There seems to be a consensual agreement in innovation policy discourse that innovation policy in developing countries is partly hindered by fragmented and weak states, as well as poor governance (Aubert, 2005; Intarakumnerd, et al 2002; Karo and Kattel, 2010a; Reinert et al., 2009). Developing countries face fundamental challenges of governance problems, lack of resources, insufficient infrastructure, and other constraints. These conditions raise particular challenges for the promotion of innovation. Despite the nature of these conditions in developing countries, well-designed and well-implemented innovation policies are perhaps even more relevant than in developed countries. Innovation is a central component of economic development and productivity growth, and hence the competitiveness of regions and nations.

Innovation policy has considerably changed over the last decades in line with the growing empirical evidence of the importance and complexity of innovation

processes. Innovation policies are being tailored to countries' specific characteristics in line with the recognised fact that the "one size does fit all" approach does not apply and this is a greater consideration for developing countries. Increasingly, innovation emerges in the context of dynamic and systemic interplay of complex interaction of a multi-actor, multi-sector and multi-level process all of which can impact on the trajectory of a country's economy. The complexity of innovation policy and its cross-sectoral interlinks with various policy-making fields as well as links across different levels of government makes it even more difficult to manage (OECD 2005).

Many authors have acknowledged that effective innovation policies require coordination of other support policies (Lundvall and Borras, 1997; Bodas Freitas and Von Tunzelmann, 2008). The new role of innovation policy, which entails the convergence of the previously separate domains of science and technology, industrial policy, education policy and other policies has had major consequences for governance, particularly in the need to develop new horizontal and vertical ways in which to coordinate the activities of the actors previously responsible for these separate domains. Increasingly innovation policies have to be relevant in that they address socio-economic objectives; coherent across different levels of government and with other policies; and inclusive in terms of scope and of the actors involved.

The concept of integration in the field of innovation policies is understood as a condition when policies or programs work together in a coherent and mutually reinforcing manner (Pelkonen, Teräväinen et al., 2008). The lack of policy integration may lead to policy duplication, contradictory effects, inconsistencies and gaps, as well as an overlapping and insufficiently systemic view of innovation. Policy integration has long been promoted as a tool for enhancing effective and efficient policymaking at a holistic view as part of wider policy analysis literature. Effective policy integration and execution is required across all spheres of government.

There has been a significant focus on theoretical and empirical studies for national systems of innovation (NSI) and the concept has dominated policy analysts and policymakers in both developed and developing countries. While the concept of the NSI originated in developed countries and is still in its early stages; the study of the NSI in developing countries is at an even more nascent stage (Intarakumnerd et al.,

2002; Lundvall, 2009). The NSI, particularly on the African continent have underdeveloped innovation systems that are largely unproductive and require extensive investments and reforms.

While innovation systems at the national level have been widely adopted by analysts and policy makers, there has been a growing interest in regional innovation systems not only due to their geographical proximity but in terms of knowledge transferand learning; unique competitive advantage; and increased opportunities for innovation networks (Lorentzen, 2008). Regions are seen as an effective approach in contributing to the aggregate national innovation and economic performance (Cooke, 2002; Asheim and Gertler, 2005; Niosi, 2010). Regions are increasingly becoming the focal point of economic activities in the globalised environment and are more dynamic and reflexive than at national level with regards to innovation and economic activities (Chaminade and Vang, 2006; Schmitz, 2006; Vang and Asheim, 2006). With the rapid growth of certain regions in developing countries, it is even more critical for them to take into account this regional dimension.

South Africa, like many developing countries has not been effective in coordinating and integrating its policy efforts, least of all its innovation focus. A lot has been documented on South Africa's fragmented and inadequately coordinated national system of innovation (NSI) (DACST, 1996; OECD, 2007; NACI, 2014).). South Africa's governance of the innovation system is highly centralised and hierarchical. It is notable that South Africa was the first developing country to adopt the NSI concept in its policy-making (Rooks and Oerlemans, 2005). Innovation policy in South Africa initially emerged from the R&D policy sphere and has predominantly followed a linear approach to innovation (Kahn, 2013).

The national Department of Science and Technology (DST) assumes leadership for innovation policy design, development and implementation. The DST introduced a policy framework intended to serve as a basis for achieving integration and coherence in the innovation system: the White paper on science and technology (S&T) (1996); and the National Research and Development Strategy (DST, 2002).

However in 2008, the Organisation for Economic Cooperation and Development's (OECD) review of South Africa's NSI noted a lack of what it termed "vertical

articulation" at national, provincial and local levels (OECD, 2007:220). One of the key recommendations from the OECD review was for the Department of Science and Technology (DST) to develop a ten year innovation plan.

In response to the OECD review, DST adopted the Ten-Year Innovation Plan (TYIP): Innovation Towards a Knowledge–Based Economy, (2008-2018) which identified five "grand challenges" in order to transform South Africa into a knowledge-based economy was developed. Many academics and researchers have criticised the TYIP as being too scientifically and technologically focused and not adequately targeted at addressing the economic and social challenges that South Africa is currently facing (Khan, 2013). Hausman and Klinger (2006) and Lingela (2004) argue that the innovation system has been virtually disconnected from disadvantaged communities. The plan has a largely top-down approach with no mention of regional or local systems of innovation (Mhula, Jacobs et al., 2013) and many argue that it has not been effective in addressing some of the current challenges facing the country.

At the regional level, several regions in South Africa have demonstrated greater awareness of the importance of devoting more attention to regional innovation policies. Out of the nine provinces in the country, a few regions such as Gauteng, Western Cape, Eastern Cape, Limpopo, and the Free State have either completed their regional innovation strategies or are in the process of completing them. Scerri (2008) argues that Gauteng, the Western Cape and, to a lesser degree, KwaZulu-Natal and the Free State may be considered provincial systems of innovation. The focus of the study is on the Gauteng province.

Gauteng Province contributes 33 percent to the national economy and 10 percent to the GDP of the entire African continent (Statistics South Africa). The province is one of the fastest growing regions in Africa, accounting for more than 10 percent of the Southern Africa Development Community (SADC) GDP and is ranked the 4th biggest economy on the continent and 56th in the world. Gauteng is considered the economic and industrial hub of South Africa. Although Gauteng is the wealthiest region in South Africa, it has relatively high levels of inequality. The Gauteng province has recently approved its regional innovation strategy, spearheaded by the Innovation Hub. A number of initiatives have been developed by regional stakeholders. The study aims to assess the relationship between South Africa and

Gauteng's innovation policy and argues for the need for effective multi-level governance systems.

1.3 PROBLEM STATEMENT

South Africa has made significant progress in its innovation policy having been one of the first developing countries to adopt the national system of innovation (NSI) concept in its policy-making. Despite having a dynamic national innovation strategy and continuously reviewing its innovation landscape, South Africa continues to have a fragmented and inadequately co-ordinated NSI that results in inefficiencies and lack of policy effectiveness in promoting innovation.

South Africa's innovation policy is centralised and characterised by a top-down approach and there is a lack of innovation policy co-ordination, co-operation and alignment in the different spheres of government in South Africa (DST, 2012; OECD, 2007). Thus, the innovation policy making at the national level has not been effective in addressing socio economic challenges and better use of public resources in the country.

1.3.1 RESEARCH QUESTIONS

To address the research problem outlined above, this study poses the following research questions:

1. What is the extent of integration between national and regional innovation policy in South Africa?
2. How could integration in innovation policy between national and regional levels be improved?

1.4 SIGNIFICANCE OF THE STUDY

The study sets out the theoretical underpinnings towards an approach to improving the understanding of multi-level governance and the regional dimension of innovation policy in the context of developing countries.

South Africa needs an effective and efficient innovation policy in order to address as well as find solutions to its economic and social challenges. Evidence from various studies shows that countries that have succeeded in promoting innovation policy effectively, have taken into account integration and alignment of innovation policy, and have also increased the relevance of regional dimension in ensuring national socio-economic progress (OECD, 2011; Lundvall and Borras, 1997; Bodas Freitas and Von Tunzelmann, 2008).

This topic is relevant and timely given that one of the key challenges that South Africa faces is the need to achieve coordination and coherence of the components of the NSI to ensure a functional and effective system that will deliver innovation-driven national economic and social development.

The increase in the number of regions developing regional innovation strategies in South Africa creates an even greater challenge to integrating innovation policy resulting in more overlap, duplication and contradiction of initiatives as well as wasteful resources which a developing country like South Africa cannot afford. There is a greater need to ensure integration of innovation policy as these new regional innovation strategies are being developed.

While South Africa has recognised the need for integration in the innovation system, it has not been able to address the challenge of implementing this system effectively. Identifying and implementing framework conditions for integrating innovation policy to achieving a more holistic and inclusive approach is an important policy challenge for South Africa as it is for many other countries.

The study builds on and contributes to the empirical work on policy integration and innovation policy in developing countries. The study provides additional insights into the approach of developing countries in integrating innovation policy. The research is

aimed at making contributions that address the empirical and theoretical gaps identified above.

1.5 LIMITATIONS OF THE STUDY

The study is focused on assessing the extent of integration between South Africa's innovation policy and Gauteng's innovation policy. It is also mainly focused on one region, Gauteng, which is metropolitan in nature and so the outcomes of the study may not be an adequate representation of the other regions in South Africa. Gauteng was selected as the region of focus as it is considered an economic hub for South Africa and the region already has an approved regional innovation strategy, the Gauteng Innovation and Knowledge Economy Strategy. In the study, innovation policy is understood to be a complex, multi-level, multi-actor domain. The focus of the study is limited to the broad view of innovation policy managed across vertical (regional-national) and horizontal (across different ministries and to some extent agencies).

The study uses mainly content analysis to assess levels of integration in three key policy documents: the national innovation strategy, Ten Year Innovation Plan (TYIP) (2008-2018) and the Gauteng Innovation and Knowledge Economy Strategy, the regional innovation strategy and the Ministerial Review Committee on the STI landscape in South Africa (2012), which was used to substantiate the findings of the assessment. The researcher is aware that content analysis is not always sufficient by itself to form the basis for a complete research project (Stemler, 2001)

The semi-structured interviews were used to verify conclusions from the document analysis and so were used for the triangulation process. The interviews was limited to only four key policy officials at senior, decision-making level involved in national and regional innovation policy. In light of this, the results may not be applicable for other developing countries or regions within South Africa.

1.6 STRUCTURE AND OUTLINE OF THE RESEARCH REPORT

The rest of the research report is organised as follows. In Chapter 2, the theoretical and conceptual framework for innovation policy is reviewed from the perspective of systems of innovation. This chapter also further reviews literature on policy integration including the framework for analysing policy integration, and innovation policy in the context of developing countries. The role of regions in innovation policy in a developing county context is also reviewed. Chapter 3 presents the detailed research design, and the methodology employed in the course of the research. A qualitative research approach in form of a content analysis and interviews were utilised. Chapter 4 presents research findings from the content analysis and interviews. Chapter 5 analyses and interprets the research findings. Chapter 6 summarises the research study and, in particular, draws conclusions from its findings. It is in this chapter that some key recommendations with regard to integrating national and regional innovation policy in South Africa's context are made and suggestions for future research offered. It provides practical insights on the dimensions required to ensure effective integration of national and regional innovation policy.

1.7 CONCLUSION

This chapter introduces the focus of this study. It provides a background to the study and presents the problem statement and purpose of the study. The importance and benefits of the study are highlighted. The key terms are defined and the limitations of the study discussed. This chapter also presents an outline of the structure of the rest of the research report. The next chapter presents a comprehensive review of literature that has been carefully synthesised to provide support for the study. The following chapter revolves around integration of innovation policy.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

The primary purpose of this chapter is to provide a critical review of the relevant literature on policy integration and innovation policy. The literature starts by examining the theoretical and conceptual background on the central aspects of the research question: integration of innovation policy across policy domains (horizontal integration) and inter-connectedness between governance levels (vertical integration. The review provides an analysis of innovation policy in developing countries and the relevance of regions from a systemic approach as a driving force for national economic competitiveness. A framework for analysing policy integration is reviewed. South Africa's innovation policy and the Gauteng regional innovation policy were selected in order to get a better understanding of their integration within a developing country context. Finally, the chapter reviews international best practices in integrating national and regional innovation policy.

2.2 CONCEPT OF POLICY INTEGRATION

The search for better policy integration has received intensified attention from policy-makers as well as policy analysts. Policy integration has long been promoted as a tool for enhancing effective and efficient policymaking at a holistic view as part of a wider policy analysis literature. The literature on the concept of integrating policy also has a relatively long history (e.g. the first reference to policy integration is found in Underdal, (1980) but the concept has not been clarified in the policy-making environment, and therefore may have divergent interpretations). The concept of policy integration has of late become a categorical necessity for all governments, be they national, regional or local. Policy integration and execution is required across all spheres of government. The benefits of policy integration are that it forces greater collaboration between measures, where the sum of the total impact is greater than the individual impacts of the measures.

The search for increased integration of various policies may be due firstly; to the administrative fragmentation and departmentalism that political-administrative processes have acquired as a consequence making governmental action burdensome and inefficient (Peters 2005). Secondly, the areas of government intervention have increased exponentially and various policy areas have progressively sedimented, stratified and overlapped making integration between policy fields and at different levels of government necessary to enhance effectiveness. The current trends are forcing policy makers to adopt a coherently holistic approach to decision-making in order to ensure guaranteed impact of policies being implemented.

The number of better known and more or less synonymous and overlapping concepts of integrating policy can be found: coherent and cross-cutting policy-making (OECD, 1996), policy co-ordination (Challis, 1988; Alter and Hage, 1993), and holistic government or joined-up government (Ling 2002, Christensen and Lægreid 2007). These concepts have been developed within organisational theories studies including those on coordination, collaboration, cooperation and intergovernmental management.

Briassoulis (2004) defines policy integration as a "process either of coordinating and blending policies into a unified whole, or of incorporating concerns of one policy into another (output)". Shannon and Schmidt (2002) define policy integration as "an activity that links policy actors, organisations, and networks across sector boundaries. Facilitating, supporting, and rewarding processes that cross, expand, or otherwise link policy sector boundaries is a necessary characteristic for inter-sectoral policy integration." Policy integration cuts across boundaries of established policy fields and levels of government (Meijers and Stead, 2004). According to Peters (2005:5), policy coordination refers to "the need to ensure that the various organisations… charged with delivering public policy work together and do not produce either redundancy or gaps in services". There are diverse views on the definitions and perspectives regarding policy integration (Briassoulis, 2011; Mickwitz and Kivimaa, 2007; Ostrom, 2007).

In conceptualising policy integration, the study draws from literature on policy coordination. A number of policy analysts in the fields of public policy and public administration have highlighted the challenges of achieving policy coordination, coherence and integration. Policy coordination, coherence and integration are often used interchangeably. Policy coherence is often used when trying to avoid conflicts between the objectives of different policy areas and to ensure that various policy outputs are harmonious (van Bommel and Kuindersma, 2008). Policy coordination, on the other hand can be seen to be aimed at policies and programmes of government working together with minimised redundancy or gaps in delivering services. Policy integration takes both policy coordination and coherence into account and it engenders a holistic view of effectiveness in policy-making (Briassoulis, 2005b; Metcalfe, 1994).

Policy integration can be theorised as either a governing process, as policy outputs and/or policy outcomes (Jordan and Lenschow, 2010; Adelle and Russel, 2013). Moreover, integrated policy making can refer to horizontal (between different departments at the same level of government) and vertical (between different levels of government) or combinations of both (Briassoulis, 2005). The distinction between a vertical and a horizontal approach in policy integration is not unambiguous or straightforward to make in practice (Persson, 2004). Integrated policy making can also occur at a strategic level (coordination of strategies, programmes and initiatives); and operational level (the coordination of related delivery mechanisms), and the coupling of strategic and operational levels.

2.3 NATIONAL INNOVATION SYSTEM

Innovation is a critical component of economic development and productivity growth, and improved competitiveness. Increasingly, innovation emerges in the context of a complex and systemic interplay of multifaceted interaction of actors and institutions. Theoretical advances based on evolutionary economics suggest that innovation is not necessarily a linear process, but are rather complex and multiple interactions involving a variety of actors and their environment, and this is known as the “innovation system” (Freeman, 1987; Nelson, 1993; Lundvall, 2010).

The innovation system approach has been largely adopted in developed and developing countries (Edquist and Chaminade, 2006; Chaminade, 2012; Lundvall et al, 2006; Muchie et al., 2005; Mytelka and Smith, 2002). Policy-makers are attracted to the systems of innovation concept due to the fact that innovation system approaches can highlight the strengths and weaknesses within the system (Soete, Verspagen and Ter Weel, 2010). The systemic approach has under the terminology of systems of innovation gained much credence in policy circles at different levels of application and purpose of analysis: national system of innovation (NSI) (Nelson, 1993; Freeman, 1995; Lundvall, 2010), and has extended with the notion of regional (Cooke, Gomez Uranga et al., 1997), sectoral (Malerba, 2002) and technological (Hekkert et al., 2008) systems of innovation.

Systems of innovation can also be defined based either on their functional or on their territorial aspects (Kaiser, 2003; Carlsson, Jacobsson et al., 2002; Malerba 2002),and highly complex, cross-cutting policy that is not limited to S&T policy but interfaces directly and indirectly with almost all other policies (such as trade and industrial policy, investment policy and education policy) and at different levels of administration (national, regional and local). According to some scholars, systems of innovation are complex, multi-dimensional systems (Katz, 2006; Metcalfe and Ramlogan, 2008), with characteristics of a dynamic, non-linear, systemic process involving a range of interacting actors (Tödtling and Trippl, 2012; Uyarra and Flanagan, 2013).

According to Marcelle (2012), innovation is defined as the creation, diffusion and use of new knowledge through interactive learning processes and not necessarily the knowledge through research and development (R&D) and frontier science. This view suggests that innovation can be an incremental or a radical process.

The nature of innovation and systems of innovation are gradually changing. The new role of innovation policy, which entail the merging of the previously separate disciplines and fields of science and technology (S&T), trade and industrial policy, education policy and other policies have had significant consequences for governance, particularly in terms of the need to develop new ways in which to coordinate the activities of the actors previously responsible for these separate disciplines and fields.

Increasingly, innovation is perceived as a systemic, complex and multi-dimensional concept affected by various elements while government institutions have relatively narrow mandates with closed decision-making processes, and departmentalised in their thematic focus, resulting in fragmentation. These inconsistencies, nevertheless, are becoming one of the most dangerous bottlenecks of future systems of innovation.

National governments continue to play a key role in developing their countries' innovation systems, and continue to define national innovation strategies, with the objective, challenging to attain, of ensuring coherence and effectiveness in the systems of innovation.

The notion of the NSI has found recognition amongst policy-makers and provides a new approach to innovation policy and governance in contrast to the more traditional neoclassical approaches (Freeman, 1987; Nelson, 1993; Soete et al. 2010; Schrempf, et al, 2013). It adopts a holistic and interdisciplinary perspective of innovation rather than focusing on various isolated aspects of innovation. Systems innovation relates to the interaction of actors within a system governed by both formal and informal institutions. (Lundvall, 2010; Fagerberg and Verspagen, 2009). At the core of the system; firms are the key actors in innovation for innovation. Although the NSI approach assists in understanding how innovation is evolving and identifying enabling framework conditions for policy makers to derive more appropriate leads for government intervention in innovation, it has its shortcomings. The theoretical framework of the NSI approach is often seen as rather abstract where it offers only a view of the elements and framework conditions that determine and affect innovation processes in general while in reality there are numerous innovation processes.

Innovation policy largely assumes the NSI perspective, despite the literature findings stressing the importance of national differences in the framing conditions for innovation, policy approaches tend to be uniform. Therefore one can speak of the heterogeneity of innovation systems and the homogenisation of the policy perspective. The concept is widely used in both developed and developing countries' strategies. There are, however, a number of weaknesses in the NSI approach. A key weakness of the NSI approach is that it was created based on empirical studies of

developed countries as an ex-post concept (implying that developments have already taken place and are later analysed) rather than as an ex ante concept (Arocena and Sutz, 2002; Manzini, 2012; Crespi and Dutrénit, 2014). Miettinen (2002) gives a critical assessment of the NSI concept and some of the major points raised are:

- That the NSI concept lacks the understanding interactive learning and knowledge calls for in disciplines other than economics.
- Future research on innovation has to go into more detail referring to specific clusters, regions and technologies rather than remain at an aggregate national system's level.
- A 'scientification approach' that declares the intention to establish complete and final explanations of national innovation performance is not commendable as well as neglect of experience based learning (Lundvall, 2004).

The NSI approach assumes homogeneity within countries, but this is not necessarily the case. A further challenge for the NSI approach can be seen in the increasing innovation activities, which do not require research (Cowan and van de Paal, 2000), especially those activities connected to the ICT and internet sector in a globalised economy. These global developments limit the effectiveness of national policies (Soete et al., 2010).

2.3.1 INNOVATION POLICY IN DEVELOPING COUNTRIES

There is a general consensus among policy analysts, academics and policy makers that innovation and innovation policy is the main driver for economic progress, especially in developing countries (Muchie, 2003; Lall and Pietrobelli, 2005; Lundvall, Intarakumnerd et al., 2006; Schmitz, 2006; Intarakumnerd and Chaminade, 2007; Borrás, Chaminade et al., 2009). The NSI concept to developing countries has been gradual and has provided a framework which can be adopted for purposes of catching up. It is only recently that the notion of innovation has been adopted by developing countries and has subsequently formed part of the agenda of policy-makers (Chaminade, 2009; Farley et al., 2007).

A developing country is defined as a low-income, lower middle-income or an upper middle-income country according to the World Bank's classification. Developing countries face the challenge of competing effectively with more developed countries in a globalised marketplace. Innovation policy in developing countries is heterogeneous and therefore it is important to consider the context in which it takes place. Many developing countries are faced with fundamental social problems of poverty, unemployment and inequality. Developing countries are characterised by "poor business and governance conditions, low educational levels, and mediocre infrastructure" (Aubert, 2005). The instability and vulnerability of the macroeconomic; also political, financial and institutional frameworks are weak and misaligned. Additionally, hierarchical bureaucracies, corruption, policy silos, lack of strategic long term planning and insufficient resources are prevalent. These circumstances make it very challenging for the promotion and coordination of innovation.

According to Lundvall et al. (2009), the narrow mode of NSI on production and R&D knowledge has limited relevance to understanding the challenges pertaining to developing countries. The inherent, complex nature of a systems-based approach to innovation policy, the need for a highly refined understanding of actors' interactions and for strong integration across government organisations can put a burden on human and institutional resources (UNCTAD, 2011a). Developing countries need to move from the traditional, linear, S&T approach to a broader system of innovation policy (Bell, 2002; Intarakumnerd, 2002).

Therefore developing countries, perhaps even more than developed countries, need effective innovation policies to promote economic growth and development. There seems to be an almost consensual agreement in innovation policy discourse that innovation policy in developing countries is partly hindered by weak governance capacities and institutions contributing to less effective innovation systems, stagnant economies (Karo and Kattel, 2010a; Kattel, 2010a; Reinert et al., 2009). Chaminade and Padilla Pérez (2014) specifically highlight the problems of alignment of innovation policies with the national economic development agenda and the alignment of objectives and instruments with systemic problems in developing countries.

Formulation of innovation policies, particularly in developing countries requires an in depth understanding of the macro political context, specific policy context, the factors that affect the implementation process, the nature of the policy process and the extent to which the policy objectives and the cause-effect relationship are clear. The macro political context looks at the extent to which the volatility of the political environment, democracy and conflict can affect innovation. Policy context matters, particularly in the stages of the policy process including agenda setting, diagnostic process, policy formulation, implementation, monitoring and evaluation).

There are a number of studies that have highlighted the lack of policy coherence and coordination in developing countries (Lundvall, 2009). Many authors have acknowledged that effective innovation policies require coordination of other support policies (Lundvall and Borras, 1997, Bodas Freitas and Von Tunzelmann, 2008). In developing countries, incorporating these supporting polices is important so as to effectively promote innovation as well as other core development goals such as creating employment and reducing poverty. Innovation policy is increasingly informed from an NSI theory perspective, despite empirical evidence suggesting national differences in the framing of conditions for innovation, policy approaches tend to be uniform. Therefore one can speak of the heterogeneity of systems of innovation and the homogenisation of the policy perspective.

Systems of innovation are complex, evolving systems and economies that have been successful in this regard are those that have robust, but adaptable, network connections that enable organizations to translate new knowledge into viable innovations and enhanced productive capacity (Edquist, 2005, McKelvey and Holmén, 2006). It is important to recognise that developing economies are adapting systems working within a continuously evolving world and the evolution of new policy framework is a critical portion of that development process. The context for developing countries is fundamental to all appropriate policy undertakes. Policy makers tend to promote a ‘one-size-fits-all” policies to promote innovation and this approach does not work.

Innovation can take place in small continuous incremental changes (adoption and adaptation of existing technologies) or discontinuous radical (new to the world) innovations (Edquist and Riddell, 2000). Many studies argue that incremental

innovation had a greater role to play as very few innovations are radical or disruptive. Incremental innovations are shown to have been an important source of change for developing countries (Manimala, Jose et al., 2005). Radical innovation requires a long-term commitment with huge investments in the technical skills and infrastructure and there is no guarantee. National innovation policies that focus on traditional inputs such as R&D intensity tend to not adequately address the socio-economic challenges faced by developing countries. The OECD (2011) argues that the new approach to innovation policies requires countries to expand their traditional emphasis on inputs and consider other kinds of interventions.

Developing countries do not have the resources and technical skills to pursue radical innovation. Successful developing countries have prioritised incremental innovations as the main source of innovative performance rather than radical innovations.

2.4 ROLE OF REGIONS IN INNOVATION POLICY

While the national level remains the most important for conceptualising systems of innovation due to the importance of country-specific interactions in creating a climate for innovation, regions have an important role in the innovative potential of a country. Many of the developed countries and increasingly developing countries with performing regions are advancing in their capacity to integrate the regional dimension in innovation policies. Regions are becoming active in developing, designing and implementing their own innovation policies. More recent work has highlighted the significance of the regional dimension in shaping innovation and its role in shaping coordinated economic processes (Doloreux and Parto, 2004; Chaminade and Vang, 2006; Schmitz, 2006; Todtling and Trippl, 2013).

The heterogeneity in regions such as industrial specialisation patterns and innovation performance (Tödtling and Trippl, 2005); knowledge spill-overs, (Audretsch and Feldman, 2004); and tacit knowledge (Tsoukas, 2005) uniquely position regions as strategic platforms for specific national objectives. There are various theoretical and empirical constructs concerned with regional economies and industrial development including learning region, industrial district, cluster, and

regional innovation systems (Trippl, 2008; Cooke, 2001, Asheim and Isaksen, 2002, Malmberg and Maskell, 2002).

A region as a concept is not limited in definition by a determinate size. It is homogeneous in terms of specific criteria and possesses some characteristics of internal cohesion. A region is generally understood as a spatial entity that fulfils certain criteria at a subnational level where a system of governance exists. Regions may be homogenous, functional or administrative. Regions can also be defined as learning regions (Cappellion, 2002). A region could be a metropolitan area, a non - metropolitan area, a county or a federal state. The definition of a region is also affected by the history and political orientation, budgetary responsibilities, capacities and experiences. Given the relative newness of the regional role in innovation policy, more formal definitions are evolving. In the study, regions are viewed as functional areas rather than administrative borders.

Some of the key major factors why regions are the appropriate level for stimulating innovation include:

- Globalisation has raised the profile of regions and increased the need for local action to identify possible endogenous sources of growth and this is because of the rise to prominence of regional and local industry clusters as vehicles for global and national economic competitiveness.
- The increasing need for innovation policy in addressing socio-economic challenges and regions being seen to be closer to the innovation system actors such as industry, universities and communities. (OECD, 2011). Regions have unique assets because of the geographical proximity that facilitates acquisition, accumulation and use of knowledge. Cooke (2005) makes reference to 'regional knowledge capabilities' which essentially emphasis capabilities and knowledge transfer at regional level. Many authors have stressed the importance of regions developing core competencies and competitive advantages that are location specific, allowing embeddedness of the regional culture, which makes it unique and difficult to replicate (Boschma, Minondo et al., 2013).

- The increased importance of networked innovation creates opportunities for regions that can play a facilitator and broker role to ensure fluidity of relationships and support collaboration of actors within and outside the region. The relationship within the networks creates a level of interdependence, trust and a specialised knowledge base with a high degree of tacit knowledge. It is this embedded, localised interactive learning within a regional context which makes the regional concentration of actors ideally suited to knowledge spill overs and technology transfer (D'Allura, Galvagno et al., 2012).

The regional level is also more appropriate for creating policies to foster technology transfer from universities, and to establish networks and partnerships between government, firms and research institutes. Table 1 aims to illustrate the different competencies that exists at national and regional levels in innovation policy. Note, however, that in light of the heterogeneity that exists across countries and regions, this classification does not intend to be prescriptive or indicative of the most efficient approach.

Table 1: National vs. Regional Competencies in Innovation Policy

	More often national	**More often regional**
Modes of innovation	Basic research, generation of new knowledge	Applied research, knowledge adoption and diffusion, technology transfer
Target groups	Public research labs, universities, large firms	Universities, small- and medium-sized enterprises (SMEs), startups, spinoffs
Infrastructure	Public universities, public R&D labs	Business incubators, science and technology parks, technology transfer offices
Regulations	Intellectual property rights	Building permits,

	(IPR) regime, subsidies, fiscal incentives for private R&D	infrastructure Development
Human capital	University education, postgraduate scholarships	Technical training, lifelong learning, internships
Linkages	International linkages, scientific collaboration	Public–private partnerships, cluster development

Sources adopted from: Koschatzky and Kroll 2009, OECD 2011, Perry and May 2007, Ritzen and Soete 2011, and Tödtling and Trippl 2005.

The regional innovation systems (RIS) as a geographical subset of NSI, are important as the strong dynamics of innovation generation in regions are crucial for achieving national innovation policy objectives. Asheim and Gertler (2005) define RIS as "the institutional infrastructure supporting innovation within the production structure of a region". RIS focuses on proximity and innovation and in the role of intangible and tangible locally bound assets in shaping the rate and trajectory of the innovation process. RIS are composed of the interaction between knowledge exploitation subsystems and the knowledge support organisations (often referred to as the knowledge exploration subsystem) in which universities and R&D institutes; technology transfer agencies, business incubation and finance institutions are included.

The key dimensions of a RIS include processes and policies supporting knowledge transfer; innovation governance whereby key regional governance mechanisms are interactive and inclusive; the level of investment in innovation; the type of firms and their degree of linkage and communication, in terms of networking. RIS do not exist in isolation but are affected by the national and global environment, external conditions and internal dynamics. Effective RIS requires systemic linkages between firms, external and internal sources of knowledge production, intermediaries

In addition to being systemic, effective regional policy often needs to be tailored to the specific demands of the various regional stakeholders. The empirical insight shows that in spite of the application of various practices in regard of regional initiatives, there is no one-size-fits-all policy approach (Nauwelaers and Wintjes, 2002); (Tödtling and Trippl, 2005). In order for the regional innovation policies to work at a regional level, Kuhlmann (2002) argues that the objectives of the policies must be clear, resources must be allocated and there must be strategic intelligence in policy making in order to achieve the intended goals. In the context of innovation policy, regions suffer even greater systems deficiencies such as a lack of local actors; fragmentation of actors and their activities; lack of financial resources; inadequate knowledge infrastructure to support interactive learning; negative lock-in; capacity to designing, developing, implementing and monitoring policies.

There is growing literature on RIS specificities and contingencies of developing countries (Lundvall et al., 2006; Yeung, 2006; Schmitz, 2006; Asheim and Vang-Lauridsen, 2005, Chaminade and Vang, 2008, Scott and Garofoli, 2011). Well-functioning RIS based on intense interactive learning are typically found in developed countries but seldom in the developing world. RIS in developing countries are characterized by a low degree of institutional thickness thus weak interactive learning (D'Costa, 2006). RIS in developing countries face fundamentally different theoretical challenges as they are embedded in institutional frameworks that are often not as strong and well established as in developed countries (e.g. World Bank, 2010; Kraemer-Mbula and Wamae, 2010a). Many of the opportunities and challenges of regional innovation policy do not depend on a country's level of development, but developing countries' regional innovation systems often face higher levels of diversity, income inequality, and institutional instability than do similar systems in developed countries (Cassiolato and Martins 2000).

Competence building is a major challenge in developing countries when designing and implementing innovation policies (Borrás and Edquist 2013). In designing innovation policies, policy makers in developing countries often lack the tools and competencies needed to enable them identify policy problems and solutions. The

challenge is even greater when aiming to integrate innovation polices. This is often worse at a regional level where fewer policy makers have been exposed to innovation policy. Some regions are capable of setting the overall strategic framework; developing, implementing and evaluating policies; sourcing the financing of regional programmes (OECD, 2011).

Furthermore, there are also considerable typological differences between regions (e.g. peripheral regions; lagging regions; urban regions; clustered regions; fragmented regions etc.). Therefore, designing regional policy requires acknowledging the specificities of the region and its economic structure. Therefore, regions have to be proactive in developing their own strategies and should take more initiative and responsibility for designing innovation policies, creating the necessary supporting environment and improving the implementation mechanisms of regional development strategies (OECD, 2011).

The country's political structure is an important, but not determinant, factor in understanding the scope for regional action. Regions may play a passive role, such as stages (scales for national action) or implementers (regions serve to deliver centrally conceived priorities and targets). They may also play an active role, such as partners (helping to design and finance national priorities) or independent policy makers (using own resources and independent agenda setting) (Perry and May, 2007).

Modernising activities in developing countries are often concentrated in regional industrial clusters (e.g. special economic zones, incubators) and they draw upon local knowledge infrastructure as well as on international sources of knowledge. Theoretically, the existing literature in RIS in developing countries continues to be rather generic, ignoring the specificities of the regions. Chaminade and Vang (2006) argue that there is a need to move from individual cases to the systematic comparison of regions and develop a systematic and rigorous method to study the dynamics of regional systems of innovation in developing countries in a comparative perspective.

The empirical study of de Lucio, Mas-Verdu et al. (2010) indicated that some regions follow linear-type policies of adopting national policies that are not specifically adapted to the system of innovation in which they are applied.

Regions within a single country may follow very different technological trajectories and have different technological needs. Even those with similar levels of technological development may adopt completely different innovation strategies as a result of their industrial characteristics or historical path dependencies (Sanz-Menendez and Cruz-Castro, 2005). Moreover, depending on their circumstances, some regions may be more likely to develop an interest in science policy than others. These regional variations call for flexible strategies of national–regional interaction, avoiding a one-size-fits-all approach.

2.5 ANALYSING AND ASSESSING POLICY INTEGRATION

There is no specific framework for analysing innovation policy integration however there are a number of frameworks for analysing policy integration that exist in the literature and have been applied in various policy fields. In assessing the extent of policy integration in a policy process, a framework for analysing policy integration is adopted from Briassoulis (2004) and Nilsson and Persson (2003) is used in the study. Both authors argue that policy consists of four main elements: the policy problem characteristics; the available policy structures and procedures; involved actors and their goals; and the instruments and mechanism used to achieve these goals (Nilsson and Persson, 2003, Briassoulis, 2004).

Both authors consider an intertwined approach to policy integration and propose a congruent relationship between the objects, goals, actors, procedures and instruments of two or more policies:

- Policy objects – a common scope, perspective and treating common or complementary facets of a problem.
- Policy actors – common actors that have shared values, common visions, and common goals increase the chances of integration.
- Policy goals – common or complementary goals as necessary (but not sufficient) pre-conditions for integration.

- Policy structures and procedures – horizontal and vertical linkages among organizational and administrative apparatuses and coordinated structures and procedures for formulating and carrying out solutions;
- Mechanisms and policy instruments – congruent mechanisms and policy instruments of the same or different types (or the use of integrative instruments).

The framework for analysing policy integration is divided into three main categories, with subcategories as follows (Table 2): 1) complementary policy goals, priorities and scope; 2) policy structures and procedures for policy integration; and 3) mechanisms and policy instruments to steer integration.

Table 2: Framework for analysing policy integration

Categories of framework for analysing policy integration	**Sub-categories**
Complementary policy goals, priorities and scope	Extent of complementarity of strategic objectives between national and regional government
	Explicit mention of national and regional actors working together
	Explicit mention of political commitment
	Quantitative, measurable, indicator-based targets and timelines
	Consistency in the concepts and terminologies
Policy structures and procedures for policy integration	Explicit mention of clear mandates, roles, responsibilities and modalities of operations
	Administrative capacity for policy integration – organisation, officials administrative reform
	Overarching political body
	Consistent, compatible and coordinated procedures and rules of decision making
	Common or coordinated/compatible action plans across the different levels of government
Mechanisms and policy instruments to steer integration	Regular dialogue, consultation processes and ad hoc meetings
	Joint institution or agency that oversees the implementation
	Co-financing tools that have been developed to align resources

	Complementary policy instruments
	Common assessment, monitoring and evaluation mechanisms/ methodologies, and tools (policy integration indicators)

Source: Adopted from Briassoulis (2004) and Nilsson and Persson (2003)

Both authors argue that the degree of policy integration requires an analysis of the goals, objectives, and targets of the policies considered to assess whether they are consistent, compatible or, at least, in agreement with one another. Furthermore, policy integration may be set separately as an explicit policy goal. Statements indicating political commitment or stipulation of specific integration goals, targets, and consistent concepts and terminologies are characterised as evidence of policy integration.

With regards to policy structures and procedures; horizontal and vertical linkages should exist between the organisational and administrative processes of individual policies, such as common, congruent and coordinated structures and procedures, for properly formulating and carrying out joint, cooperative and integrated solutions to common problems. Administrative procedures and other organisational arrangements and requirements for communication, joint decision making, collaboration and conflict resolution within and between state and non-state actors, both during policy formulation and during implementation, are necessary to promote policy integration. Procedural integration refers to the existence of provisions that integrate the implementation procedures and the instruments of the policies considered within and across government departments and at the different levels at which they apply.

The use of compatible, non-conflicting, and mutually reinforcing policy instruments increases the possibility of achieving a high degree of policy integration. It is important to take into account the design of other policy instruments in order to avoid possible conflicts of compatibility. The effective coordination of policy instruments is strongly dependent on policymaking procedures and their role in guiding the varied combination of instruments.

Coordination mechanisms are also used to strengthen policy integration across government departments and at the different levels of government (see Table 3).

These include regular dialogue; consultation process; co-financing tools; joint institutions that oversee implementation and ad hoc co-ordination arrangements.

Table 3: Implementing co-ordination mechanisms for the multi-level governance of STI policy

Mechanisms	Primary benefits
Regular dialogue, consultation processes and ad hoc meetings	• Promotes information sharing at a given level or across levels to support innovation policy development. Sufficient regularity is needed to maintain relationships and support regular feedback. • Builds trust through repeated interactions. A "neutral" or respected entity can sometimes be helpful for playing the convening role for dialogue. • Process for providing feedback (generally by regions to national government) at key stages in development of an innovation policy. High-level political consultation processes can reveal conflicting objectives in other policy areas.
Joint agency (multi-level)	• Joint implementation of overall strategies. Opportunity to pool funds across departments at a higher level of government, discouraging policy silos problematic for the lower level. • Helps to identify bottlenecks and complementarities for overall innovation policy mix. Many choices need to be made regarding the role of the agency that influences the capacity to build bridges across levels of government.
Contracts	• Addresses fiscal imbalances (*ad hoc* or strategic). Opportunity to pool funds across departments at a higher level of government, discouraging policy silos problematic for the lower level. • Promotes inter-governmental dialogue in contract development process. Anticipates an impact-oriented, as opposed to audit-oriented, review of contract performance for policy learning. • Information is shared periodically, including through commonly agreed indicators. • Encourages convergence of objectives. • Contracting process can build policy-maker capacity
Project co-financing	• Supports joint action across levels of government. When higher level selects co-financed project, it should consider the project's integration into broader regional/local strategies. • Addresses fiscal imbalances (*ad hoc*). • Encourages convergence of objectives (*ad hoc*). Considers whether design of co-financing mechanism adds to or reduces transactions costs of programme implementation.

Adopted from Source: (OECD 2011)

2.6 KEY ASPECTS OF INTEGRATING NATIONAL AND REGIONAL INNOVATION POLICY

According to Pelkonen, Teräväinen et al. (2008), integration in the context of innovation policies is viewed as policies and programmes working coherently together to achieve a common goal. The application of the NSI approach in innovation policy creates an even greater challenge for developing countries in combining efforts for knowledge creation, diffusion and use with the purpose of ensuring socio-economic impact. Integration of policy objectives, goals, regulation, instruments and mechanism takes place within the context of a joint imperative and policy components in each policy domain may build upon and reinforce each other. The lack of integration may lead to policy duplication, contradictory effects, inconsistencies and gaps, as well as an overlapping and insufficiently systemic view of innovation.

Common challenges of integrating innovation policy across government departments and levels of government include (Edler, Kuhlmann et al., 2003):

- a high degree of departmentalisation, compartmentalisation, bureaucratic structures, administrative silos;
- failing attempts at restructuring responsibilities in government because of institutional inertia;
- dominance of linear model of innovation in policy approaches;
- innovation policy approach in a very specific, narrow field focusing on investment in research and development, patents and high science;
- Lack of understanding of innovation policy in other policy domains and lower levels of government (e.g. regional and local levels).

2.6.1 MULTI-LEVEL GOVERNANCE

Multi-level governance is defined as an arrangement where there is sharing of policy competencies and budgetary resources across various resources in a given policy

domain. This arrangement allows actors, organisations and policies at different levels of territorial aggregation to be coordinated in order to achieve coherent policies and programmes (Schmitter 2004). This increases the number of actors, organisations, policies and programmes to be coordinated in order to achieve policy integration. Multi-level governance brings even greater challenges to developing countries as the articulation of goals and programmes between the various levels of government can be a time – and resource- consuming process; as well as lack of resources and public budgets for innovation particularly at lower levels of government can act as a barrier to integrating government effort.

Understanding the multi-level governance challenges in innovation policy requires a systemic approach. According to the OECD (2011), there are five dominant gaps that challenge multi-level governance: information, capacity, fiscal, administrative, and policy gaps (see below). These gaps are interrelated, can exacerbate each other and should be approached in a holistic way. Promoting integration and capacity-building is a large and critical component towards bridging multi-level governance gaps on innovation policy.

- Information gap: is characterised by different levels of government having information asymmetries when designing, implementing and monitoring innovation policy. The sharing of information across different levels of government to inform each other's policy is difficult.

- Capacity gap: exists when there is a lack of capacity to formulate and implement policy. It arises when there is a lack of human resources, knowledge (skill-based and “knowhow”) or infrastructural resources available to carry out tasks, regardless of the level of government. Asymmetries between national and regional government can be related to regional weaknesses in terms of innovation strategy design, or on the other side, to the national government limitations to identifying relevant innovation projects without consulting regional actors.

- Fiscal gap: The absence of stable and sufficient revenues of regional actors is a primary challenge for integrating innovation policy across different government departments and between different levels of government. The gap reflects the insufficient financial resources that prevent other regions for

participating in the innovation system. This creates a direct dependence of regional government on the higher level of government for funding innovation policies. The budgetary allocations to regions may not necessarily coincide with decision-making power. Budgets can be decentralised but decisions may remain at the national level.

- Policy gap: Policy integration relies in the set of institutions. When roles and responsibility are scattered across actors and policy areas, segmented working methods can prevail and complicate the decision-making processes. The fragmentation has an impact on the innovation policy processes across government departments and between levels of government. Policy silos at national/national level undermine efforts to co-ordinate at the subnational level. Inefficiencies are high given the proliferation of programmes emanating from different levels; and gaps in the allocation of responsibilities result in policy areas unmet at any level of government.

- Administrative gap: arises when administrative borders do not correspond to relevant economic and social territories for innovation policies, leading to a fragmentation of public approaches.

2.6.2 CENTRALISED AND DECENTRALISED COMBINED APPROACHES TO INNOVATION POLICY

Developing countries tend to have hierarchical top-down approaches to innovation policy. The top-down approach assumes policy implement is most effective through national policy. Reflection on both the centralised, top-down and decentralised, bottom-up approaches reveals that both have their advantages and disadvantages. Balanced approach that recognises the value of the various different models of governance and policy integration of innovation is critical. These approaches should be complementary and interdependent. According to the World Bank (2010) bottom-up approaches should be used for standard types of innovation projects and for gathering information and inducing self-organisation in new areas. The top-down

approaches should be used for providing strategic framework and changes in policy directions.

All levels of government, from national to local, are seeking to maximise the efficiency and effectiveness of their resources and time. In most cases, regions do not have sufficient regulatory autonomy; budgetary autonomy; sufficient human resources to design, development, implementation and evaluation innovation policy; and relevant competences and experience to do effectively. National governments are seeking to delegate more innovation policy responsibility, but need assurances that regions have the capacity and capability to do effectively. Table 4 shows challenges of excessive centralisation or decentralisation in implementing national innovation strategies.

Table 4: Challenges of excessive centralisation or decentralisation in implementing national innovation strategies

Risks of excessive centralisation	Risks of excessive decentralisation
Asymmetries of information	Lack of coherence and synergy among national and regional strategies
Resources not targeted to regional needs	Insufficient vertical integration across levels of government
Insufficient complementarities between levels of government	Inefficiencies and lack of effectiveness in services due to weak administrative or technical capacity at regional levels
Passive regional governments, which do not complement national policies by their own efforts	More administrative responsibilities transferred to regional levels without adequate financial resources makes the provision of their services more difficult

The critical role of national governments in an increasingly decentralized scenario is to ensure integration of regional innovation strategies by searching for economies of

scale while reducing fragmentation and regional tendencies to set overambitious and unfocused goals. The degree of decentralisation may be different for innovation-related matters than for more general policies. It is not true to assume the bottom-up approach can solve all the problems of the top-down approach without bringing in its own.

The benefits of the decentralisation of innovation policies stem from the potential of regional governments to better identify local technological strengths and opportunities, respond to the desires and aspirations of their constituents, and so improve their ability to overcome systemic inefficiencies and information asymmetries. The combination of decentralisation, bottom-up regional initiative and increasing attention to place-based dimensions in national policy can result in greater areas of mutual dependence in innovation policy. At the same time, it has created new challenges for each level of government. National governments are dependent on regional level to achieve many of their policy objectives. At the same time, the regional levels are often dependent on the collaboration or consent of the national level in order to carry out their responsibilities.

2.6.3 EVIDENCE-BASED POLICY EXPERIMENTATION

Many governments are moving from policy that is opinion-based towards policy that is relevant based on evidence. A lot has been written about the need for policy experimentation in developing countries (Lundvall, et al., 2011,Chaminade et al., 2009; Srinivas and Sutz, 2008; Juma and Yee-Cheong, 2005). Their views highlight the need to open up new development trajectories with greater emphasis on generating knowledge and leaning particularly at a lower level of policy. Effective evidence-based policy experimentation would however require the existence of adequate learning mechanisms and a certain degree of policy flexibility and autonomy.

Regions can play a central role in improving the quality of evidence-based policy, and develop analytical capacity that can be useful for monitoring to support evidence-based policies. As innovation policy evolves incrementally and it advances through trial and error, the newly prominent role of regions in innovation will require

both availability of resources and capacity to design and implement innovation policies. The heterogeneity of the regions and the uncertainty of the innovation process generate the need for a certain degree of policy experimentation.

2.7 OVERVIEW OF SOUTH AFRICA AND GAUTENG INNOVATION POLICY

2.7.1 SOUTH AFRICA

2.71.1 SOCIO-ECONOMIC PROFILE

South Africa can be described as a centralised political-system, and a developmental state with a three-tier administrative structure, however, there are some levels of decentralisation at provincial and local level. South Africa is considered an upper-middle income developing economy by the World Bank, and is considered to be a newly industrialised country. South Africa has the second biggest economy on the African continent, behind Nigeria and the 34th-largest in the world. South Africa has extremely high levels of unemployment and inequality by historical and international standards. It also has high levels of disparities between and within all its nine regions. An analysis done on South Africa shows that its economic performance is being held back by under-performing regions. In seven of the nine regions more than 50 percent of the population lives in poverty.

Out of the nine provinces, the regions that are developing regional innovation strategies include Gauteng (completed), Western Cape (completed), Eastern Cape (in progress), Limpopo (in progress), and Free State (in progress).

2.7.1.2 Innovation policy

South Africa was the first developing country to adopt the NSI concept in its policy-making (Rooks and Oerlemans, 2005). It is emerging as a global player in STI in certain fields but faces a range of challenges in developing its NSI amid difficult socio-economic conditions and weak coordination of governmental structures. South Africa's NSI is characterised by a high degree of fragmentation and a lack of coordination. Governance of NSI is still marked by weak state coordination and lack of policy and administrative capacity (OECD, 2008; NACI, 2014). The challenges,

amongst others include: a fragmented innovation system; lack of innovation policy coherence; weak performance management framework indicated by weak monitoring and evaluation and lack of an enforcement mechanism; a weak institutional framework. As a consequence, resulting in fragmentation of responsibilities with regards to innovation across a considerable number of government departments and agencies.

Two decades following the era of apartheid, the advanced system of science and technology research and development (R&D) has been embedded within an extremely poor national innovation system (Scerri, 2012). South Africa's national government plays a fundamental role in developing and implementing innovation policy, and its emerging science and technology R&D system remains state-led and focused on frontier technologies.

At the political level, the Parliamentary Portfolio Committee for STI (comprising members of Parliament) provides an oversight of the activities of the Department of Science and Technology (DST) and its agencies. The Portfolio Committee does not, however provide holistic advisory on strategies, policies and programmes of the systems. The National Planning Commission (NPC) and the Department of Performance Monitoring and Evaluation (DPME) also provide high-level policy framework for strategic guidance and accountability. At the strategic level, both in the National Growth Path (EDD, 2011) and the National Development Plan (NPC, 2011) do not makes significant reference to innovation policy.

DST assumes leadership for innovation policy design, development and implementation in South Africa. The DST was formed in 2004 from the previously Department of Arts, Culture, Science and Technology (DACST) that was established in 1994. The 1996 White paper on science and technology (S&T) was the first science policy to be adopted. This framework document laid the foundation for South Africa's NSI. The DST later commissioned the following policy documents - the National Research and Technology Foresight (DACST, 1999); the National Research and Development Strategy (DST, 2002); Ten-Year Innovation Plan (TYIP) (DST, 2008): Innovation Towards a Knowledge–Based Economy, 2008-2018; OECD review of South Africa's NSI (DST, 2008). The evolving policy framework has

intended to serve as a basis by which integration and coherence could be achieved in the innovation system.

The DST coordinates the development of the NSI and influences the system through its key strategies such as the NRDS and TYIP. The DST funds a range of research, development and innovation activities and is not at the point where the organisation is seen to be a systemic formulator and coordinator of NSI-related policy and strategy. The DST is entrusted with the development, coordination and management of the NSI in South Africa.

DST's responsibilities for vertical co-ordination include a number of government agencies and research councils. Some of the key agencies and councils include the National Research Foundation (NRF), the Technology Innovation Agency (TIA), the Council for Scientific and Industrial Research (CSIR), the Human Sciences Research Council (HSRC). All of these agencies and councils have their own performance indicators, agreements, and governance bodies appointed by the DST.

The Department of Trade and Industry (DTI) is a significant funder of technology, research and innovation, and via other agents. Some of the key innovation programmes funded by the DTI are the Technology and Human Resources for Industry Programme (THRIP) managed by the National Research Foundation; and Support Programme for Industrial Innovation (SPII) managed by the Industrial Development Cooperation (IDC) (now moved to the Department of Economic Development); and Small Enterprise Development Agency (SEDA). The DTI's responsibilities include aspects of technology-related innovation and entrepreneurship, often on a shared basis with DST.

The DTI itself has also developed a range of policy frameworks that directly influence the development of the innovation system, in particular the Integrated Manufacturing Strategy (IMS). There is also some level of horizontal integration between these government departments (DST, DTI and others) through annual publication of an iterative Industrial Policy Action Plan (IPAP). The DTI produces an annual Industrial Policy Action Plan (IPAP) that the DST and a few science councils provide inputs for.

The perceived role of the Department of Trade and Industry's (DTI) intervention on innovation policy has been to enhance the role of the private sector in the innovation

system. One of the strategic objectives of DTI is to “facilitate transformation of the economy to promote industrial development, investment, competitiveness and employment creation”. The role of the DTI is to provide a triple helix relationship model, towards industrial funding and partnerships with public researchers. Although the SEDA and IDC are region-wide parastatals, their programmes are coordinated primarily at a national level.

The DTI also spearheads the newly adopted Special Economic Zones (SEZ) Bill which is set to provide for the designation, promotion, development, operation and management of SEZs. The Special Economic Zone (SEZ) Bill that is currently being tabled aims at supporting a broader- based industrialisation growth path for our country, as well as balanced regional industrial growth, and the development of more competitive and productive regional economies with strong up and downstream linkages in strategic value chains – managed nationally.

The Department of Economic Development (EDD), established in 2009 is set to “promote economic development through participatory, coherent and coordinated economic policy and planning for the benefit of all South Africans”. The New Growth Path (NGP), a long term project that argues for concerted intervention in the economy to construct a developmental state is spearheaded by EDD. The NGP is adopted as the framework for economic policy and the driver of the country's jobs strategy. The NGP aims to create five million jobs by 2020 and bring unemployment rate down to 15 percent.

EDD also sits with some components of innovation activities and has recently been given the mandate to oversee the Industrial Development Cooperation (IDC), which manages the Support Programme for Industrial Innovation (SPII) these are seen to be critical in supporting innovation within the private sector. The New Growth Path has fixed six priority areas in terms of job creation: infrastructure development, agriculture, mining, manufacturing, the "green" economy and tourism. The NGP and National Development Plan (NDP) make reference to technological innovation as a way of driving the economy. The NDP is a national plan to eliminate poverty and reduce inequality by 2030. The NDP and the NGP are key overarching national policies for economic and social development.

The National Advisory Council on Innovation (NACI) was established in 1998 and set up as a body which advises the Minister of Science and Technology. NACI reports directly to the Minister of Science and Technology and therefore has a limited role in forming and advising government on strategy and planning at a national level, as it reports to only one department. It does not have extensive influence on the activities of the various NSI stakeholders to influence the achievement of a common strategic priority.

NACI is limited by its ties to DST and lacks the wider overview needed to debate and help set national priorities and to coordinate the national effort that cuts across different government departments and different levels of government. South Africa does not have a high-level steerage mechanism body headed from the President's office. The 2008 review of NACI did highlight the establishment of such a body indicating that NACI is equipped to perform its proposed role.

Both DST and NACI have not been able to coordinate and manage the process of designating the fragmented and diversified NSI as coordinators. As a result, South Africa's NSI continues to be inadequate at both the vertical (across different levels of government) and horizontal (across government departments) integration of purpose and effort amongst the actors in the NSI. The limited integration and coherence is reflected in many of the misaligned policies, strategies and institutions; and R&D activities appear to be highly fragmented and not results in commercial marketable value.

NACI's structure, position and empowerment to carry out its function has always been in question. NACI has not been able to function effectively and transparently. The organisation has not been able to gain visibility in terms of profiling its work and does not have the research capacity to influence actors in the NSI. Some authors have argued that NACI's role should be to carry out the task of agenda-setting of the NSI, with regards to prioritisation of actions, providing oversight of the system in terms of systems of planning, monitoring, evaluation and review.

2.7.1.2.1 Relevant nation innovation policy documents

2.7.1.2.1.1 White Paper on Science & Technology, 1996

The White Paper on Science and Technology of 1996 (DACST, 1996), introduced the notion of an NSI into South Africa's formal public policy discourse and arguably set in motion the transformation of South Africa's S&T system into a better co-ordinated and inclusive system. The vision of the White Paper on having an NSI that can drive economic and social development has not been adopted widely enough across the government department. Furthermore , it addresses systemic failures requiring concerted national action such as a fragmented and inadequately co-ordinated S&T system; the erosion of innovative capacity, poor knowledge and technology flows from the science base into industry; poor networking both within the region and in the global context; and inefficiencies and poor levels of investment in R&D.

2.7.1.2.1.2 OECD review of South Africa's NSI, 2008

In 2007, the Organisation for Economic Cooperation and Development (OECD) commissioned a review of South Africa's innovation policy at the request of the DST. The OECD review was based on a country self-assessment that was prepared by National Advisory Council of Innovation (NACI) and interviews with stakeholders in the NSI. The OECD review pointed out that although significant measures have been taken to rearrange the NSI in order to meet the socio-economic needs of the country, the NSI was perceived as still inadequate to address the socio-economic problems that the country faces such as alleviating poverty, unemployment and exclusion from the formal economy.

The review noted that the concept of the NSI in the country has yet to gain limited currency, both in the extent to which it is understood as something wider than traditional R&D activities and the extent to which it has been fully absorbed into the strategies of other sectoral governments and universities.

The OECD review (2008) pointed out that although significant measures have been taken to restructure the NSI in order to meet the socio-economic needs of the

country, the NSI was still perceived as being inadequately equipped to address the socio-economic problems that the country faces such as poverty alleviation, unemployment and exclusion from the formal economy. The OECD review also pointed out specific weaknesses identified within the NSI, such as weak public sector coordination of the planning and implementation of the NSI, which was a key role identified in the White Paper of 1996.

The OECD Review (2008) mentions that the efforts of government (particularly the DST and NACI) in addressing the highly fragmented and diverse NSI have not been successful. It reported that South Africa has achieved only limited horizontal and vertical coherence and integration across government; its agencies and small business support.

2.7.1.2.1.3 Ten-Year Innovation Plan (TYIP) (DST 2007)

The Ten-Year Innovation Plan (TYIP) (DST, 2007) was released in 2008, in response to the OECD review. The ten-year plan is considered to be the key document on South African innovation policy. The plan attempts to transform the country's economy into a knowledge-based economy that will be primarily coordinated by the DST. A detailed content analysis on the TYIP is provided in Chapter 4. One of the key issues that the TYIP aimed to address was the fragmented and inadequately co-ordinated NSI.

The plan suggests four key areas that the NSI needs to focus on in order to achieve significant economic growth and these include: human capital development; knowledge generation and exploitation; knowledge infrastructure; and enablers to address the 'innovation chasm' between research results and socio-economic outcomes. The main focus of the TYIP is an S&T-based innovation approach towards addressing five grand challenge areas (Kahn, 2013; Mhula, Jacobs et al. 2013).

The five grand challenges, to be spearheaded by the DST include bio-economy, space, energy security, global change, and understanding of social dynamics. The grand challenges are spread across the operating domains of many national government departments and represent priority areas of government.

The TYIP is seen more as a vision statement than an action plan, and more supply than demand driven. The plan has a largely top-down approach with no mention of regional or local systems of innovation (Mhula, Jacobs et al., 2013). Given the focus on the grand challenges, it is clear that the plan is primarily scientifically and technologically focused and that there has been limited consultation or prioritisation with communities outside the formal NSI.

2.7.1.2.1.4 DST Ministerial Review Committee on the STI landscape in South Africa, 2012

The Ministerial Review Committee on the STI landscape in South Africa (DST, 2012) was convened in 2010 by the Minister of Science and Technology, Naledi Pandor to review the science, technology and innovation landscape in South Africa. The review provided recommendations to rearrange the current NSI governance model, which would have profound implications if implemented. The Ministerial Review Committee, comprising mainly of a panel of national level experts was tasked to consider the state of the South African NSI in light of the following:

- Its readiness to meet the needs of the country in the medium to long term;
- The extent to which SA is making optimal use of its current strengths;
- The degree to which SA is positioned so that it can respond rapidly and significantly to changing global contexts.

Following this process, the committee made recommendations in the Ministerial Review Report in 2012 on the future structure and governance of the NSI, the roles and responsibilities of the various actors, the roles and responsibilities of the DST and its relationship with other government departments, human resource and other capabilities of the NSI and funding and recapitalisation needs. The Ministerial Review Report points out that the TYIP "reads more as an elaborate 'vision statement' than a fully developed action plan."

The Ministerial Review Report (DST, 2012) noted that many of the concerns indicated in the OECD review were ignored in the subsequent ten-year plan of 2007, particularly the more central inclusion of the private sector and SMEs into the NSI, resolving governance issues with regard to vertical and horizontal coordination and

the institutional architecture of the NSI. A more detailed content analysis on the Ministerial Review Report is provided in Chapter 4.

The recent 2012 DST Ministerial Review Committee on the Science, Technology and Innovation (STI) Landscape in South Africa has reiterated that the NSI is still incoherent and fragmented despite the various policy interventions that have taken place (Hart, 2013). The problems are not only contained to the NSI but more broadly within the state as a whole.

2.7.2 GAUTENG

The Gauteng region is one of the fastest growing metropolitan regions in South Africa. Despite the fact that the region is the wealthiest and most urbanised province in South Africa; it still has the largest concentration of informal settlements in the country. Although the smallest of nine provinces, Gauteng is considered the economic and industrial hub of South Africa contributing 34 percent to the national economy and 10 percent to the GDP of the entire African continent (Statistics South Africa). Gauteng's growth is widespread across sectors such as the manufacturing, financial, transport, and telecommunications sectors.

Gauteng hosts leading research institutes and is the centre of higher-level education providing 40 percent of tertiary education in the country, as well as a number of business services, making it a knowledge intensive region. The region hosts a number of key institutions, all the national government departments, the Council for Scientific and Industrial Research (CSIR), the Agricultural Research Council (ARC), Onderstepoort Veterinary Institute and various universities. The region also hosts the Innovation Hub, Africa's first internationally accredited science park and a subsidiary of the Gauteng Growth and Development Agency (GGDA), which is an agency of the Gauteng Department of Economic Development (GDED). Innovation Hub Science Park, which seeks to incubate innovative new companies and enhance the synergy between industry, academia, and public institutions.

The EDD funds a wide number of economic development initiatives related to innovation. Some of the initiatives are funded through the GGDA and the Innovation Hub. The Innovation Hub is directly funded by GDED. GDED adopted the Gauteng Innovation and Knowledge Economy Strategy (GIKES) in 2012. A detailed content

analysis on the GLKES is provided in Chapter 4. The GIKES aims to "*accelerate innovation in all its forms, in order to bolster and support the broader strategic objectives of employment creation, and sustainable social and economic development*".

The main weakness in Gauteng's economy is the low innovation capacity (OECD, 2011). Enterprises, in the rest of the country are limited to developing innovative activities because of a lack of funding, because markets are dominated by established enterprises, and because of a perception that the costs of innovation are too high. This is amplified by a low rating for the establishment of start-up businesses and a high rating of business turnover, especially for early-stage businesses. The GIKES supports a range of provincial policies already in place, including: Gauteng Employment Growth and Development Strategy; Gauteng Industrial Policy; Gauteng Integrated Energy Strategy; information and Communication Technology Strategy; Local Economic Development Strategy. The region does not have a regional innovation agency however the Innovation Hub has taken over that responsibility.

2.8 LESSONS ON INTEGRATING INNOVATION POLICY FROM OTHER COUNTRIES

The growing complexities and interconnectedness with respect to innovation policy makes it highly challenging for developing countries to manage. Increasingly, national and regional governments are developing their own innovation strategies to reach their economic and innovation goals, and regions matter to achieve those national goals. As regions develop their roadmaps and policies, based on their own assets and strategic choices, they need to ensure integration with the national government priorities and goals.

Many of the developed countries have progressively gained new competencies in their regions developing and implementing innovation policies. Countries such as Germany, Switzerland, and the United States France, Sweden, Poland, Japan, and South Korea are among those countries. These countries and regions differ on scale and scope of regional control depending on their particular technological profiles, institutional frameworks, and historical trajectories. In Europe, many countries are

encouraged to formulate regional innovation strategies in order to access structural funds. These strategies are becoming the cornerstone of industrial and innovation policies in Europe and beyond to support the emergence and consolidation of competitive clusters (Ritzen and Soete 2011). Developing countries such as China, Brazil, Russia, India, Mexico, Colombia and Chile decentralised their innovation polices and South Africa is also one of them.

Table 5 provides an overview of institutional variety across some developed and developing countries in relation to regional development and innovation. The table classifies countries according to: i) their institutional organisation (federal or unitary countries with elected regions or non-elected regional authorities); and ii) the degree of devolution of competences in science, technology and innovation (STI).

Table 5: Decentralisation of powers for innovation

Degree of devolution in STI policy competences and resources		**Federal countries**	**Countries with elected regional authorities**	**Countries with non elected regional level / decentralised state agencies**
Significant control of innovation powers and/or resources		Austria, Belgium, Germany, Australia, Canada, Switzerland, United States, Brazil	Italy, Spain, United Kingdom (Scotland, Wales, Northern Ireland)	
Some decentralisalisation of innovation powers and/or resources		Mexico	France, Netherlands, Poland, Sweden (pilot regions), Norway, Denmark (autonomous regions)	United Kingdom (English regions), Korea Sweden (except pilot regions)
No decentralisation of innovation powers	Regional innovation strategies		Denmark, Slovak Republic, Turkey, Czech Republic, Portugal (autonomous regions)	Hungary, Ireland, Portugal (mainland)
	Innovation projects only		Chile, Japan	Greece, Finland, Luxembourg, Iceland, New Zealand, Slovenia

Source: Adapted and expanded from Muller, E., C. Nauwelaers *et al.* (2005).

The Finnish government has one of the best examples of achieving a more integrated form of governance particularly in innovation policy. The long history of a

strong, if not dominant, public bureaucracy, was making central leadership difficult in that system (Bouckaert, Ormond and Peters, 2000). Innovation policy in Finland is largely implemented in a decentralised policy system where centrally agreed policy strategic goals and objectives are operationalized. Finland's NSI is characterised by strong tradition of collaboration and coordination throughout the system across government departments, agencies and levels of government and other stakeholders. Innovation policy also explicitly aims to support for stakeholder collaboration and networking between government, industry, universities, and public research agencies.

The Finnish government has adopted a national regional development strategy that provides guidelines for regional innovation policy. Within this framework, a number of relevant national and regional government departments are responsible for preparing the appropriate policy measures. National regional development frameworks focusing on growth, competitiveness and employment have been adopted by many countries (e.g. Poland, Hungary and Slovakia).High-level and sustained political commitment has contributed significantly to the success of in countries such as Finland and Korea (OECD, 2011). The high level advisory body, the Science and Technology Policy Council of Finland (STPC) is one of its formal national-regional co-ordination bodies. The council is responsible for the strategic oversight, development and co-ordination of STI policy and of the National Science and Innovation System as a whole. It is chaired by the prime minister and consists of members from the government and key stakeholder organisations. Other countries with high-level bodies (councils) include Mexico Iceland and the Netherlands.

Vertical co-ordination mechanisms to maximise intergovernmental synergies between national and regional innovation can be used together to achieve policy outcomes. Dialogue, consultations, joint implementation agency, contracts and project co-financing are commonly used tool in many of the developed countries for joint action across levels of government (OECD, 2011). Joint agency provides an opportunity to pool funds across government departments and levels of government for joint implementation of innovation strategies. Examples include the Innovation Norway's programme co-owned by national and regional levels, as an innovative approach to supporting national-regional joint action in innovation policy.

Contracts, which are commonly long-term, can exist in a form of a more complex investment (such as a large-scale Infrastructure programme) or to finance a broader set of initiatives when regions lack their own finances to do so. Examples include Spain where contracts between the national government and the autonomous communities (regions) in innovation policy and in Austria and Germany long-term contracts are for higher education institutions, research and innovation centres and other projects involve both national and regional levels.

2.9 CONCLUSION

This chapter provides a brief review of relevant literature surrounding the research areas in this investigation. This chapter discussed the literature related to integration of innovation policy between national and regional government levels. It also interrogated the concepts of policy integration in the context of innovation policy and its relevance for developing countries. Integrated innovation policy in this context implies a more systemic policy where innovation is not only covering the domain of supporting innovation in the economic realm but contributes to solving societal problems more widely.

The literature on the regional dimension of innovation policy in supporting national goals was also reviewed. In assessing the extent of integration, a framework for analysing policy integration was reviewed, and key themes that are relevant to the integration of national and regional innovation in the context of developing countries were summarised as the responsibility of government at multiple levels; these responsibilities include centralised and decentralised approaches to innovation policy as well as evidence-based policy experimentation. South Africa's innovation policy and its Gauteng region's regional innovation system were reviewed as well as lessons on integrating innovation for other countries. The next chapter presents the research strategy and methodology in addressing the research question.

CHAPTER 3: RESEARCH STRATEGY AND METHODOLOGY

3.1 INTRODUCTION

In the previous chapter, literature on policy integration in the context of innovation policy was reviewed. This chapter presents the research methodology used in this study discussing its research techniques as well as the design implemented for the study. It offers an overview of the research approach and the design of the study, justifying the approach and design as being appropriate for the study in terms of addressing the research question. The aim of the study is to assess the extent to which the national and regional innovation policy in South Africa and Gauteng are integrated.

3.2 RESEARCH DESIGN

A research design describes the overall plan in relation to how the study was conducted. It refers to the overall strategy where different components of the study complement each other in a logical and coherent manner ensuring that the data gathering method fits with the research problem. The purpose of a research design is to specify the structure of an enquiry through generation of empirical evidence that can be used to answer the research questions (McMillan and Schumacher, 2001; Bogdan and Knopp Biklen, 2006; Ary, Jacobs et al., 2002). It shows how the major components of the research including specific methods, techniques and instruments work together to address the research questions. Main types of research design include quantitative, qualitative and mixed research methods. In the study, both qualitative and quantitative research design in order get a perspective on the extent of integration between South Africa and Gauteng's national and regional innovation policy.

A mixed method approach of qualitative and quantitative research design was selected for the purpose of this study because it provides both the depth and breadth that enables the researcher to obtain thick descriptions and to attain depth of information for a better understanding of the phenomenon under investigation. This

approach for gathering and evaluating data may assist to increase the validity and reliability of the research.

Qualitative methods emphasise aspects of meaning, process and context: the 'why' and the 'how' rather than the 'how many' (Litosseliti, 2003). While quantitative research involves analysing numerical data, qualitative research interprets the text emanating from policy documents, press reports or notes taken during participant observation.

Both qualitative and quantitative methodologies are deemed as relevant for the study of this nature since the best way of tackling a research problem entails assessing policy documents through a process of content analysis. The choice of both designs and methods was based on the nature of the study and the data needed for the study. Both qualitative and quantitative research designs were used to ensure a high level of reliability. The qualitative data was obtained through content analysis of policy documents and semi-structured interviews and quantitative data, was extracted from the additional content analysis of policy documents.

3.3 DATA COLLECTION

Document analysis was the primary methodology used for data collection. A mixed approach involving quantitative and qualitative content analyses were used to assess the extent of integration between national and regional innovation strategies. Semi-structured interviews were utilised to triangulate the findings of the content analysis.

3.3.1 CONTENT ANALYSIS OF POLICY DOCUMENTS

Quantitative and qualitative content analyses of two policy documents produced at national and regional levels were used to assess the extent of integration at both levels. The policy documents included the national innovation strategy, the Ten Year Innovation Plan (TYIP) (2008-2018) (DST, 2008) and the regional innovation strategy, as well as the Gauteng Innovation and Knowledge Economy Strategy

(GIKES) (GDED, 2012). In addition, the Ministerial Review Committee on the STI landscape in South Africa (DST, 2012) was also used in the content analyses to substantiate the findings of the assessment. Each official document was assessed against a set of core categories of the framework for analysing policy integration described in the literature review.

The policy documents are publicly available and were accessed from the organisations' websites. These documents reflected government's aims and priorities for innovation policy. The reason for doing the content analysis was to get a deeper knowledge about the level of convergence between national and regional innovation policies in South Africa. The nature of the study required an extensive use of document analysis to gain a better understanding of innovation policy issues that exist between national and regional government.

The categories of the framework for analysing policy integration were used to assess the extent of integration. All documents were assessed by searching for text fragments that contain information on the sub-categories of the framework. The framework for analysing policy integration derived from the literature (Nilsson and Persson, 2003; Briassoulis, 2004) was used in the content analysis to assess the extent of integration between policy documents. Based upon policy integration theories and literature review, three core categories for assessing the extent of policy integration were summarised as: 1) complementary policy goals, priorities and scope; 2) policy structures and procedures for policy integration; and 3) mechanisms and policy instruments to steer integration.

Content analysis is objective and gives unbiased results. If replicated by another researcher, the analysis and interpretation would show same results. The objective of content analysis is the accurate representation of a body of messages. In addition, Smith (2000) points out "by means of content analysis a large body of qualitative information may be reduced to a smaller and more manageable form of representation".

Content analysis is defined as a "systematic and replicable technique for compressing many words of text into fewer content categories based on explicit rules of coding" (Krippendorff, 2004). According to Frankfort-Nachmias and Nachmias (2004), content analysis is "any technique for making inferences by systematically

and objectively identifying specified characteristics of messages". Content analysis can be defined as a “technique used to extract desired information from a body of material (usually verbal) by systematically and objectively identifying specified characteristics of the material” (Smith, 2000: 314). Furthermore, content analysis can be referred to as “any research technique for making inference by systematically and objectively identifying specified characteristics within text” (Markoff et. al., 2008:270). Despite these varied definitions, many scholars would agree that content analysis is systematic, replicable and logical, and employs clearly defined and carefully followed rules including that text must be coded.

Content analysis emphasises categorising according to certain coding exercises, hence, extending beyond simple word counts. This argument is supported by Stemler (2001) who contends that what makes the content analysis technique particularly rich and meaningful is that it can reduces and interrogates text into easier form by using emerging themes or pre-existing categories in order to generate or test a theory.

Content analysis can be quantitative or qualitative. The methodology adopted utilises a combination of qualitative and quantitative content analysis to assess the extent of integration between national and regional innovation strategies. Quantitative content analysis involves the reporting of results in numerical terms or by using statistics. This involves the counting of articles and keywords, and will be applied to this research. Krippendorf (2004:18) defines quantitative content analysis as “a research technique for making replicable and valid inferences from data to their context". Quantitative content analysis can augment research by identifying the frequency of keywords, thematic or rhetorical patterns and then assessing their relationship through statistical analysis.

The quantitative content analysis was conducted by counting the frequency of the keywords in the three official documents. The documents were analysed by how frequently keywords are mentioned in the documents. The search of keywords allows a quick comparison of the words used by official documents and to observe where is has the greatest emphasis. Quantitative content analysis was done using computer-aided text analysis (CATA) software which searches for count word frequencies and phrases.

Boettger and Palmer (2010: 346) argue that quantitative content analysis can prove to be a “more powerful method than surveys and interviews because of its unobtrusive nature and its lack of reliance on subjective perceptions”.

Qualitative content analysis is concerned with the words and language and analysing them to derive meaning. A qualitative content analysis is defined as an approach “to documents that emphasizes the role of the investigator in the construction of the meaning of and in texts” (Bryman, 2004). Forman & Damschroder (2008) define qualitative content analysis as that which is concerned with examining data which arose out of open-ended data collection techniques which were aimed at looking at detail and depth rather than measurement.

3.3.2 SEMI-STRUCTURED INTERVIEWS

Semi-structured interviews were used to verify conclusions from the document analysis and to gather information that is not often reflected in official documents. The semi-structured interviews were used for triangulation to increase the reliability and the validity of the conclusions from document studies but are also a source of informal information on integration of innovation policy.

There are three categories of research interviews: structured, semi-structured and depth/unstructured. Structured interviews are, essentially, verbally administered questionnaires, and are most typically used in quantitative investigations where there are standardized sets of questions prepared. Structured interview questions are the most common type used in survey interviewing in which there is no scope for follow-up questions to responses that require further elaboration. Conversely, unstructured interviews do not have questionnaires or predesigned questions (though there is usually a list of categories or themes) and can allow the respondents to choose the categories that are relevant to them. Unstructured interviews also allow both interviewers and interviewees to pursue topics that does not necessarily relate directly to the original questions and this can be difficult to manage and time-consuming.

Semi-structured interviews were selected for the study. Semi-structured interviews provide reliable, comparable qualitative method of inquiry that allows for a predetermined open-ended set of questions with a certain degree of flexibility for the

interviewer to explore themes or responses further (Cohen et al., 2007). This approach allows for questions that prompt discussion (Ritchie & Lewis: 2003); and also to pursue an idea or response in more detail.

Semi-structured interviews were selected because of two main reasons. Firstly, they are well suited to the exploring of perceptions and opinions of respondents regarding complex issues and the interviewer has the advantage of being able to ask open-ended questions, which presents opportunities for unexpected information to emerge (Gaskell 2000). Secondly, the interviews allow for a systematic capturing of data across interviewees and unanticipated topics can be discussed and the interviewer does not require in-depth prior knowledge of the domain beyond the necessary terminology. Such interviews also enabled further probing on issues in order to get in-depth interview material. According to Schulze (2002), interviewing is the most common method of data collection in qualitative research. The advantage of using semi-structured interviewing is that the researcher is able to follow up on particularly interesting avenues as they emerged in the interview, which presents opportunities to gain a fuller picture of the research topic.

Semi-structured interviews were conducted with four policy makers who are involved at national and regional level in innovation policy. Respondents were representatives and senior officials at national-level and regional-level in high-level organisational positions in the innovation policy area (n = 4) (Appendix B). Interviewees were asked about their perspectives on the extent of integration between South Africa and Gauteng's innovation policy guided by the framework for analysing policy integration.

The criteria used in selecting people involved in the hands-on innovation policy process was that they would best be able to explain some of the complexities of the process as it unfolded. Further, it was important that interviewees played a decision making role. Finally, they needed to be either at national or regional level within the public sector.

Semi-structured interviews were held with key officials using an interview protocol (Appendix C). A question guide was prepared beforehand with the research questions and objectives in mind, to ensure key questions were answered and specific issues were examined. The questions were drafted based on framework for

analysing policy integration. The semi-structured interview protocol asked questions around three main areas: 1) complementary policy goals, priorities and scope; 2) policy structures and procedures for policy integration; and 3) mechanisms and policy instruments to steer integration. The respondents were asked about their perspectives regarding the level of integration between South Africa's innovation policy and Gauteng's Innovation policy in all the subcategories of the framework for analysing policy integration. The face-to-face interviews were particularly useful in uncovering issues that are not readily available from the policy documents.

Each interview typically lasted an hour and was taped and later transcribed verbatim. The same fundamental questions were used for each of the interviews in order to get the broader aspects of assessing national and regional innovation policy. By using the same questions it is easier to compare possible similarities or differences.

Pilot testing was performed to test the reliability and validity of the semi-structured questionnaires. The research protocol was tested with two senior officials from the national Department of Economic Development (EDD) employed to undertake policy work within the field of innovation policy. The researcher is also employed in the EDD and therefore could have easy access to the senior officials.

The pre-testing was undertaken to ensure that the questions developed would respond to the objectives of the study. This was a useful exercise as it assisted the researcher in sequencing the interview questions and rephrasing a few questions to make them clearer. None of the questions were irrelevant. A few questions yielded similar responses, but instead of deleting these questions, the researcher saw this as a way of verifying responses or 'digging deeper'. All this enhanced the trustworthiness of the research. The respondent against whom the research tool was tested fitted the profile of the sampled respondents to be interviewed. The success of the test required that minimal changes be made to the interview schedule.

It is important to note that related issues of validity and reliability may characterise the nature of a qualitative research design. The use of mixed methods content analysis and expert interviews was used to test both the reliability and the validity of the data (Schusser et al., 2012). Reliability questions the application of methods in gathering and producing the same data under the same conditions (Fraenkel and Wallen, 1990; Schumacher and McMillan, 1993). The validity of the study questions

whether the assumptions and conclusions drawn by the researcher address the research problem and whether the findings are comprehensible. The researcher and a colleague did the frequency counts on the quantitative content analysis that required tallying. The reliability and validation was also improved by preparing a draft of the interview protocol and was tested with other colleagues. Consistency and accuracy of the data collection by the researcher herself ensured reliability of the study and the same questions were used for the key informants.

Triangulation in form of semi-structured interviews was also used to compare if similar findings are produced. According to Arksey and Knight (1999), triangulation is an approach that can be used to reinforce the confidence of the research findings.

Triangulation can reduce research bias to an absolute minimum and increase the probability of generalising the findings of a study as the data is gathered from different angles and by different methods. Triangulation facilitates validation of data through cross verification from more than two sources and so the use of mixed methods and interviews to examine the same dimension of a research problem increases the validation. It tests the consistency of findings obtained through different instruments. Patton (2002: 556) points out, “rather than always thinking that triangulation must show similar findings, it is just as important to find inconsistencies that help add to the richness of the data and the interpretation explaining why things are operating the way they are”.

3.4 DATA ANALYSIS

Data analysis is a “process of bringing order, structure and meaning to the mass of collected data” (Marshall and Rossman, 1990). The process involves data management and analysis. Data analysis is a systematic search for meaning” (Hatch, 2002: 148). The main purpose of analysing qualitative data is to look for patterns in the data. The specific context of the data is also important.

The data was analysed using thematic content analysis including data collected from qualitative content analysis and semi-structured interviews. Thematic analysis is a method that recognises, examines and presents patterns or themes within the data.

Braun and Clarke (2006: 79) define thematic analysis as a “method for identifying, analysing and reporting patterns within data.” It is used to identify and analyse rich detail and description of data into classifications, themes or patterns. Deductive thematic analysis was selected for the study since there was a predetermined framework already in place for analysing the data. Deductive thematic analysis allows the researcher to impose their own structure or theories on the data and then apply these during analysis of the data.

Thematic content analysis was therefore used to reduce and categorise the large volume of material into more meaningful units from which interpretations could be made. Frequency analysis was used for quantitative content analysis. Scores were given based on the occurrence of keywords and phrases, for the strength of wording used, and for the consistency.

The analysis of data collected from qualitative content analysis and the semi-structured interviews was structured against the three core categories for assessing the extent of policy integration: 1) complementary policy goals, priorities and scope; 2) policy structures and procedures for policy integration; and 3) mechanisms and policy instruments to steer integration. Each policy document was assessed against each dimension of the framework for analysing policy integration. The interviews were also based on the each dimension of the framework for analysing policy integration. The dimensions function as themes of analysis for the phenomenon studied.

There are six basic steps in the thematic content analysis process which were used in the proposed research. According to Henning, van Rensburg and Smit, (2004) these steps include the selection of a topic and the determination of a research question; the selection of a documentary source; the development of a set of analytical categories; the formulation of a set of instructions for using the categories to code the material; the establishment of a basis for sampling the documents and the counting of the frequency of a given theme in the documents sampled. This is followed by the writing of the final themes of the set of data and the presenting of patterns of related themes (Henning, Van Rensburg and Smit, 2004).

In examining the extent of integration of the policy documents, the statements were given numerical scoring ranging from 0 to 2; depending on the extent of each the dimension was included in the policy document, and the strength of treatment. In this research, a numerical score of 0 is given when no statement or words are found regarding to the stated dimension. A score of 1 was awarded when a key word was stated, but no reference was made to integration and the highest score 2 was awarded when a key word was stated and there was reference to integration.

3.5 SCOPE AND LIMITATIONS OF THE STUDY

With regards to content analysis, there are several limitations to using content analysis (Gray et al., 1995b; Milne and Adler, 1999; Unerman, 2000). The major limitation is the subjectivity involved in coding (Deegan and Rankin, 1996; Frost and Wilmshurst, 2000). The study was only limited to the content analysis of three policy documents: the Ten Year Innovation Plan (TYIP) (DST, 2008); the regional innovation strategy Gauteng Innovation and Knowledge Economy Strategy (GIKES) (GDED, 2012); and the Ministerial Review Committee on the STI landscape in South Africa (DST, 2012). Each part of the process of content analysis, such as data reduction and data grouping, was repeated extensively to check consistency.

There was also a geographical limitation to the study. It concerns only integration of innovation policy between South Africa and the Gauteng region. Since innovation policy is context specific, the results may not be applicable for other developing countries and regions. Furthermore, due to time constraints, the study was only limited to four national-level and regional-level policy makers and so does represent all of the officials in government that work on innovation policy.

3.6 ETHICAL CONSIDERATIONS

Qualitative researchers face many ethical issues and challenges when collecting data during analysis and in the dissemination of findings and final reports. Creswell (2003:141) depicts the ethical issues in groupings as follows: there are “informed

consent procedures, deception of covert activities, confidentiality towards participants, benefits to participants and requests that goes beyond social norms."

While the topic at hand is not of a sensitive nature, all ethical considerations were taken into account. Ethical considerations do not only involve how the researcher relates to respondents who participate in the study, but also takes into account methodological issues as well as the way data is utilised.

For ethical consideration purposes, when conducting qualitative research, the documents which are chosen and used for data collection and analysis by the author must be explained and substantiated in order for an evaluator to be able to judge the quality of the data (Ambert et al., 1995). This study supports both these ethical considerations and made sure that the entire process during data collection and analysis was documented.

After the approached participants agreed to participate, informed consent was first sought from them. Before conducting the interview the researcher again explained the purpose of the study there after respondents were 'invited' to participate in the research. The interviews were scheduled at the convenient time of the respondents. Participants were informed that their confidential information would only be accessed by the researcher and the supervisor. The researcher considered it very important to establish trust between the respondents and herself and to respect them as autonomous beings, thus enabling them to make sound decisions. Confidentiality to the agreed upon aspects during data collection was adhered to and an unnecessary and controversial information is not recorded in the findings. The researcher in this study has exercised caution and diligence regarding ethical issues.

3.7 CONCLUSION

This chapter provided a detailed account of the research design and methodology adopted to realize the goals of the study. The research design, methodological approach, data analysis, validity and reliability, as well as ethical considerations were explained in detail. The following chapter will present the research findings of the study.

CHAPTER 4: RESEARCH FINDINGS

4.1 INTRODUCTION

While the preceding chapter described the research design and methodology, this chapter provides results of data analyses and findings of the study. The focus of this study is to assess the extent of integration between national and regional innovation policy in South Africa and the Gauteng region. The study seeks to answer the following research questions:

1. What is the extent of integration between national and regional innovation policy in South Africa?
2. How could integration in innovation policy between national and regional levels be improved?

Document analysis and semi-structured interviews were used to respond to the research objectives. The results are divided into two sections. The first section deals with the findings from a quantitative content analysis and qualitative content analysis to assess the extent of integration between national innovation strategy, the Ten Year Innovation Plan (2010 - 2018) (TYIP) (DST, 2007) and the regional innovation strategy, Gauteng Innovation and Knowledge Economy Strategy (GIKES) (GDED, 2012). The Ministerial Review Committee on the science, technology and innovation (STI) landscape in South Africa (DST, 2012) was also assessed to substantiate the findings.

Several official documents were assessed against a framework for analysing policy integration (Briassoulis, 2004; Nilsson and Persson, 2003). The second section reports on the findings from semi-structured interviews that served as complementary evidence for the triangulation process. Integration of the policy documents was assessed on two levels, firstly, where there is explicit mention of the dimensions in the policy document and secondly, where there is explicit mention of the other levels of government in reference to the dimension.

4.2 RESULTS FROM CONTENT ANALYSIS OF POLICY DOCUMENTS

4.2.1 OVERVIEW OF COLLECTED POLICY DOCUMENTS

A summary of government official documents used in the content analysis is presented in this section. The documents include the TYIP (2008); the GIKES (2012) and the Ministerial Review Committee on the STI landscape in South Africa (2012).

4.2.1.1 *Ten-Year Innovation Plan: Innovation Towards a Knowledge–Based Economy*

In July 2007 The Department of Science and Technology (DST) adopted the national innovation strategy, the TYIP (DST, 2007). The Department's TYIP is centred on five grand challenges which are to be addressed through technology development and innovation. The five grand challenges include bio-economy, space, energy security, global change, and understanding of social dynamics. The plan strives to transform the country's economy into a knowledge-based economy and suggests that the economic growth of South Africa can only be achieved if the national system of innovation (NSI) focuses on four key elements. These include human capital development, research and development (R&D); associated infrastructure to ensure knowledge exploration and generation and 'enablers' to address the gap between research results and their socio-economic outcomes.

4.2.1.2 *Gauteng Innovation and Knowledge Economy Strategy*

The regional innovation strategy, the GIKES (GDED, 2012), adopted by the Gauteng Department of Economic Development (GDED), emphasises the importance of social innovation and open innovation for an inclusive innovation system. The strategy aims at achieving a more efficient use of resources – both public and private – in delivering on its objectives; of creating new and valuable knowledge relevant to the social and economic priorities; and supporting the movement towards an advanced, knowledge-based economy by creating appropriate functions and infrastructure. The strategy's objectives include improving competitiveness of the Gauteng economy, improving efficiency of the public sector in delivering services and promoting the sustainable livelihood and quality of life of Gauteng citizens.

Ministerial Review Committee on the STI landscape in South Africa (2012)

The Ministerial Review Committee on the STI landscape in South Africa (DST, 2012) was commissioned by the Minister of Science and Technology, Minister Naledi Pandor to review the current STI landscape in South Africa. The review provided a set of recommendations to restructure the current governance model of the NSI, future structure and governance of the National System of Innovation (NSI), the roles and responsibilities of the various actors, the roles and responsibilities of the DST and its relationship with other government departments, human resource and other capabilities of the NSI and funding and recapitalisation needs. The Ministerial Review Committee comprised mainly of a panel of national level experts was tasked to consider the state of South Africa's NSI.

4.2.2 QUANTITATIVE CONTENT ANALYSIS

Table 6 below provides a summary of the official documents used in the content analysis. The national innovation strategy, the TYIP has forty-two pages and a word count of 10 437. The regional innovation strategy, the GIKES has forty-two pages and a word count of 10 437.

Table 6: Overview of official documents used in the content analysis (*n* = 3)

Title	Year of publication	Lead Institution	Number of pages	Word count
National innovation strategy				
Ten-Year Innovation Plan: Innovation Towards a Knowledge–Based Economy	2008	Department of Science and Technology	42	11 011
Regional innovation strategy				
Gauteng Innovation and Knowledge Economy Strategy	2012	Department of Economic Development: Gauteng Provincial government	64	18 661
Review report on the National System of Innovation				
Ministerial Review Committee on the STI landscape in South Africa	2012	Department of Science and Technology	224	104 438

4.2.2.1 Frequency of keywords in the official documents

The quantitative content analysis was conducted by counting the frequency of the keywords in the three official documents. The documents were analysed by how frequently keywords are mentioned in the documents. The search of keywords allows a quick comparison of the words used by official documents and to observe where is the greatest emphasis. Table 7, Table 8 and Table 9 shows the quantitative content analysis of keywords with the highest frequency counts.

Table 7: Keywords with the highest word frequency counts in the Ten Year Innovation Plan

Word	Frequency	%	Rank
Innovation	89	1.3%	1
Knowledge	84	1.3%	2
Technology	84	1.3%	3
Science	73	1.1%	4
Research	41	0.8%	4

Table 8: Keywords with the highest word frequency counts in the Gauteng Innovation and Knowledge Economy Strategy

Word	Frequency	%	Rank
Innovation	463	4.2%	1
Development	108	1.0%	2
Economic	94	0.9%	3
Social	79	0.7%	4
Government	72	0.7%	4

Table 9: Keywords with the highest word frequency counts in the Ministerial Review Committee on the STI landscape in South Africa

Word	Frequency	%	Rank
Innovation	891	0.84%	1
Research	611	0.48%	2
System	484	0.44%	3
National	464	0.44%	4
Science	407	0.39%	4

As expected, the keyword “’innovation” has the highest frequency counts in all the official documents. According to Table 7, some of the keywords with the highest

frequency counts in the TYIP include “knowledge”, “technology”, “science” and “research”. In contrast, the keywords with the highest frequency counts in the GIKES include “development”, “economic”, “social” and “government” according to Table 8. The Ministerial Review Committee on the STI landscape in South Africa has “research”, “system”, “national” and “science” as keywords with the highest frequency counts according to Table 9.

Table 10: Frequency counts of keywords and phrases in the Ten Year Innovation Plan; Gauteng Innovation and Knowledge Economy Strategy; Ministerial Review Committee on the STI landscape in South Africa

Terms/ Phrases	Frequencies in the Ten Year Innovation Plan		Frequencies in the Gauteng Innovation and Knowledge Economy		Frequencies in the Ministerial Review Committee on the STI landscape in South Africa	
	Frequency	%	Frequency	%	Frequency	%
National	41	0.37%	38	0.20%	464	0.44%
Regional	4	0.04%	8	0.40%	24	0.02%
Provincial	1	0.01%	37	0.19%	11	0.01%
Industry	17	0.14%	19	0.10%	107	0.10%
Communities	0	0%	29	0.16%	23	0.02%
Knowledge economy	0	0%	0	0%	42	0.04%
Knowledge-based economy	26	0.24%	1	0.01%	9	0.01%
Science and technology	40	0.36%	2	0.01%	133	0.13%
Social innovation	0	0%	27	0.15%	74	0.07%
Open innovation	0	0%	20	0.11%	1	0.001%
Inclusive innovation	0	0%	3	0.02%	0	0%
Innovation system	3	0.03%	21	0.11%	69	0.07%
National system of innovation	4	0.04%	4	0.02%	41	0.04%
Regional innovation system	1	0.01%	2	0.01%	0	0%
May	6	0.04%	27	0.15%	77	0.07%
Should / Should be	11	0.9%	14	0.08%	194	0.19%
Must /Must be	26	0.24%	22	0.12%	42	0.04%

Table 10 compares the frequency counts of some of the keywords and phrases in the TYIP; GIKES; Ministerial Review Committee on the STI landscape in South Africa. According to Table 9, keywords and phrases with high frequency counts in the TYIP include “national”, “science and technology”, “knowledge-based economy” and “industry”. The keywords “must / must be” and “should / should be” also have a high frequency count compared to the key word “may”. The keyword “provincial” and the phrase “regional innovation system” only appeared once in the TYIP. The TYIP makes no mention of phrases such as “social innovation”, “open innovation” and “inclusive innovation” which have a higher frequency count in the GIKES.

The phrases and keywords with high frequency count in the GIKES include “national”, “provincial”, “communities”, “social innovation”, “industry” and “open innovation”. The keywords “may” and “must / must be” also have a high frequency count in the GIKES in comparison to the key word “should / should be”. The GIKES only mentions the phrase “science and technology” and “regional innovation system” twice.

The keywords and phrases with high frequency counts in the Ministerial Review include “national”, “science and technology”, “industry”, “social innovation”, “innovation system”, “knowledge economy” and “national innovation system”. The Ministerial Review makes some mentions of keywords include “regional”, “provincial”, “communities”. The keyword “should / should be” has a high frequency count in comparison to keywords “may” and “must / must be”. The Ministerial Review makes no mention of “regional innovation system”.

From these frequencies a number of important trends can immediately be seen. The TYIP is using a lot of the science and technology related terminology unlike the GIKES which makes mention of social innovation and open innovation. The Ministerial Review Report seems to be orientated towards the TYIP and this can be observed from its frequency count of “national”, “science and technology” and little mention of “regional”, “provincial”, “communities”. The high frequency count of “must / must be” in the TYIP, and “may” in the GIKES as opposed to “should / should be” in the Ministerial Review Report indicates that these actions in both the TYIP and GIKES may be discretionary rather than mandatory.

4.2.3 QUALITATIVE CONTENT ANALYSIS

This section presents the results for the qualitative content analysis of official documents against the framework for analysing policy integration as shown in the previous chapter. The framework for analysing policy integration was used to assess integration between the TYIP and the GIKES. The Ministerial Review Report was also assessed against the framework for analysing policy integration to substantiate the findings from the national and regional official documents. The framework for analysing policy integration is divided into three main categories, with subcategories as follows (Appendix A): 1) complementary policy goals, priorities and scope; 2) policy structures and procedures for policy integration; and 3) mechanisms to steer integration.

The research findings from the qualitative content analysis are provided for each category and subcategories. The detailed content analysis of each policy document against the framework for analysing policy integration is provided in Appendix D.

4.2.3.1 Complementary policy goals, priorities and scope

In assessing whether two policies are integrated, or have chances of being integrated, there must be common, complementary scope, goals and priorities.

4.2.3.1.1 Congruent, consistent and complementary policy objectives

The content analysis shows that both the TYIP and the GIKES to some extent have congruent, consistent and complementary policy objectives and priorities. Both documents emphasise the objective of the creation of a knowledge-based economy and competitive economies. The Ten Year Innovation Plan states that the "*pillars of a properly functional knowledge economy are human capital development, R&D and knowledge infrastructure*" (DST, 2008: 2). The key strategic objectives mentioned in the Ten-Year Innovation Plan include: converting ideas into economic growth; government investing in areas of the highest socioeconomic return, the grand challenges; investment in key research must be made at a critical mass; R&D scale-up must be consistent for the system to have the appropriate absorptive capacity;

and R&D infrastructure being considered over the long term. The priorities in the Ten Year Innovation Plan are centred on the "*grand challenges outlined in the plan to address an array of social, economic, political, scientific, and technological benefits*" (DST, 2008: 9). According to the plan, the grand challenges include creation of a bio-economy, space science and technology; energy security; global climate change; and human and social dynamics.

The GIKES prioritises community-led innovation and open innovation as its key objectives of driving future economy. The strategy's aim is to "*accelerate innovation in all its forms, in order to bolster and support the broader strategic objectives of employment creation, and sustainable social and economic development*" (GDED, 2012: 4).The key strategic objectives of the regional strategy include improving the competitiveness of the Gauteng economy; to improve the efficiency of the public sector in delivering services; and to promote community-led innovations within the Gauteng region.

Although the Ministerial Review Report is not explicit on common, complementary objectives and priorities between national and regional government, it points out that "*Government has to see to it that these NSI components are in place, that they interact, and that there is an agreed set of goals and objectives for a knowledge society/economy*" (DST, 2012: 54). The review argues that the greatest imperative for the NSI is still lack of coherent, "*high-level goals and objectives of the whole system*" (DST, 2012: 61) that ensures making the goal of innovation-driven development a realistic proposition. Between the TYIP and the GIKES, the GIKES is the only one that is explicit in integrating its priorities and objectives to the TYIP.

4.2.3.1.2 National and Regional actors working together

Both the TYIP and the GIKES explicitly mention national and regional actors working together. In the TYIP, there is explicit mention of national government's intention to support the role of regional players: "*with provincial governments and facilitate the development of regional systems of innovation plans*" (DST, 2008: 29). However, this is only mentioned once in the document. The plan is also explicit in mentioning intended horizontal collaboration with other government departments "*the DST, in collaboration with other government departments, aims to boost innovation through a series of directed interventions in strategic areas*" (DST, 2008: 6).

The GIKES is explicit in acknowledging the TYIP as well as cooperating and collaborating with the national government. This is supported by statements in the strategy as follows: "*Gauteng Provincial Government will be seeking to accelerate policy efforts aimed at strengthening the national systems of innovation*"; (GDED, 2012: 2) and "*The Department of Science and Technology released the Ten Year Innovation Plan, a Cabinet-level plan that seeks to achieve a number of outcomes for South Africa. These are contained in five "Grand Challenge" areas*" (GDED, 2012: 52). There are a number of statements in the regional strategy that show a clear intention to cooperate with the national government, according to the regional innovation strategy: "*Furthermore, provincial government and its agencies will be establishing eco-system based approaches and relationships with national government and its agencies to ensure effective implementation of the strategy*" (GDED, 2012: 6).

Although the Ministerial Review Report is explicit on national and regional governments working together it emphasises that there are *"insufficient linkages between various levels of government, with consequently weak integration between national, provincial and local levels*" (DST, 2012: 65). The Ministerial Review Report emphasises more the need for horizontal integration across government departments than vertically across levels of government. Between the TYIP and the GIKES, the GIKES seems to emphasise more the need for national and regional level to work together.

4.2.3.1.3 Political commitment for national and regional policy integration

The TYIP is explicit in stating that "*the Department of Science and Technology's Ten-Year Innovation Plan is by far the clearest signal of the commitment to a prosperous South Africa, one in which all citizens benefit from the fruits of our investment in knowledge and its exploitation*" (DST, 2008: v). The plan makes a general statement of the political commitment and recognition for leadership in innovation but is not explicit on the political commitment for national and regional policy integration.

The GIKES mentions to some level commitment for integrating national and regional innovation policy however is not explicit on the need for political commitment for national and regional policy integration. This is supported by the following statement

from the strategy: "*Given that innovation plays an important role in driving future growth, the Gauteng Provincial Government will be seeking to accelerate policy efforts aimed at strengthening the national systems of innovation'*" (GDED, 2012: 3).

The Ministerial Review Report is explicit in pointing out that "*South Africa has yet to fully mobilise political leadership and authority adequately behind the promise that the idea of the NSI holds*" (DST, 2012: 211). Between the TYIP and the GIKES, none of them is explicit in mentioning the political commitment for integrating national and regional innovation policy.

4.2.3.1.4 Aligned quantitative, measurable, indicator based targets and timelines

The TYIP is explicit in mentioning its quantitative, measurable, indicator-based targets and timelines and they are all centred on the five grand challenges. The plan mentions a concise set of indicators anticipated to be achieved by 2018, and is presented with each of the grand challenges. The TYIP is also explicit in terms of the targets for South Africa's vision for the country by 2018:

- "*Being one of the top three emerging economies in the global pharmaceutical industry, based on an expansive innovation system using the nation's indigenous knowledge and rich biodiversity;*
- *Deploying satellites that provide a range of scientific, security and specialised services for the government, the public and the private sector;*
- *A diversified, supply secured sustainable energy sector;*
- *Achieving a 24-percent share of the global hydrogen and fuel cell catalysts market with novel platinum group metal (PGM) catalysts;*
- *Being a world leader in climate science and the response to climate change;*
- *Having met the 2014 Millennium Development Goals to halve poverty*" (DST, 2008: 19).

The TYIP also reflects "*an investment target of 1 percent of gross expenditure on R&D as a percentage of gross domestic product (GERD/GDP) for 2008*" (DST, 2008: 62). However, the TYIP is not explicit on the role of the stakeholders in implementing the plan.

The GIKES, on the other hand mentions indicator based targets but is not explicit on the targets. The targets are provided as follows:

- "*The development of specific clusters in priority sectors, focused on driving innovation in a low carbon economy, green technologies, and other sectors as identified by the Gauteng Industrial Policy Framework (GIPF);*
- *The implementation of an "Industry Innovation Unit" with a specific mandate to address industrial process innovation and design at an industry scale;*
- *Incentivisation programmes to stimulate appropriate research, development and innovation aligned to the provincial strategies and objectives of the innovation strategy. Some examples include: both direct incentivisations such as 'innovation vouchers' as well as the potential use of government procurement; and Targeted innovation competitions.*
- *The development of an information and knowledge exchange networks, based on open systems of innovation; and*
- *Promotion of high speed Information and Communication Technology (ICT) access at a household level as a means of fast-tracking innovation*" (GDED, 2012: 5).

The TYIP targets are centred on achieving the grand challenges while the GIKES is focusing on developing regional clusters; implementing an "Industry Innovation Unit; developing incentivisation programmes; and promoting of high speed ICT.

Although the Ministerial Review Report is not explicit on the alignment of national and regional indicators and targets, it points out that "*The TYIP, as originally disseminated, reads more as an elaborate 'vision statement' than a fully developed action plan. Nonetheless, the notion of the 'Grand Challenges' has entered the discourse of the NSI community, especially the science councils*" (DST, 2012: 69). The review argues that "*The 'Grand Challenges' are to be spearheaded by the DST and will offer tremendous opportunities for steering our resource-based economy towards a knowledge-based economy. Notably, the responsibility for addressing the Grand Challenges is necessarily spread across the operating domains of many government departments*" (DST, 2012: 69). The review makes no mention of regional indicator based targets and timelines. Between the TYIP and the GIKES, the

TYIP is more explicit in terms of its indicator based targets and timelines but the indicator based targets are not aligned to that of the GIKES.

4.2.3.1.5 Consistency in the concepts and terminologies

The TYIP does not provide definitions for innovation or innovation system. The concept of innovation in the Ten Year Innovation Plan is mainly applied in science and technology as indicated in the statements: "*Innovation is, of course, the key to scientific and technological progress, but our starting point is not innovation for its own sake"; and "This is the government's broad mandate, and the grand challenges of science and technology are in sync with the needs of our society*" (DST, 2008:1)

The GIKES provides definitions for innovation and innovation system. The strategy defines innovation as "*the process by which new solutions are discovered to solve problems facing society at large*" (GDED, 2012: 8).

The innovation system is defined as:

- "*The system is composed of institutions and entities;*
- *The system acts upon the innovative, technological state of the country through various means including importing, developing, inventing and diffusing new technologies;*
- *The relationships and interactions between the entities are critical to its ability to affect the environment*." (GDED, 2012: 9).

The Ministerial Review Report provides definitions for innovation and the NSI. The strategy defines innovation as *"the capacity to generate, acquire and apply knowledge to advance economic and social purposes. It includes both the search for frontier technologies driven by research and development (R&D), as well as the forms of learning and adaptation that might be market led or socially driven"* (DST, 2012: 8). The NSI is defined as **"***the sum total of activities that contribute to innovations of any kind, whether as improved practices or as new products*" (DST, 2012: 8).

The review argues that *"the concept of a national system of innovation had as yet gained limited currency, both in the extent to which it was understood as something*

wider than the sum of traditional research and development (R&D) activities, and in the extent to which it had been fully absorbed into the strategies of key actors (including government departments and higher education institutions). The notion of innovation – in all its dimensions, including technical, economic and social – was poorly understood, especially on the demand side" (DST, 2012: 10).

Between the TYIP and the GIKES, the GIKES is explicit in its definitions of innovation and systems of innovation. The definition of innovation by GIKES and the Ministerial Review Report are similar in nature.

4.2.3.2 Institutional structures and procedures for policy integration

In assessing whether two policies are integrated, or have chances of being integrated, there must be alignment and complementarity in institutional structures and procedures.

The category of policy structures and procedures for policy integration analyses highlight whether horizontal and vertical interlinkages exist among the organisational and administrative systems involved with individual policies. The focus is on cooperative, coordination structures, and on procedures for formulating and carrying out joint, cooperative and integrated solutions to common problems.

4.2.3.2.1 Clear mandates, roles, responsibilities and modalities of operations

The TYIP is not explicit in mentioning the different roles of the actors in carrying out the plan. It does not explicitly acknowledge the role of the provincial government in the innovation system.

On the contrary, the GIKES is explicit in terms of the role and responsibilities at both regional and national levels in innovation. The strategy has the following statements: "*The provincial government has a different and independent mandate from National Government, as laid out in the South African constitution. Therefore, although the province follows the country in terms of the overall policy direction, there are certain*

specific areas which the province has a more direct influence over." "*While National Government provides the overall framework and direction of public-sector innovation, the Provincial Government still has a crucial role to play as the Regional Authority*." (GDED, 2012: 6)

The Ministerial Review Report is not explicit on the roles, responsibilities and modalities across the different levels of government however the report argues that there are insufficient linkages between national and regional levels.

4.2.3.2.2 Administrative capacity for policy integration – organisation, officials administrative reform

The TYIP states that a Science and Technology Managers' Forum, as well as an interdepartmental S&T initiative were to be established to "*promote greater use of science and technology and strategic coherence between departments. For the forum to be effective, policy administration capacity needs to be further developed*" (DST, 2008: 29). There is no evidence of whether the Forum was established, or if it was the composition or mandate of the Forum. There is currently no evidence of an established national led administrative capacity body for integrating innovation policy at different levels of government.

The GIKES indicated that "*the Innovation Hub through GDED will be establishing the Inter-Governmental (IGR) Forum with provincial municipalities targeting Research & Knowledge Management Units/Departments to create awareness about the importance of innovation in economic growth and employment. The IGR Forum will also identify and implement a range of innovation-related initiatives/programmes at community-level."* (DST, 2012: 30).

The Ministerial Review Committee on the STI landscape in South Africa is not explicit on the administrative capacity for policy integration – organisation, or the administrative reform of officials.

4.2.3.2.3 Overarching political body for national and regional relations (covering many policy areas) in innovation policy

Both the TYIP and GIKES do not make explicit mention of the establishment of a high-level overarching advisory body for innovation policy integration across different levels of government and different government departments. The Ministerial Review Report; however acknowledges that "*what is needed more than ever is a high-level expert body that will offer guidance to the NSI as a whole, a role that neither the defunct MCOST nor NACI has been able to fulfil*" (DST, 2012: 30). The review further points out that "*the Committee recommends the establishment of a compact (15–20 person) statutory National Council on Research and Innovation (NCRI) to carry out the task of prioritisation and agenda-setting for the NSI, oversight of the system and high-level monitoring of its evolution, outcomes and developmental impact*." (DST, 2012: 18).

4.2.3.2.4 Consistent, compatible and coordinated procedures and rules of decision making

None of the documents explicitly mentioned the consistent, compatible and coordinated procedures and rules of decision making.

4.2.3.2.5 Coordinated/compatible action plans across the different levels of government

None of the documents explicitly mentioned coordinated/compatible action plans across the different levels of government.

4.2.3.3 Mechanisms and Instruments to steer integration

In assessing whether two policies are integrated, or have chances of being integrated, there must be mechanisms and instruments to steer integration.

4.2.3.3.1 Regular dialogue, consultation processes and ad hoc meetings

None of the documents explicitly mentioned formal consultation processes on integrating national and regional innovation policy.

None of the documents explicitly mention the need for a forum for regular dialogue, consultation and alignment with representatives from different levels of government. The GIKES mentions the establishment of an "*Inter-Governmental (IGR) Forum with provincial municipalities targeting Research & Knowledge Management Units/Departments to create awareness about the importance of innovation in economic growth and employment. The IGR Forum will also identify and implement a range of innovation-related initiatives/programmes at community level* (GDED, 2012: 30). There is currently no evidence of an established regional led forum for regular dialogue, consultation and alignment of innovation policy.

The Ministerial Review Report points out that "*Efforts to achieve better vertical coordination between layers of government are focused on the development of a series of Provincial Systems of innovation*. *In order to achieve sustained activity, Provincial Innovation Forums are being established, to bring together the leadership from industry, government and the research communities in the provinces*." (DST, 2012: 72). None of the documents explicitly mention a forum for regular dialogue, consultation and alignment with representatives from different levels of government. None of the documents explicitly mention *ad hoc* meetings and working groups in promoting such dialogue, in addition to formal consultation processes.

4.2.3.3.2 Joint institution or agency that oversees the implementation of national and regional innovation policy

None of the documents explicitly mention the establishment of a joint institution or agency that oversees the implementation of national and regional innovation policy.

4.2.3.3.3 Co-financing tools to align resources

None of the documents explicitly mention the establishment of co-financing tools to align resources at different levels of government.

4.2.3.3.4 Complementary policy instruments that are being used at both national and regional level to support innovation

None of the official documents explicitly mention complementary policy instruments that are being used at both national and regional level to support innovation. The Ministerial Review Report, however mentions that "*robust instruments for performance measurement and evaluation are required for an effective management information system (MIS) that will serve the planning and monitoring requirements of any NSI" (DST, 2012: 92).*

4.2.3.3.5 Common assessment, monitoring and evaluation mechanisms/ methodologies, and tools (policy integration indicators) to assess innovation policy

None of the official documents explicitly mention the establishment of common assessment, monitoring and evaluation mechanisms/ methodologies, and tools (policy integration indicators) to assess innovation policy. With regards to the planning and monitoring requirement of South Africa's NSI, the Ministerial Review Report noted that "*there is no coordination of S&T information or indicators, and thus inevitable duplication and gaps*" (DST, 2012: 92). In addition, the review noted "*the absence of an assigned responsibility for ensuring the availability, collation, maintenance (and even analysis) of the science, technology and innovation indicators, both quantitative and qualitative, needed for monitoring and evaluation, and for planning and management of the NSI as a whole"* (DST, 2012: 92).

Table 11 shows the summary of representations of the qualitative content analysis results. The three official documents, the TYIP, the GIKES and the Ministerial Review Report are compared against the framework for analysing policy integration using a scoring 0, 1, 2 to assess the extent of the policy in integrating other levels (0 = lowest level of integration and 2 = high level of integration). A brief visual analysis of Table 11 shows that best overall integration across TYIP and GIKES are in the category of complementary policy goals, priorities and scope. The summary of the

results show that none of the official documents make mention of mechanisms and instruments to steer integration.

In examining the extent of integration of the policy documents, the statements were given numerical scoring ranging from 0 to 2, depending on the extent of each the dim was included in the policy document, and the strength of treatment. In this research, a numerical score of 0 is given when no statement or words are found regarding to the stated dimension. A score of 1 was awarded when a key word was stated, but no reference was made to integration and the highest score 2 was awarded when a key word was stated and there was reference to integration.

Table 11: Summary of representations of the qualitative content analysis results

Categories of the framework for analysing policy integration	Sub-categories	Ten Year Innovation Plan Score	Gauteng Innovation and Knowledge Economy Score	Ministerial Review Committee on the STI landscape in South Africa
Complementary policy goals, priorities and scope	Extent of complementarity of strategic objectives between national and regional government	1	1	1
	Explicit mention of national and regional actors working together	1	2	1
	Explicit mention of political commitment for national and regional policy integration	1	1	2
	Quantitative, measurable, indicator-based targets and timelines that are nationally and regionally aligned	1	1	0
	Consistency in the concepts and terminologies	0	2	2
Institutional structures and procedures for policy integration	Explicit mention of clear mandates, roles, responsibilities and modalities of operations	0	2	0
	Administrative capacity for policy integration – organisation, officials	1	1	0

	administrative reform			
	Overarching political body for national and regional relations (covering many policy areas) in innovation policy	0	0	2
	Consistent, compatible and coordinated procedures and rules of decision making	0	0	0
	Common or coordinated/compatible action plans across the different levels of government	0	0	0
Mechanisms and Instruments to steer integration	Regular dialogue, consultation processes and ad hoc meetings	0	0	0
	Joint institution or agency that oversees the implementation of national and regional innovation policy	0	0	0
	Co-financing tools that have been developed to align resources	0	0	0
	Complementary policy instruments that are being used at both national and regional level to support innovation	0	0	0
	Common assessment, monitoring and evaluation mechanisms/ methodologies, and tools (policy integration indicators) to assess innovation policy	0	0	0

4.3 RESULTS FROM THE SEMI-STRUCTURED INTERVIEWS

This section of the chapter presents the findings of the study which were obtained through the semi-structured interviews (see Appendix C). The semi-structured interviews served as complementary evidence during the triangulation process with secondary data.

4.3.1 PRESENTATION OF FINDINGS FROM THE SEMI-STRUCTURED INTERVIEWS

This section presents the results of face-to-face qualitative interviews conducted with the national and regional key informants. A total of four key informants interviews were conducted with the aim of capturing their perspectives around the integration of national and regional innovation policy (Table 12). Coding was used to refer to the respondents: AA and AB represented national level and XX and XY represented regional level.

Table 12: Respondents of the semi-structured interviews

Code	Management	Organisation
AA	Senior level manager	Department of Science and Technology
AB	Senior level manager	Department of Trade and Industry
XX	Executive manager	The Innovation Hub
XY	Executive manager	Gauteng Growth and Development Agency

The semi-structured interview instrument was structured according to the categories of the framework for policy integration including: 1) complementary policy goals, priorities and scope; 2) institutional structures and procedures for policy integration; and 3) institutional mechanisms to steer integration. The following results were obtained from the semi-structured interviews.

4.3.1.1 Complementary policy goals, priorities and scope

The first part of the questions that were put forward to the key informants were aimed at gaining their understanding of the alignment of goals, priorities and scope of national and regional government in innovation policy.

4.3.1.1.1 Complementary policy objectives

All the key informants were of the opinion that there is, to some extent a level of alignment of innovation policy strategic objectives within the different spheres of

government. Both national-level respondents, AA and AB agreed that the strategic objectives of national innovation policy have provided a clear overarching framework for policy development and implementation at different levels of government. One regional-level respondent, XX agreed that the national innovation policy objectives are clearly articulated by the national government however he argued that he viewed the national innovation policy as more towards science push policy and therefore considered it to have a narrow approach. The following verbatim account illustrates this:

XX: "*the innovation policy at the national level is narrowly orientated towards science, technology and research objectives and this is not aligned to the regional view of innovation policy encompassing incremental innovation and social innovation."*

XY indicated that regional innovation policy was only recently gaining momentum and the policy has not been clearly communicated across government and so the complementarity will develop with time. The following verbatim account illustrates this:

XY*: "Integrating innovation policy across different levels of government is still relatively new in South Africa as there was no regional innovation strategy two years ago. The main aim at regional level has been implementation.."*

Another regional-level respondent, XY pointed out that the broader objectives of creating a knowledge-based economy may be aligned but the emphasis on policy actions may differ. XY added that the strategic objectives for Gauteng are primarily customised based on the activities that are taking place in that particular regional innovation system and this may move away from the science and technology push.

4.3.1.1.2 National and regional actors working together

All respondents agreed that there is need to improve the relationship across national government and across different levels of government. One national-level respondent, AB stressed that there are few opportunities where the three spheres of government are seen to be working together on one project and delivering one comprehensive package of services. She added that government and its agencies still work in silos and information is not readily available and therefore there is not

enough collaboration between national and regional government. The following verbatim account illustrates this:

AB: "*there is need for national and regional government to work together better in driving innovation policy and not just with Gauteng but other provinces and for national government needs to do more in promoting regional growth innovation policy*."

AA points out that "*there is still a major gap in understanding regions' innovation policy portfolios and more needs to be done to integrate all levels of government in order to manage the overlaps and gaps and to ensure synergies in the inevitable competence-sharing arrangements*."

XX: "*there is a great opportunity with regions being able to experiment policies and projects on behalf of national level and through trial and error, we are able to design, develop, implement and evaluate policies that are relevant"*

Both regional-level respondents, XX and XY emphasised that innovation policies are no longer the responsibility of national-level governments alone and that the national government should work closely with regional government in implementing these polices.

2.3.1.1.3 Clear political commitment at the highest level

Both national-level respondents, AA and AB agreed that there is political commitment at the highest level to drive innovation policy in the country. One national–level respondent, AA pointed out that there has been continuous increase in the national investment of research, development and innovation over the years and that has demonstrated the level of commitment from government. Both national-level respondents, AA and AB also acknowledged that establishment of an overarching advisory body located in the President's office comprising of Ministers in relevant government departments. The following verbatim account illustrates this:

AB: "*the political leadership and commitment from our government has been encouraging and there is a growing attention to promoting innovation in the country*"

Both regional-level respondents, XX and XY argued that innovation policy in South Africa is not at the core of government's action and that there is a very low level of

commitment and aggressive leadership is needed at the highest level to integrate innovation across government as a whole. The following verbatim account illustrates this:

XY: "*high level visible political commitment to innovation policy at all levels of government is fundamental to driving forward the objectives of the country*"

XX: "*the relevance of innovation in addressing the country's socio-economic challenges is not realised at the highest level of government, innovation is not clearly articulated as a top economic agenda in the country.*"

4.3.1.1.4 Measurable, indicator-based targets and timelines that are nationally and regionally aligned

Both national-level respondents, AA and AB agree that the targets and timelines for innovation activities at a national level are carried out through the Industrial Policy Action Plan (IPAP) on an annual basis. Both respondents agreed that there is greater involvement at the national level than the regional level. One national-level respondent, AA made reference to the targets of the grand challenges of the TYIP (2008-2018) and pointed out that they are not only targets for the Department of Science and Technology (DST) but for the whole department. The following verbatim account illustrates this:

AA: "*the targets have been set for some time and DST cannot implement them alone. We need all the relevant stakeholders to actively participate in ensuring the targets are met".*

Another national-level respondent, AB acknowledged that there is greater collaboration at the national level than vertically between national and regional government. Both national–level respondents agree that a lot of emphasis has been placed on national quantitative indicator-based targets such as patents and national gross domestic expenditure on research and development (GERD) and not much on the targets for regional level in support of national government. They admitted that not a lot of emphasis is placed on identifying specific indicators and targets for provinces that are specific to their conditions. The regional-level respondents argue that there are no efforts being made yet to try and align some of the national targets with the activities at regional level, let alone developing regional innovation

indicators. The lack of resources was also indicated as a key hindrance in delivering on some of the targets that have been set. The following verbatim account illustrates this:

XX: "*currently the regional strategic targets are not fully aligned to the grand challenges and one reason is lack of resources*"

4.3.1.1.5 Consistency in the concepts and terminologies

In terms of the understanding of innovation and innovation policy, all respondents agreed that the concepts of innovation and innovation policy are still very new within the South African context. They all acknowledged that even at the national level, there is still not a common understanding of the concepts and approaches to innovation policy design and implementation. The regional-level respondents, XX and XY went on to add that innovation and its policy intervention has been narrowly defined as a "new to the world" concept in South Africa and that this has had a limited impact in the country. One regional-level respondent, XX highlighted that there is an urgent need for common understanding on innovation and the appropriate interpretation of the policy in addressing the social challenges in the country and argued that this process must be led at national level. The following verbatim account illustrates this:

XX: "*The national level is pursuing a rather narrow approach to innovation policy by emphasising high-technology and at regional level, we would like to see a broader approach to innovation and there should be a clear message on this*."

4.3.1.2 Assessing institutional structures and procedures for policy integration

The first part of the questions that were put forward to the key informants were aimed at gaining their understanding on the existing institutional structures and procedures for integrating national and regional innovation policy in South Africa.

4.3.1.2.1 Clear mandates, roles, responsibilities and modalities of operations

All respondents agreed that the mandates, roles, responsibilities and modalities of operations in innovation policy are not always clearly defined particularly at national

level. Both the national-level respondents, AA and AB argued that there is some level of overlap and duplication in the policy design and implementation particularly at national-level. The following verbatim account illustrates this:

AA: "*innovation is a complex, continuous process and it becomes even trickier at policy making level. The mandates, roles and responsibilities are there in principle but they become blurry at implementation stage and this needs to be addressed. It's not only a government problem..*"

One regional-level respondent, XY points out that "*there is need for greater clarification of mandates, roles and responsibilities among government and its agencies. It will difficult to address challenges of coordination what we are not clear who is supposed to do what*".

4.3.1.2.2 Administrative capacity for policy integration

All respondents agreed that there is a lack of administrative capacity to integrating innovation policy across government departments and different levels of government. The national-level respondents, AA and AB pointed out that there is already limited capacity in the administration of innovation policy and that integrating innovation policy would require a different set of skills and additional resources. The respondents added that integration and cooperation is done through existing structures and is specific to the project at hand. The following verbatim account illustrates this:

AA: "*we need administrative capacity for policy integration*"

AB: "*there is limited capacity in innovation policy and so there will be an additional requirement on integrating innovation policy*"

4.3.1.2.3 Overarching political body for national and regional relations

All respondents indicated that the National Advisory Council of Innovation (NACI) is considered as the advisory body in innovation policy however they all argued that NACI has not played that role effectively. One national-level and one regional-level respondent, AB and XX argued that NACI has been not effective in ensuring effective innovation policy oversight due to its limited capacity and lack of resources. One regional-level respondent, XY went on say that there is a need for the

establishment of an overarching body at the highest level which will have oversight of innovation policy across the government departments and the different levels of government. The following verbatim account illustrates this:

XY: "*NACI is reporting to one national department and not positioned centrally at the highest level of government, which meant it didn't have the powers and resources to make impactful decisions across government. We need a high-level body that can provide strategic direction and ensure coordination of innovation policy*."

4.3.1.2.4 Consistent, compatible and coordinated procedures and rules of decision making

All respondents agreed the procedures and rules of decision making within government are common in general but argued that they are far from being consistent, compatible and coordinated. They went on to add that the administrative procedures and rules of decision making are mostly independent at different levels of government and will not be unique to policy making in innovation. The following verbatim account illustrates this:

AA: "*the procedures and rules of decision making are more or less the same in government. The main challenge may be that there needs to be more synergy"*

4.3.1.2.5 Coordinated/compatible action plans across the different levels of government

All respondents agreed that there is no coordination on the action plans particularly across different levels of government. AB pointed out "*we are not even aware of the plans for the regions in innovation policy*." The following verbatim account illustrates this:

XY: "*national government does not consult us in terms of inputs for the IPAP, so the contribution by regions in innovation activities is not yet realised and it's upon regions to make their mark*."

4.3.1.3 Assessing mechanism and policy instruments to steer integration

The last part of the questions that were put forward to the key informants were aimed at assessing mechanism and policy instruments that they perceived to be steering

integration between South Africa at a national government level and Gauteng at regional level.

4.3.1.3.1 Information sharing level on issues relating to innovation policy

All respondents indicated that information sharing on innovation policy across government departments and at the different levels of government is limited. The respondents admitted that information sharing across levels of government is a challenge. They all acknowledged that there is a tendency across government departments to create policy silos and the “owning” of strategies and projects. One national-level respondent, AB mentioned that information sharing is still being done through platforms such as conferences, workshops, seminars. All respondents agreed that improving sharing of information and experiences would benefit government as a whole.

4.3.1.3.2 Level of co-ordination in the formulation and implementation of innovation policy

All respondents agree that there is not enough coordination across policy areas and different levels of government in formulating and implementing innovation policy. One national-level respondent, AA acknowledged that the level of coordination is better across government departments than across the regions. All respondents agreed that not enough action is being taken throughout government to promote policy coordination in innovation.

4.3.1.3.3 Formal / informal consultation processes on innovation policy

All respondents reported that there are consultation processes but these are more dominant at national level than regional level. All respondents agreed that the informal consultations are more regular than formally established consultation processes. All respondents agreed that more formal and informal consultations across different levels of government have to take place in order to strengthen integration of innovation in the system. The following verbatim account illustrates this:

XX: "*Although there is no formal consultation process specific to national and provincial government, the informal process does occur and is a key coordination tool in engaging national government*"

4.3.1.3.4 Forum for regular dialogue, consultation and alignment with representatives from different levels of government

All respondents indicated that there is no specific forum for regular policy dialogue and consultation across different government departments and different levels of government to discuss innovation related issues. The national-level respondents indicated that there are forums that are being held on a specific innovation issue that often include all stakeholders such as public sector, private sector, universities, and communities. All respondents agreed that are no specific forums being set up for regular dialogue with representatives from national and regional government. One national-level respondent, AA elaborated by indicating that there are forums such as workshops and seminars that are being hosted on a continuous basis but may not be directly linked to the involvement of different levels of government.

4.3.1.3.5 Ad hoc meetings and working groups in promoting such dialogue, in addition to formal consultation processes

All respondents agreed that there are many ad hoc meetings on innovation policy as a needed basis and all respondents emphasised the need for more ad hoc meetings across different levels of government.

4.3.1.3.6 Joint institution or agency that oversees the implementation of national and regional innovation policy

All respondents agreed that there is currently no joint institution or agency that oversees the implementation of innovation policy across different levels of government. They all agree that government would benefit from such an institution that oversees joint implementation of overall strategies. The following verbatim account illustrates this:

XY: "*we would welcome a joint institution that oversees the implementation of national and regional innovation policy*"

4.3.1.3.7 Co-financing tools that have been developed to align resources

All respondents indicated that there are currently no co-financing (matching) arrangements between national and regional governments' projects in innovation policy. None of the respondents could provide an example of a co-financed innovation initiative between national and regional government.

4.3.1.3.8 Forms of agreements that may be existing between national and regional government in support of innovation related programmes/ priorities

In terms of agreements, all respondents indicated that they are partnership agreements (binding and non-binding) that exists in form of contracts or a signed Memorandum of Understanding or Agreement on a need basis with a national or regional government department or agency however the implementation of those agreements has not been effective. One regional-level respondent, XX elaborated by noting that the agreements are specific to projects or a sectoral priority but there not many agreements between national and regional government on specific innovation related programmes and added that the lack of implementation of the agreements was extremely concerning.

4.3.1.3.9 Mechanisms to ensure effective feedback across policy areas and different levels of government

All respondents acknowledged that there is a lack of coordinating mechanisms to ensure effective integration of innovation policy across government departments and different levels of government. Both national-level respondents, AA and AB pointed out that while there are a few mechanisms for the integration of government as a whole, there are challenges with regards to the feedback and follow-up in terms of implementation and that this has resulted in a number of projects and programmes not taking off and not being completed.

5.3.3.3.10 Complementary policy instruments that are being used at both national and regional level to support innovation

One national-level respondent, AB mentioned that there is still a lack of alignment and synergy across national policy instruments in innovation and points out that South Africa would benefit from integrated policy instruments.

AB: "*the policy instruments for innovation policy are currently not coherent and some have been identified to having the same or overlapping targets and this is just at the national level. More needs to be done in ensuring the integration of the policy instruments horizontally and vertically. The DTI is undertaking this process".*

One regional-level respondent, XY pointed out that there are few policy instruments for regional innovation support and that resources are not close to meeting the demands. The regional-level respondent went on to say that there is still a lot that regions need to do in creating instruments towards supporting innovation in regions.

4.3.1.3.11 Common assessment, monitoring and evaluation mechanisms/ methodologies, and tools (policy integration indicators) to assess innovation policy

All respondents agreed that there is no effective common assessment, monitoring and evaluation mechanism or tool that currently integrates innovation policy across policy fields and at different levels of government. One respondent from a national department, AA mentioned that there is some effort from the Department of Performance, Monitoring and Evaluation to evaluate current policy instruments including those in the innovation landscape however this process is only limited to a few instruments and the focus is not ensuring integration of the policy instruments but on individual instruments. Another national level respondent, AB mentioned there is no coordinated approach to monitoring the innovation policy.

AB: "*each government department is responsible for their own key performance measures and although there are discussions around collective monitoring and evaluation, it is not happening in practice*."

A regional-level respondent, XX argued that the assessment, monitoring and evaluation are still being done by individual government departments and he went on

to say that currently the monitoring and evaluation for national and regional government are carried out separately and there is no integrated approach. Another regional-respondent, XY emphasised that the assessment, monitoring and evaluation are mostly being conducted at the national level and added that even at that level, there is no horizontal integrated approach across the different government departments. XY added that South Africa is still trying to identify suitably appropriate indicators as well as access to data and proper analysis of indicators.

4.4 SUMMARY OF THE RESEARCH FINDINGS

The summary of the research findings is covered using three key categories for assessing the extent of integration between South Africa's innovation policy and the Gauteng innovation policy. The three categories identified based on literature review were 1) complementary policy goals, priorities and scope; 2) institutional structures and procedures for policy integration, 3) institutional mechanisms and policy instruments to steer integration.

Overall, the findings based on the content analysis suggest that the category of complementary policy goals, priorities and scope is better reflected in all the three policy documents, the TYIP, the GIKES and the Ministerial Review Report. The institutional mechanisms and policy instruments to steer integration category was not reflected at all in the three policy documents. The policy structures and procedures for policy integration category was partly reflected in the three policy documents. These findings are to some extent in agreement with the findings from the semi-structured interviews.

With regards to the content analysis, the findings show that GIKES appears to reflect more of the dimensions in general compared to the other two policy documents. In addition, GIKES reflects more of an integration at the national level in comparison to the TYIP, which reflects on integration at a regional level.

Overall, the semi-structured interviews re-emphasised the findings in the content analysis particularly with regards to the categories of policy structures and procedures for policy integration; and institutional mechanisms and policy instruments to steer integration. The findings from the semi-structured interviews

show that both national-level and regional–level respondents perceive integrating innovation policy as a necessity however they acknowledge that the country and its regions are not well integrated. The findings show that the national-level is not familiar with the innovation initiatives taken by Gauteng and that there is lack of a formal interaction between the two levels. The findings also show that the regional level respondents are not content with the national-level approach to innovation policy.

4.5 CONCLUSION

The chapter presented the key research findings of the content analysis and semi-structured interview. The aim of the chapter was to relate the research findings to the research questions in an attempt to provide answers. The semi-structured interviews served as complementary evidence for the triangulation process. The next chapter presents the analysis of the research findings.

CHAPTER 5: ANALYSIS OF RESEARCH FINDINGS

5.1 INTRODUCTION

In the preceding chapter, the findings of the study have been presented. The interpretation and analysis of these findings follow. The findings are based on the information gathered through the use of content analysis and semi-structured interviews. The chapter analyses the main findings from the research in relation to the research questions and the relevant literature is integrated where appropriate. The research is focused on assessing the extent of the integration between South Africa's innovation policy and Gauteng's innovation policy.

The analysis of the findings is divided into five sections. The first section provides the background to the discussion. The second section responds to the first research question regarding the extent of integration between South Africa and Gauteng's innovation policy based on the findings. The third section suggests means to enhance policy integration within the context of innovation policy in South Africa. The forth section provides an assessment of the framework for analysing policy integration and the fifth section concludes with the chapter summary.

5.2 BACKGROUND DISCUSSION

This study used a combination of document analysis methods and interviews to answer the research question. In order to answer the main research question of this study, document analysis methods were used to assess the extent of integration between the Ten Year Innovation Plan (2010 - 2018) (TYIP) (DST, 2007) and the Gauteng Innovation and Knowledge Economy Strategy (GIKES) (GDED, 2012). The Ministerial Review Report was used to substantiate the findings of the national and regional innovation strategies.

Quantitative and qualitative content analyses were used to assess the extent of integration among the policy documents. A framework for analysing policy integration suited for an innovation policy context was developed based on existing literature (Briassoulis, 2004; Nilsson and Persson, 2003). The framework for analysing policy

integration is divided into three main categories, with dimensions as follows (Appendix A): 1) complementary policy goals, priorities and scope; 2) policy structures and procedures for policy integration; and 3) mechanisms and policy instruments to steer integration. The framework was used to assess the level of integration between South Africa and Gauteng's innovation policy using content analysis and the semi-structured interviews. Given the above background the next sections focus on the analysis of the research findings.

5.3 EXTENT OF INTEGRATION BETWEEN NATIONAL AMD REGIONAL INNOVATION POLICY

Overall, the findings of the study suggest there is weak integration between South Africa's national innovation policy and Gauteng's regional innovation policy based on the framework selected for policy integration. These results are in line with and complement the literature on the innovation policy coherence and coordination in South Africa (Kahn, 2013) and official policy documents (White Paper, 1996; OECD Review, 2008; Ministerial Review Report, 2012). The findings presented in the study are in accordance with national-level and regional-level discourses of innovation policy in developing countries (Muchie, 2003; Lall and Pietrobelli, 2005; Lundvall, Intarakumnerd et al., 2006; Intarakumnerd and Chaminade, 2007; Borrás, Chaminade et al., 2009; Karo and Kattel, 2010a; Kattel, 2010a; Asheim and Vang-Lauridsen, 2005; Chaminade and Vang, 2008; Scott and Garofoli, 2011). Similarly they support the work of scholars who argued that integration in innovation policy drives effectiveness (Lundvall, 2009; Lundvall and Borras, 1997, Bodas Freitas and Von Tunzelmann, 2008).

The findings from the content analysis and the semi-structured interviews reveal that all the categories of complementary policy goals, priorities and scope; policy structures and procedures for policy integration; and mechanisms and policy instruments to steer integration are poorly integrated across South Africa's national innovation policy and Gauteng's regional innovation policy. These findings are substantiated by the content analysis findings of the Ministerial Review Report.

The inherent complexity of integrating policies not to mention innovation policy, which requires a highly sophisticated understanding of policy interactions, is a

challenging task for many developing countries (UNCTAD, 2011a). The findings are not surprising since many developing countries are struggling with coordination and multi-level governance, even more so than developed countries, since their innovation systems are often characterised as weak and fragmented because of a high degree of these kinds of systemic failures (Intarakumnerd and Charoeporn, 2013; Aubert, 2005).

The findings suggest that there is more horizontal integration of innovation policy across government departments than vertical integration across different levels of government. The reason for the lack of vertical integration may be that regional systems of innovation in developing countries have only recently started to be conceptualised (Lundvall, et al., 2006; Yeung, 2006; Schmitz, 2006; Asheim and Vang-Lauridsen, 2005; Chaminade and Vang, 2008; Scott and Garofoli, 2011). This is in agreement with the content analysis findings that showed that the TYIP reflected more on other national government departments than at the regional or local level. Furthermore, the Ministerial Review Report (DST, 2012) was explicit in terms of horizontal integration (across national government departments) but less explicit on vertical integration of innovation policy (across levels of government).

The findings also suggest that the national level does not explicitly recognise the role of the regional dimension in the innovation system. The reason may be that decentralization of innovation policy is still in its infancy but most importantly the issue of limited available funds for the region. On the contrary, the GIKES seems to have informed the TYIP in terms of its strategic goals. There is a strong reference to working closely with the national level in the GIKES document however integration from both levels remains significantly weak. Oddly, the GIKES only mentions “regional innovation system” twice in the document and the concept is used in a rather abstract manner, not elaborating the regional competencies and functions of the components of Gauteng. In addition, the lack of emphasis on firms in all the policy documents analysed suggests that firms are not being viewed as key actors at the core of the innovation system.

5.3.1 COMPLEMENTARY POLICY GOALS, PRIORITIES AND SCOPE

The findings suggest that there are weak levels of complementarity in the overall strategic goals. At a strategic level, both the TYIP and GIKES policy documents reflect the policy goals of achieving a knowledge-based economy and creating a competitive economy. There is however significant diversion in both documents on how these goals will be achieved.

The TYIP identified grand challenges as critical areas for steering the economy towards a knowledge-based economy while the GIKES identified community-led innovation and open innovation as its main areas of focus. This demonstrates a fundamental difference between the two policies. This may suggest that the regional level might not be an active participant in the implementation of the "grand challenges" and that the national level might not actively engage the Gauteng region in its community-led innovation and open innovation initiatives. The findings of the study from both the content analysis and the interviews show that national level's approach to innovation policy is considerably narrow, linear and R&D based. While some authors hold the view that South Africa's national innovation policy is primarily research and development (R&D) focused (Kahn, 2013; Mhula et al., 2013) this study explicitly demonstrates the orientation of both the TYIP and the national level respondents towards a research and frontier science agenda.

In contrast, the GIKES is oriented towards social approach to innovation and makes a slight reference to science and technology (S&T) approach to innovation. However the regional innovation strategy strongly argues for a broader socially inclusive approach in tackling the development challenges in Gauteng. Social innovation in the GIKES is defined within the context of organisational innovation and community structures which is an approach that deviates entirely from the R&D approach at the national level.

The national level's focus on the grand challenges and radical innovation rather than socially orientated innovation as prioritised by the GIKES poses an even greater threat to integrating innovation policy across South Africa's innovation system. These radical innovations, which are highly complex, costly, risky and take longer time to develop than incremental innovation, are less likely to create jobs and reduce the

inequality in the country (Kahn, 2013; Manimala, Jose et al., 2005). Since the regional level is closer to the innovation actors such as firms, research institutes and other innovation actors, it helps that the GIKES has a broader innovation approach. Innovation policy in developing countries has to respond to the specific needs, priorities and capacities whether developed at a national or regional level.

There is a clear indication from the findings that national and regional government are not working closely enough together in innovation policy. Policy areas are highly autonomous and competition between the government departments over the same innovation policy responsibilities is high. One national level respondent's remark that government continues to work in silos are supported by the Ministerial Review Report (DST, 2012) and the OECD review (DST, 2008). It would appear that integration of innovation policy is being left to occur on its own. Since policy integration is seen to be a voluntary and informal process, the emphasis by government remains futile.

It is not surprising that in the process of the content analysis the Ministerial Review Report (DST, 2012) was found to be more orientated with the TYIP than the GIKES. The Ministerial Review Report was commissioned by the Minister of Science and Technology, Mrs Naledi Pandor and the focus of the review was on the National System of Innovation (NSI). In contrast to the TYIP, the Ministerial Report does argue for a broader approach to innovation policy in South Africa and widening of the system in all aspects (Hart, 2013).

The findings referring to political commitment to policy integration reveal that the policy documents are kind of "muddling" through the need for high-level political commitment. None of the documents except the Ministerial Review Report made explicit reference to the need for political commitment. While some national-level respondents are adamant that there is visible political commitment to innovation policy due to the significant investment by government in R&D, regional-level respondents argued that the political impetus and backing for innovation policy from the highest level is low, not visible and aggressive enough to influence innovation policy. The World Bank (2010) points out that sustained political leadership and commitment to innovation policy is more critical to developing countries. It further adds that a strong visible leadership and commitment at the highest level is

important to ensure coherence between policies. High level political commitment was perceived to be a critical element for integrating national and regional innovation policy by all respondents.

The lack of high-level political commitment can result in several problems such as proliferation of policies, institutions or action plans without endowment (Kahn, 2013); lack of strategic oversight and policy continuity (DST, 2012); and ineffective governance arrangements. Although South Africa's investment in R&D has evolved considerably over the years, the country's share of investment in GDP is lower than other high performing developing countries such as China and India. Although, there is some political will towards supporting innovation, many authors argue that R&D investment and political commitment to innovation policy remains exclusively focused on supporting R&D based innovation. Innovation is not identified as one of the key job drivers in the National Growth Path (EDD, 2011). The National Development Plan (NPC, 2011) makes significant reference to innovation, however, it is in the context of technological innovation. These contrasting views may suggest that the visibility of political leadership and commitment may be more apparent at the national level than at regional level and this may be due to the centralised nature of the innovation system, and the fact that in South Africa, the NSI concept has been in existence much longer than the regional system of innovation.

The findings revealed that there is significant lack of alignment and integration of quantitative, measurable indicator based targets between national and the regional level. The targets for South Africa's gross expenditure on research and development (GERD) was set at 1 percent for year 2008/9 by the Department of Science and Technology however the target was not achieved. The new target of 2 percent by 2018 seems increasingly unlikely to be met (Kahn 2013).

On the contrary, the targets set at the regional levels appear to be more realistic and achievable, this includes developing clusters in priority sectors; implementation of an "Industry Innovation Unit"; and establishing an incentivisation programme for research, development and innovation; however, it is not specific on timelines. Although it was established from the interviews with the regional level respondents that there has been little progress made on these targets set by Gauteng, they confirmed that the process has been initiated. The targets set by Gauteng differ

substantially from those set at the national level. Although it is not expected that both levels have the same targets for both policies to be integrated, there has to be some alignment that is also informed by the policy objectives. There is, however an acknowledgement at the national level that regions are not given adequate opportunities to actively participate in the setting of national targets.

Respondents at regional-level argued for equal emphasis on regional-level indicators and targets that are aligned to the national government. The reference to TYIP and (Industrial Policy Action Plan) IPAP as key instruments of the innovation policy by the national level suggests that the innovation system is still confined to the narrow R&D approach and that there are limited stakeholders active in the NSI. Kahn (2013) argues that the IPAP lacks focus on the innovation policy and he further argues that the document is mainly confined to the Council for Scientific and Industrial Research (CSIR) as the only science council. The role of the other stakeholders is not explicitly mentioned in the document. The Ministerial Review Report (DST, 2012) also argued that the "responsibility for addressing the Grand Challenges is necessarily spread across the operating domains of many government departments" and that the "target of 1 percent was elusive".

The findings also suggest that there is significant emphasis on the national-level indicators and targets for innovation policy and less emphasis on those at regional-level. Maharajh and Kraemer-Mbula (2010) argue that to increase the probability of success, innovation strategies must take into account and promote broader socio-economic targets and inform policy formulation at different levels of government.

The empirical results on consistency in the concepts and terminologies suggest that there is a significant disjuncture in the way the concept of innovation and the NSI in South Africa is understood. This is in line with the argument raised in the Ministerial Review Report (DST, 2012). There is a lack of common understanding of the concept of innovation and that the concept of a national system of innovation is not well understood outside of the science and technology (S&T) community and it has not been fully incorporated into other key strategies. While at the national level innovation is narrowly viewed innovation within the context of "technological innovation" and "scientific and technological process", Lundvall (2007) argues that most of the innovation policy efforts at the national level operate on the basis of the

narrow definition of innovation system where the focus is on an innovation mode based in scientific progress.

The regional level provides broader definitions to innovation and systems of innovation in the sense that they incorporate the scientific and technological element and the adaptation and learning as well as the social benefit, as literature suggests (Marcelle, 2011). The definitions provided in the GIKES are in line with those provided in the Ministerial Review Report. The findings suggest that there is a need for the national government to communicate clearly the concept of innovation and to ensure that there is adoption across the country.

5.3.2 POLICY STRUCTURES AND PROCEDURES FOR POLICY INTEGRATION

With regards to policy structures and procedures across national and regional government, the findings suggested that there is significant lack of policy integration. The respondents raised concerns about the lack of clarity around the mandate roles, responsibilities and of a number of organisations and agencies in terms of modalities of operations in promoting innovation. The findings also suggest that both national-level and regional–level respondents agree that some of the functions of national government departments working in innovation policy are duplicated and overlapping. The lack of clarity of the roles, responsibilities and mandates of government departments and its agencies has been highlighted previously (OECD, 2008; DST, 2012) and this challenge is not limited to the NSI but it is a concern across government in South Africa.

The Ministerial Review Report makes an argument that mandates, roles and responsibilities of the various actors in the NSI should be further clarified to avoid overlap and duplication of work and that linkages within stakeholders should be strengthened. The Review also pointed out that the responsibility for the governance of the innovation system is not formally vested in any particular government department (in this case the DST), but that the responsibility should be distributed across different sectoral government departments such as Department of Trade and Industry and the Department of Economic Development. There is an argument that roles and responsibilities of the DST, Department of Trade and Industry (DTI), Department of Economic Development (EDD) and other sector departments in

innovation policy is not clearly articulated (OECD, 2008; Kahn, 2013; Ministerial Review Report, 2012). The same is true with regards to the science councils and entities responsible for innovation-related programmes. This creates confusion among the officials working within this space and more importantly among the users of innovation .

In the course of the interviews, the setting up of a high-level strategic policy body to oversee innovation policy integration was strongly emphasised. High-level bodies are being implemented in many developed and developing countries (e.g. Finland, Iceland, Mexico, the Netherlands, Portugal) and they have been created as high-level as policy decision-making structures that are hierarchical and very often chaired by the head of state. According to the OECD (2011), the advisory body's aim is to provide an oversight of the innovation policy making process by providing guidance to the NSI as a whole; monitoring innovation strategies and the innovation system across government departments and levels of government; and fostering integration across government departments and at various levels of government; prioritising resources where they are needed most. The international experience suggests that many countries have a forum or body at the highest level of government that plays a strong integrative and advisory role across the whole of government, overseeing how innovation policies and instruments are being integrated within other policies and instruments in the system.

The lack of a visible high-level political commitment may be an impediment for the integration of innovation policy. The establishment of a high-level cross-departmental President-led advisory body responsible for holistic oversight of the departmental strands of innovation system policy would be one step towards showing political commitment (OECD, 2008; Ministerial Review Report; 2012). Such a body could set direction and priorities across the innovation system as a whole (national, regional and local levels); monitor and evaluate innovation plans across departmental initiatives; foster cross departmental integration in areas such as the interfaces noted above. However, the rise of regional autonomy and competencies in South Africa might limit the role of the national government even when the national-level is coordinating the overall innovation policy (Sanz-Mene'ndez, 2007).

Furthermore, the findings revealed weak administrative capacity and inefficient public administration across government departments and at different levels of government. This is in line with the literature review (Painter and Pierre, 2005; Karo and Kattel, 2010a). Administrative capacity in government is constrained by compartmentalisation and institutional fragmentation. Nassif (2007) argues that integration capacity enables a state to combine policy, administrative, and financial capacities for goal achievement. Administrative capacity for integrating innovation policy can ensure alignment of innovation in other policy areas, coherence of different innovation strategies with existing policy instruments. Administrative capacity for integrating policy requires other unique sets of skills. Competencies in administrative capacity for integrating innovation policy would have to be developed so that there is a common approach to the problems, the solution and the processes used.

None of the official documents reflects on coordinated action plans across the different levels of government. The findings also suggest that there is no concerted effort to coordinate government procedures and rules of decision making to allow policy integration. The findings revealed that administrative structures and procedures in national and regional government are top-down, hierarchical and compartmentalised. The rigidity of government structures and the lack of a coherent approach to administrative systems, processes and procedures have resulted in delays and incompletion of projects. Coordinated procedures and rules of decision making are of vital importance in facilitating and assuring durable policy integration. If procedures and rules of decision across national and regional levels are not compatible and coordinated, they can prevent early integration.

The results in this category of policy structures and procedures for policy integration demonstrate broader weaknesses on the strategy implementation capacity in the state's part of the innovation system. Both vertical and horizontal structures of roles within the organisations that are responsible for innovation system governance do not have the specialisation and competencies for innovation policy. Currently, the organisational structures, both vertically and horizontally as well as procedures are still deeply embedded in an innovation system that is not able to translate opportunities to support the growing economic and social development challenges. Great attention needs to be given to the governance of the NSI to ensure that

structures, processes and procedures are allowing for an effective, integrated approach.

5.3.3 MECHANISMS AND POLICY INSTRUMENTS TO STEER INTEGRATION

The findings showed that there is no explicit mention of mechanisms and policy instruments geared towards integrating national and regional innovation policy. Based on the interview, the findings suggest that only informal mechanisms such as regular dialogue, consultations and ad hoc meetings are the main coordinating mechanisms for national and regional level in South Africa. These findings suggest a significant lack of formal coordination mechanisms and aligned policy instruments.

The findings also show that there is a lack of coordinating mechanisms to ensure effective integration of innovation policy across government departments and different levels of government. The other challenge raised by the respondents was the lack of a mechanism for integrating government as a whole, and challenges in the feedback and follow-up of actions agreed in meetings.

In terms of the policy instruments, the findings suggest that incentives, particularly at national-level are not aligned and that at the regional-level there is still a need to strengthen innovation support instruments and increase its resources in order to have an effective innovation system. The findings also showed that there is misalignment in financial incentives and that there are not enough incentives to support the innovation system. Both the OECD review (2008) and the Ministerial Review Report (2012) have argued that the real impact of the financial instruments for innovation policy still is not felt in the NSI and some of the reasons for this is the thinly spread funding as well as lack of synergy.

The findings based on the interviews showed that information sharing across government departments is a challenge and an even greater challenge across different levels of government. The findings are in line with the comments made on the “national and regional government working together” dimension as well as those found in the content analysis. Respondents’ feedback indicated that there is limited information sharing on innovation policy across government departments and different levels of government and that this is increasingly becoming common

practice in the government system. Policy silos at national level undermine efforts to co-ordinate at the regional level and gaps in the allocation of responsibilities result in policy areas being unmet at any level of government (OECD, 2011).

The lack of a joint institution or agency that oversees the implementation of innovation policy across different levels of government as well as co-financing (matching) arrangements between national and regional governments' projects in innovation policy suggests that there is no formal, well-designed mechanisms to ensure better vertical co-ordination across levels of government (OECD, 2011). Many countries rely on contracts between national and regional governments concerning their mutual commitments, including the assignment of decision-making powers, the distribution of financial contributions, and the mechanisms to monitor and enforce the contracts (OECD 2011). Contracts are a necessary tool for the co-financing and joint programming of innovation policy instruments, and, if properly designed, they may commit levels of government beyond political mandates, contributing to the continuity and stability of innovation policy strategies regardless of the political cycle.

South Africa's national, provincial and local budget cycles are different and therefore it makes it difficult for joint planning and budgeting or to even consider co-financing. The respondents reported that the government budgeting system is not synchronised to allow efficient co-financing. The national innovation policy instruments are targeted towards supporting R&D based innovation activities while the regional innovation policy instruments are targeted towards supporting start-up companies.

According to the interviews, the findings suggest a lack of alignment and synergy across national innovation policy instruments and that South Africa would benefit from integrated and coherent policy instruments. The challenge raised was the limited number of policy instruments for regional innovation support and insufficient funding that is not able to meet the demand. One can argue that there is too much focus on the individual policy instruments than on the policy mix of instruments that can address a policy issue. There also seems to be a lack of understanding in terms of the interaction and effect of the combinations of policy instruments at both national and regional levels.

The findings showed that there is no effective common assessment, monitoring and evaluation mechanism or tool that is being used to integrate innovation policy across other policy sectors and at different levels of government. It was reported by one respondent that the Department of Performance, Monitoring and Evaluation (DPME) was in the process of evaluating some innovation policy instruments. The approach by DPME of hand picking policy instruments and evaluating them individually shows a lack of integration approach at the highest level. With regards to these reviews by DPME, the Ministerial Review Report argues that generally these "evaluations of the actual outcomes of the policy instruments are thus generally unavailable, or at best descriptive." The regional-level respondent argued that the assessment, monitoring and evaluation are still being done by individual government departments and that currently the monitoring and evaluation for national and regional government are carried out separately and there is no integrated approach.

Integrated monitoring and evaluation in innovation policy is significantly lacking. There are no mechanisms in place to track and manage innovation strategies and the various programmes and their alignment. Monitoring and evaluation capacity across government departments and different levels of government needs to be drastically addressed (World Bank, 2010). The findings show there is not much learning and information sharing between the national level and the regional level on their experiences in order to eliminate same.

5.4 OPPORTUNITIES AND CHALLENGES OF INTEGRATION BETWEEN NATIONAL AND REGIONAL INNOVATION POLICY

Based on the previous section, it is obvious that additional means such as complementary goals; coherent administrative structures and procedures; coordinated mechanisms and instruments are required in order to enhance policy integration and improve policy coherence. This section responds to the second research question on how integration between South Africa and Gauteng's innovation policy could be improved as well as key challenges identified based on the findings.

Based on the findings, four key aspects that needs to be considered urgently in order to improve integration of innovation policy between South Africa and the Gauteng region include: strong leadership and commitment at the political level; involvement of all stakeholders and getting a shared understanding of innovation; broad stakeholder involvement to steer policy integration; policy experimentation to stimulate learning and transfer of skills.

Innovation policy is increasingly becoming one of the most important political issues in South Africa. Regions are also gradually gaining a more prominent role in developing, designing and implementing innovation policy. An integrated approach to promoting innovation policy can address some of the socio-economic challenges faced by the country. The government of South African should take the issue of innovation policy integration seriously by introducing several reforms to improve policy coherence. This action has to include both horizontal policy integration across different sectoral government departments as well as vertical policy integration across different levels of government.

Based on the research findings, clear commitment and leadership to policy objectives at the highest level has been identified as fundamentally important for improving innovation policy integration. It was established that South Africa's innovation policy, particularly at the national level is inherently R&D based and therefore excludes significant components of the innovation systems resulting in further policy incoherence. Strong leadership and commitment at the political level and clearly stated and articulated political commitment at the highest political level is required in order to align innovation policies in supporting broader economic and societal transformation (World Bank, 2010).

Another important aspect to improving innovation policy integration between South Africa and Gauteng is the realisation that innovation policy needs to be more inclusive and receptive to the needs of all stakeholders, including beyond the RDI community. Policy integration can only be achieved if there is a shared vision by all stakeholders such as government, research institutions, private sectors and the community. National government has to ensure wider stakeholder involvement at all levels of innovation policy-making. Stakeholder engagement allows the opportunity for shared understanding of innovation and joint learning.

The findings also revealed that policy experimentation at regional level can improve South Africa and Gauteng's innovation policy integration. National government can use regions to experiment with new innovation initiatives. The process allows feedback into the innovation system to ensure systemic learning that leads to progress. Effective evidence-based policy experimentation would however require the existence of adequate learning mechanisms and a certain degree of policy flexibility and autonomy Pragmatic experimentation, which can inform national policy, needs to be backed by outcome-oriented policy evaluation.

Based on the research findings, insufficient human and financial resources at all levels are a major barrier to effectively integrating innovation policy. Inadequate financial and human resources contribute significantly to slowing down progress as well as affecting the effectiveness of an innovation policy. Promotion of innovation policy requires a substantial amount of financial and human resources. Integrating programmes and initiatives relating to innovation policy can minimize both the amount of financial and human resources needed in the implementation process. The importance of human capacity and financial resources in the context of innovation policy integration cannot be overemphasized. The next section makes an assessment of the selected framework for policy integration.

5.5 ASSESSMENT OF SELECTED FRAMEWORK FOR POLICY INTEGRATION

In assessing the extent of policy integration, a conceptual framework for analysing policy integration adopted from Briassoulis (2004) and Nilsson and Persson (2003) was used in the study. The framework was limited to analysing policy integration across three categories namely: categories of complementary policy goals, priorities and scope; policy structures and procedures for policy integration; and mechanisms and policy instruments to steer integration. The framework has been used extensively in other policy disciplines but has not been empirically applied to the analysis of innovation policy. Currently, there is no comprehensive framework for assessing integration of innovation policy cross policy sectoral areas and levels of government.

Although the framework was adopted to assess integration of innovation policy, it was found not to address other specific dimensions relating to integrating innovation

policy. As previously explained, innovation policy is a uniquely complex, cross-cutting policy that goes beyond other policy areas and tiers of government. Table 13 below illustrates the assessment of the framework by showing which dimensions, based on the research findings were considered (√) or not considered (x) to be highly relevant when analysing integration specific to innovation policy (see Table 5).

Table 13: Assessment of selected framework for analysing policy integration

Categories of framework for analysing policy integration	Sub-categories	Relevant / Not relevant
Complementary policy goals, priorities and scope	Extent of complementarity of strategic objectives between national and regional government	√
	Explicit mention of national and regional actors working together	√
	Explicit mention of political commitment	√
	Quantitative, measurable, indicator-based targets and timelines	√
	Consistency in the concepts and terminologies	√
Policy structures and procedures for policy integration	Explicit mention of clear mandates, roles, responsibilities and modalities of operations	x
	Administrative capacity for policy integration – organisation, officials administrative reform	x
	Overarching political body	√
	Consistent, compatible and coordinated procedures and rules of decision making	x
	Common or coordinated/compatible action plans across the different levels of government	x
Mechanisms and policy instruments to steer integration	Regular dialogue, consultation processes and ad hoc meetings	√
	Joint institution or agency that oversees the implementation	x
	Co-financing tools that have been developed to align resources	x

	Complementary policy instruments	√
	Common assessment, monitoring and evaluation mechanisms/ methodologies, and tools (policy integration indicators)	√

Source: Adopted from Briassoulis (2004) and Nilsson and Persson (2003)

Overall, the framework was found to be useful in assessing integration of national and regional innovation policy however, there are additional dimensions suggested to be more applicable to analysing innovation policy integration in the context of developing countries. These include institutional arrangements such as norm, value, culture, routines and laws; stakeholder involvement in decision making particularly firms and communities; and learning from experiences to provide feedback for policy making.

5.6 SUMMARY

Policy integration is a difficult issue for which there are no simple solutions. Up until now innovation policy has been very much a national responsibility, despite the growing importance of regional innovation policy. Overall, the findings suggest that policy integration is not widely discussed in South Africa's national innovation policy and that there is a significant lack of integration between South Africa and Gauteng's innovation policy across three categories of the framework for analysing policy integration: complementary policy goals, priorities and scope; policy structures and procedures for policy integration; and mechanisms and policy instruments to steer integration.

The findings revealed that there is more horizontal integration of innovation policy across government departments than vertical integration across different levels of government. In addition, the findings indicate that the national level does not explicitly recognise the role of the regional dimension in the innovation system.

Based on the findings, four key aspects were identified towards improving integration of innovation policy between South Africa and the Gauteng region including: strong leadership and commitment at the political level; involvement of all stakeholders and getting a shared understanding of innovation; broad stakeholder involvement to steer policy integration; policy experimentation to stimulate learning and transfer of skills. Insufficient human and financial resources were identified as major challenges to overcome with regards to the integration of innovation policy.

5.7 CONCLUSION

In this chapter, the analysis of the research findings has been presented. Findings from this study have been found to be consistent with the findings of several related studies on innovation policy in developing countries. The next chapter presents the conclusions and recommendations of the study.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1 INTRODUCTION

This research is a preliminary study into exploring the extent of integration between South Africa and Gauteng's national innovation policy. The previous chapter described in detail the findings of this study after an analysis of the data gathered. The purpose of this chapter is to draw conclusions and make recommendations for present and future research based upon the findings. The section is structured along the framework for analysing policy integration as discussed in the previous chapter. This research adds to existing empirical studies for developing countries and can help policy-makers and practitioners enhance efforts toward formulating, elaborating and implementing national strategies for sustainable development.

The primary research questions of the study were as follows:

1. What is the extent of integration between national and regional innovation policy in South Africa?
2. How could integration in innovation policy between national and regional levels be improved?

6.2 KEY CONCLUSIONS OF THE STUDY

This study is an attempt to assess the level of integration between South Africa and Gauteng's innovation policy by placing the regional dimension and insights about governance of innovation policy at the forefront. South Africa has made significant progress in innovation following the adoption of the Ten Year Innovation Plan (TYIP) (DST, 2008) and subsequent review of the national system of innovation (DST, 2012).

Despite the progress made, the country continues to have limited horizontal and vertical policy coherence; fragmentation and insufficient co-ordination (DACST, 1996; OECD Review, 2008; NACI, 2014). Two decades later following a number of policy interventions and reviews, the Report on the Ministerial Review Committee on

the STI landscape in South Africa (DST, 2012) still argues that the country has achieved only very limited horizontal and vertical coherence across government departments and at the different levels of government (Walwyn and Hagendijk, 2012).

To answer the main research question, the research findings revealed that the integration between the Ten Year Innovation Plan (TYIP) (DST, 2010) and the Gauteng Innovation and Knowledge Economy Strategy (GIKES) (GDED, 2012) is rather weak. These findings were further complemented by the Ministerial Review Report and the semi-structured interviews results. The findings were further supported by the results of the semi-structured interviews which all showed a significant lack of integration between South Africa's and Gauteng's innovation policy across three categories of the framework for analysing policy integration: complementary policy goals, priorities and scope; policy structures and procedures for policy integration; and mechanisms and policy instruments to steer integration.

The findings revealed that there is a more horizontal integration of innovation policy across government departments than vertical integration across different levels of government. In addition, the findings indicate that the national level does not explicitly recognise the role of the regional dimension within the innovation system.

Both results from the content analysis and the interviews suggested that at the national levela rather narrow and linear approach to innovation has been adopted and that its innovation system is being governed from top-to-down with minimal incorporation of the regional dimension.

The emphasis on the TYIP's grand challenges; traditional inputs (such as R&D as a share of GDP policy targets); and lack of facilitating an increased stakeholder involvement continue to create barriers for integrating innovation policy. This has resulted in the exclusion of some key innovation actors such as firms, communities and regional innovation actors that cannot actively participate in the national goals. These findings also suggest that there is less focus on incremental innovation. The R&D focus at the national level is not able to address the immediate socio-economic challenges. The mismatch between the frontier science and fragmented state institutions that rarely convert such knowledge into innovation, may partially

contribute to further excluding a large part of the society resulting in a system that is that is increasingly uncoordinated.

The study demonstrated that while rigorous investigation of coordination is lacking in the mainstream, it was possible to use a framework for policy integration in the context of innovation. Overall, there is no “ideal model” for integration of policy. No single measures or techniques can bring about policy integration alone. The methods and instruments for policy integration, whilst important, are not the only influences on policy integration and are not a guarantee that policy integration will occur with these in place. Different approaches may result in similar levels of policy integration. And similar approaches in different settings may have different effects in terms of policy integration. A range of factors can affect the impact of different approaches, including political and organisational issues.

It is also important to stress that, whilst policy integration is of critical importance for innovation policy, policy integration is not an end in itself. It is just one of the means by which actions and decisions can be made more sustainable: it is equally important that implementation is consistent with integrated policy if outcomes are to be more sustainable. The following are the key conclusions that have been drawn in relation to the categories: complementary policy goals, priorities and scope; policy structures and procedures for policy integration; and mechanisms and policy instruments to steer integration.

6.2.1 COMPLEMENTARY POLICY GOALS, PRIORITIES AND SCOPE

The study showed that South Africa’s approach to innovation policy at the national level is considerably narrow, linear and R&D based. It is evident from the study that many of the stakeholders including regional actors, firms, and communities are not afforded the opportunity to actively participate in the innovation system. The country cannot achieve coordination and coherence if some of the components of the NSI are excluded from mainstream activities. Innovation policy needs to be more inclusive and receptive to the needs of all stakeholders, particularly beyond the research, development and innovation (RDI) community.

South Africa needs to adopt a more systemic, and broader approach to innovation policy through the integration of technological innovation policy into a broader innovation policy. This approach would entail both the R&D-driven search for frontier technologies as well as the forms of learning and adaptation that might be market led or socially driven. South Africa should avoid a very narrow top-down approach to innovation and rather focus on functional priorities of the innovation system. An integrated innovation policy calls for a co-ordinated process of policy design, policy implementation and policy evaluation within the government departments concerned and across government level. South Africa's national scope of innovation policy has to be expanded from economic goals to other types of policy goals, not as constraints on growth but as part of a coherent social mission with a long-term development perspective. In order to have a coherent, integrated innovation policy, there must be an agreement and adoption by government and community at large on the concept of innovation as well as a systemic approach to innovation.

The findings also revealed strong leadership and commitment at the political level to be critical in ensuring integration of national and regional innovation policy. It is evident from the findings that South Africa needs to have a clear, visible political commitment to promote innovation policy across policy sectoral areas and levels of government. The World Bank (2010) points out that sustained political leadership and commitment to innovation policy is more critical to developing countries. It further adds that a strong visible leadership and commitment at the highest level is important to ensure coherence between policies.

The findings indicated that the notion of innovation, in all its dimensions, including technical, economic and social is poorly understood by both the supply and demand sides. High-level political commitment to innovation policy can also bring greater awareness to innovation as a concept and allow its absorption and adoption into policy sectoral areas and at different levels of government.

6.2.2 POLICY STRUCTURES AND PROCEDURES FOR POLICY INTEGRATION

The findings showed lack of policy structures and procedures geared towards integrating innovation policy. South Africa and its regional government should clarify their roles, responsibilities, mandates and modalities of operations. The governance

of innovation policy will need to be reworked to clarify the roles of different institutional administrative areas with the relevant spatial scale for innovation. This should be done in a transparent, consultative manner.

The establishment of a high-level strategic advisory body to provide advice, strategic guidance, oversight in the innovation system is key and is a demonstration of visible and strong political commitment. Several countries have an overarching political body for national and regional relations. These high-level strategic advisory bodies mainly comprise of ministers of the relevant departments and are often led by the head of state.

An establishment of administrative capacity for policy integration as a support to the high-level strategic advisory body would make sure that the decisions of the advisory body are followed through across the innovation system and that there is alignment across the whole innovation policy cycle. This could require South Africa to build competencies and capacity in this area and to ensure that there is continuous engagement throughout the innovation system.

6.2.3 MECHANISMS AND POLICY INSTRUMENTS TO STEER INTEGRATION

The findings from the semi-structured interviews suggested that regular dialogue, consultation processes and ad hoc meetings are generally considered the main coordination mechanisms between national and regional levels. Although they can build relationships as well as promote information sharing, the processes are more informal and self-organising. The problem with informal and self-organised processes is that the outcomes are not always binding and it often occurs among a network of people who are familiar with each other and their work. Many of the developed countries are using both informal and formal coordination mechanisms for innovation policy at the same time (e.g. regular dialogue, consultation, contracts, project co-financing and regional development agencies).

Formal coordination mechanisms such as contracts, project co-financing and regional development agencies can also improve integration at national and regional levels (OECD, 2011). Explicit identification of the mechanisms for vertical articulation between national, provincial and local levels is necessary. Coordination mechanisms

such as multi-level regional government agencies and project co-financing give regions the opportunity for progressive learning and experimentation in innovation policing.

6.3 RECOMMENDATIONS

This section provides recommendations for policy makers based on the findings of the study. The output of this study may be beneficial in two important ways; firstly, it applies directly to the practicality of national and regional innovation strategies, and secondly it adds to the academic literature. The main policy recommendations of this study is to enhance vertical and horizontal innovation policy integration between South Africa and Gauteng and are, as follows:

i. **Adopt a broader approach to innovation:** government interventions should not only narrowly address technological innovation but also non-research and developmental forms of innovation such as organisational innovation, incremental innovation, learning and adaptation in order to strengthen the inclusiveness of the innovation system (World Bank, 2010; Bell, 2002; Intarakumnerd, 2002). South Africa should adopt a horizontal and vertical policy that involves putting a broader strategic and systemic approach above departmental goals through the integration of priorities and objectives across various policy sectors and levels of government.

ii. **Establishment of a single high-level strategic advisory body**: The country should establish a single executive body that has a strategic decision-making role in addition to an advisory role and that can be responsible for co-ordination, implementation and supervision of integration processes (OECD, 2011).

iii. **Broaden and strengthen stakeholder involvement**: Strengthening involvement of stakeholders especially firms and end-users is critical in ensuring that the innovation policies remain relevant and address the priority needs in the innovation system (OECD, 2011).

iv. **Policy learning by experimentation**: The national level should consider using regions as a determining role in improving the quality of policy-relevant

evidence, and developing monitoring and analytical capacities to support evidence-based policies (Lundvall, et al., 2011; Chaminade et al., 2009; Srinivas and Sutz, 2008; Juma and Yee-Cheong, 2005). Competence and capacity building, particularly at the regional level should be greatly considered. The feedback mechanism should include monitoring, learning and adaptation.

v. **Better monitoring and evaluation practices:** South Africa should adopt an integrated approach to the monitoring and evaluation of innovation strategies and programmes (World Bank, 2010). One component of such monitoring should include the development of indicators at regional level so that there is understanding of regional innovation assets and constraints, as well as achievements of regional innovation policies. The monitoring and evaluation functions of DST and NACI could be expanded to include such indicators which are revised periodically in conjunction with stakeholder consultation. Dedicated resources for monitoring and evaluating innovation policy must be set aside. Reinforcing monitoring and evaluation procedures should be built into the design of public programmes, including through the appropriate provision of the necessary resources to carry out these procedures. The outcome of the assessments should serve to provide corrective measures regarding existing programmes and should be used to make improvements in the design of new ones.

6.4 RECOMMENDATIONS FOR FURTHER RESEARCH

From the literature review, it has been established that more research is needed to understand multi-level governance of innovation policy in developing countries. The study has highlighted a number of researchable aspects that could be pursued further by those involved in innovation policy in the context of a developing country. They include, although not necessarily limited to the following:

Firstly, it is recommended that there is a considerable amount of work to be done, both at a conceptual and empirical level to understand the impact of national and regional innovation policy integration on key development objectives. Secondly, it is

suggested that research be undertaken to assess the extent of horizontal integration of innovation policy across the provinces in South Africa. Thirdly, it is also recommended that an investigation is carried out into the indicators at regional level that are relevant to STI analysis and comparisons of regional performance for South Africa. This would assist in giving a more well-rounded understanding of regional innovation assets and constraints, as well as achievements of regional innovation policies. Standardised and comparative indicators on government expenditures for innovation support and corresponding outcomes are missing at the regional level, preventing the undertaking of such an objective assessment based on budgetary figures.

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APPENDIX A: FRAMEWORK FOR ANALYSING POLICY INTEGRATION

Table 14: Framework for analysing policy integration

Categories of framework for analysing policy integration	Sub-categories
Complementary policy goals, priorities and scope	Extent of complementarity of strategic objectives between national and regional government
	Explicit mention of national and regional actors working together
	Explicit mention of political commitment
	Quantitative, measurable, indicator-based targets and timelines
	Consistency in the concepts and terminologies
Policy structures and procedures for policy integration	Explicit mention of clear mandates, roles, responsibilities and modalities of operations
	Administrative capacity for policy integration – organisation, officials administrative reform
	Overarching political body
	Consistent, compatible and coordinated procedures and rules of decision making
	Common or coordinated/compatible action plans across the different levels of government
Mechanisms and policy instruments to steer integration	Regular dialogue, consultation processes and ad hoc meetings
	Joint institution or agency that oversees the implementation
	Co-financing tools that have been developed to align resources
	Mechanisms to ensure effective feedback across policy areas and different levels of government
	Complementary policy instruments

APPENDIX B: SEMI-STRUCTURED INTERVIEW SCHEDULE

Information of person interviewed
Name:
Institution:
Position:

Background

All the questions refer to integration across various government departments and different levels of government

Overall shared policy goals and priorities

1. To what extent do you think the strategic objectives between national and regional government are complementary in innovation policy?
2. Do you think the objectives and targets for integrating innovation across government are well clarified and defined?
3. In your opinion, do you think there is clear political commitment at the highest level to integrate innovation policy?
4. Do you think there is a high degree of transparency and trust across actors at the different levels of government?
5. In your opinion, is there a common understanding of innovation and innovation policy across policy areas and the different levels of government?
6. In your experience, what efforts have been made to provide clear, widely accepted objectives of innovation policy?

Policy structures and procedures for policy integration

7. Are there clear mandates, roles, responsibilities and modalities of operations to ensure policy integration?
8. In your experience, is there administrative capacity for innovation policy integration – organisation, officials administrative reform?
9. Is there an overarching political body for national and regional relations (covering many policy areas) in innovation policy?
10. Are there consistent, compatible and coordinated procedures and rules of decision making across the different levels of government?
11. Are there common or coordinated/compatible action plans across the different levels of government?

Mechanisms and policy instruments to steer integration

1. How is the level information sharing on issues relating to innovation policy across policy areas and different levels of government?
2. In your experience, how would you assess the level of co-ordination across policy areas and different levels of government in the formulation and implementation of innovation policy?
3. How often do you have consultation processes on innovation policy across policy areas and different level of government, either formally or informally?
4. Is there a forum for regular dialogue, consultation and alignment with representatives from different levels of government?
5. Are there any ad hoc meetings and working groups in promoting such dialogue, in addition to formal consultation processes?
6. Is there a joint institution or agency that oversees the implementation of national and regional innovation policy?
7. Are you aware of any co-financing tools that have been developed to align resources between national and regional governments?
8. What are the current coordination mechanisms used across levels of government with respect to integrating national and regional innovation policy?
9. Are you aware of complementary policy instruments that are being used at both national and regional level to support innovation?
10. Are there common assessment, monitoring and evaluation mechanisms/ methodologies, and tools (policy integration indicators) to assess innovation policy across policy areas and different levels of government?

Thank you for your participation.

APPENDIX C: DETAILED ANALYSES OF POLICY DOCUMENTS

Table 15: Detailed analyses of policy documents

Categories	Subcategories	Ten Year Innovation Plan	Gauteng Innovation and Knowledge Economy	Ministerial Review Committee on the STI landscape in South Africa
Complementary policy goals, priorities and scope	**Overall congruent, consistent and complementary policy objectives**	"pillars of a properly functional knowledge economy are human capital development, R&D and knowledge infrastructure" (Page 2) "grand challenges outlined in the plan to address an array of social, economic, political, scientific, and technological benefits" (Page 9) "This Ten-Year Innovation Plan is based on the following key principles: 1. Strategic decision: South Africa is failing to convert ideas into economic growth. While the government must invest throughout the entire innovation chain, strategic choices must be made. 2. Competitive advantage: the government should invest in areas of the highest socioeconomic return, i.e. Grand Challenges. 3. Critical mass: investment in key research must be made at a critical mass. 4. Sustainable capacity: the R&D	"accelerate innovation in all its forms, in order to bolster and support the broader strategic objectives of employment creation, and sustainable social and economic development" (Page 4) "Flowing from this strategy are **three strategic objectives**: 1.To improve the competitiveness of the Gauteng economy, in particular a set of identified strategic sectors ("Economic Competitiveness") 2.To improve the efficiency of the public sector in delivering services ("Public Sector Efficiency") 3.To promote the sustainable livelihood and quality of life of citizens within the Gauteng City Region("Community-led Innovation") " (Page 4)	"Government has to see to it that these NSI components are in place, that they interact, and that there is an agreed set of goals and objectives for a knowledge society/economy." (Page 54) "'To date, the question remains how the high-level goals and objectives of the whole system can best be arrived at, together with a resourcing plan (i.e. what resources will be needed, and where they will be sourced), in order to make the achievement of the goal of innovation-driven development a realistic proposition?" (Page 61) "It is the achievement of convergence, whether strongly-directed or indirectly encouraged, that is the greatest imperative for the NSI, and also the most challenging to achieve. Most of the other factors that influence the adaptive capacity, or the responsive inclination, of the system are related to this fundamental principle." (Page 97)

		scale-up must be consistent for the system to have the appropriate absorptive capacity, with each element (e.g. skills, capital spend) relying on others for the system to work. 5. Life-cycle planning: R&D infrastructure must be considered over the long term, including depreciation, skills needs and running costs" (Page 5)		
	National and Regional actors working together	"To encourage innovation, the DST will partner with provincial governments and facilitate the development of regional innovation systems plans." (Page 29) "the DST, in collaboration with other government departments, aims to boost innovation through a series of directed interventions in strategic areas". (Page 6)	"Gauteng Provincial Government will be seeking to accelerate policy efforts aimed at strengthening the national innovation systems." (Page 2) "The Department of Science and Technology released the Ten Year Innovation Plan, a Cabinet-level plan that seeks to achieve a number of outcomes for South Africa. These are contained in five "Grand Challenge" areas." (Page 51) "Furthermore, provincial government and its agencies will be establishing eco-system based approaches and relationships with national government and its agencies to ensure effective implementation of the strategy." (Page 6)	"Similarly, there is insufficient linkage between various levels of government, with consequently weak integration between national, provincial and local levels." (Page 65) "Efforts to achieve better vertical coordination between layers of government are focused on the development of a series of Provincial Innovation Systems, currently including Limpopo, Free State, Gauteng, North West, and Northern, Western and Eastern Cape provinces. In order to achieve sustained activity, Provincial Innovation Forums are being established, to bring together the leadership from industry, government and the research communities in the provinces." (Page 73) "This limited level of coherence and coordination is reflected in the fact that, in or under sectoral government departments, R&D activities appear to be highly fragmented, with the risk or even the reality of duplicated or contradictory effort, and the erosion of attention to R&D generally

				within these sectors." (Page 11)
	Political commitment for national and regional policy integration	"The Department of Science and Technology's Ten-Year Innovation Plan is by far the clearest signal of our commitment to a prosperous South Africa, one in which all citizens benefit from the fruits of our investment in knowledge and its exploitation." (Page V) "The South African science landscape has evolved dramatically since the dawn of democracy through government's commitment to transforming the inward-looking and embattled sector into a system that is innovative, flexible and responsive to the needs of our society" (Page V) "Finally, this bold innovation strategy will require policy leadership from the DST and other government departments, and strengthened cooperation in all matters of science and technology." (Page VIII)	"Given that innovation plays an important role in driving future growth, the Gauteng Provincial Government will be seeking to accelerate policy efforts aimed at strengthening the national innovation systems. These efforts include the introduction of broad measures to improve performance in areas like R&D, education, entrepreneurial activity and knowledge flows- -all of which are key determinants for innovative activity." (Page 3)	"This failure arises, the Committee believes, because South Africa has yet to fully mobilise political leadership and authority adequately behind the promise that the idea of the NSI holds" (Page 211)
	Quantitative, measurable,	"emphasised the need to	• "The development of specific clusters	"The TYIP, as originally disseminated, reads more as

	indicator based targets and timelines that are aligned	strengthen the place of research and development (R&D) in the economy, proposing an investment target of 1 percent of gross expenditure on R&D as a percentage of gross domestic product (GERD/GDP) for 2008." (Page 2) Specific targets for each Grand challenge are explicitly outlined e.g. Energy Grand Challenge: "By 2018 South Africa anticipates that it will have: • Expanded the energy supply infrastructure, with more than 50 percent of new capacity coming from clean coal technologies and nuclear plants • 5 percent of energy used coming from renewable sources, 20 percent from nuclear and 75 percent from coal (of which 30 percent would be based on clean coal technologies) • Expanded the knowledge base for building nuclear reactors and coal plants parts; source more than 50 percent of all new capacity locally • Successfully integrated uranium enrichment into the fuel cycle and feeding into the commercial reactors	in priority sectors, focused on driving innovation in a low carbon economy, green technologies, and other sectors as identified by the Gauteng Industrial Policy Framework (GIPF); • The implementation of an "Industry Innovation Unit" with a specific mandate to address industrial process innovation and design at an industry scale; • Incentivisation programmes to stimulate appropriate research, development and innovation aligned to the provincial strategies and objectives of the innovation strategy. Some examples include: both direct incentivisations such as 'innovation vouchers' as well as the potential use of government procurement; and Targeted innovation competitions. • The development of an information and knowledge exchange networks, based on open systems of innovation; and • Promotion of high speed Information and Communication Technology (ICT) access at a household level as a means of fast-tracking	an elaborate 'vision statement' than a fully developed action plan. Nonetheless, the notion of the 'Grand Challenges' has entered the discourse of the NSI community, especially the science councils." (Page 69) "The 'Grand Challenges' are to be spearheaded by the DST and will offer tremendous opportunities for steering our resource-based economy towards a knowledge-based economy. Notably, the responsibility for addressing the Grand Challenges is necessarily spread across the operating domains of many government departments." (Page 69)

		• A well-articulated energy efficiency programme and per capita energy demand reduced by 30 percent • A 25 percent share of the global hydrogen infrastructure and fuel cell market with novel PGM catalysts • Have demonstrated, at pilot-scale, the production of hydrogen by water splitting, using either nuclear or solar power as the primary heat source." (Page 19)	innovation." (Page 5)	
	Consistency in the concepts and terminologies	"The title of this report emphasises innovation – but not innovation for its own sake. South Africa's prospects for improved competitiveness and economic growth rely, to a great degree, on science and technology." (Page vii) "Innovation is, of course, the key to scientific and technological progress, but our starting point is not innovation for its own sake. South Africa's innovation revolution must help solve our society's deep and pressing socioeconomic challenges. This is the government's broad mandate, and the grand challenges of science and technology are in sync	Innovation is, put simply, the process by which new solutions are discovered to solve problems facing society at large....." (Page 8) • "The system is composed of institutions and entities; • The system acts upon the innovative, technological state of the country through various means including importing, developing, inventing and diffusing new technologies; • The relationships and interactions between the entities are critical to its ability to affect the environment." (Page 9).	"Innovation is the capacity to generate, acquire and apply knowledge to advance economic and social purposes. It includes both the search for frontier technologies driven by research and development (R&D), as well as the forms of learning and adaptation that might be market led or socially driven." (Page 8) The NSI is defined as "the sum total of activities that contribute to innovations of any kind, whether as improved practices or as new products." (Page 8) "The concept of a national system of innovation had as yet gained limited currency, both in the extent to which it was understood as something wider than the sum of traditional research and development (R&D) activities, and in the extent to which it had been fully absorbed in to the strategies of key actors (including government departments and higher education institutions). The notion of innovation – in

		with the needs of our society." (Page 1) "For more than a decade South Africa's democratic government has been developing the national system of innovation (NSI). This plan builds on the foundation of the NSI, and its multiplicity of institutional structures and relationships. It is specifically not the intention of this plan to review the entire NSI, or other critical elements of the science and technology system (the need for advanced facilities and equipment, modern laboratories, research support, expanded international cooperation) that are integral to our progress." (Page 1)		all its dimensions, including technical, economic and social – was poorly understood, especially on the demand side." (Page 10)
Institutional structures and procedures for policy integration	**Clear mandates, roles and responsibilities**	Not mentioned	"It is also important to consider the breadth of authority which the provincial government has in influencing innovation. Many of the important factors lie within the scope of national government departments. For example, tax regimes are exclusively the role of national government. Therefore, it is not possible for Gauteng Provincial Government (GPG) to become directly involved in providing income tax relief to companies with	Not mentioned

			regards to research and development. In a similar way, although the tertiary education system is critical in the overall innovation system, provincial governments have no direct say in the activities of these institutions." (Page 6) "Furthermore, provincial government and its agencies will be establishing eco-system based approaches and relationships with national government and its agencies to ensure effective implementation of the strategy." (Page 6)	
	Administrative capacity for policy integration – organisation, officials administrative reform	"Interdepartmental science and technology initiatives - In 2007 the DST launched the Science and Technology Managers' Forum to promote greater use of science and technology and strategic coherence between departments. For the forum to be effective, policy administration capacity needs to be further developed." (Page 29)	The Innovation Hub through GDED will be establishing the Inter-Governmental (IGR) Forum with provincial municipalities targeting Research & Knowledge Management Units/Departments to create awareness about the importance of innovation in economic growth and employment. The IGR Forum will also identify and implement a range of innovation-related initiatives/programmes at community-level." (Page 30)	Not mentioned
	Overarching political body for national and regional relations	Not mentioned	Not mentioned, there is no responsible executive body with designated responsibility (and powers) for the overall coordination, implementation and	"There seemed to be only limited horizontal coherence and integration between agencies in the NSI, and no Cabinet-level coordinating body had yet been successful in devising and monitoring national level

			supervision of the integration process	strategies for innovation, and marshalling the resources needed for these." (Page 10) "What is needed more than ever is a high-level expert body that will offer guidance to the NSI as a whole, a role that neither the defunct MCOST nor NACI has been able to fulfil." (Page 18) "The Committee recommends the establishment of a compact (15–20 person) statutory National Council on Research and Innovation (NCRI) to carry out the task of prioritisation and agenda-setting for the NSI, oversight of the system and high-level monitoring of its evolution, outcomes and developmental impact." (Page 18) "The Committee is of the opinion that failure to establish such a high-level steerage mechanism for the NSI will mean no coherent strategy and no real progress for many years to come ." (Page 18)
	Consistent, compatible and coordinated procedures and rules of decision making	Not mentioned	Not mentioned	Not mentioned
	Coordinated/compatible action plans across the different levels of government	Not mentioned	Not mentioned	Not mentioned

Mechanisms and Instruments to steer integration	**Regular dialogue, consultation processes and ad hoc meetings**	Not mentioned	Not explicitly mentioned. "The Innovation Hub through GDED will be establishing the Inter-Governmental (IGR) Forum with provincial municipalities targeting Research & Knowledge Management Units/Departments to create awareness about the importance of innovation in economic growth and employment. The IGR Forum will also identify and implement a range of innovation-related initiatives/programmes at community level." (Page 30)	Not explicitly mentioned. "Efforts to achieve better vertical coordination between layers of government are focused on the development of a series of Provincial Innovation Systems, currently including Limpopo, Free State, Gauteng, North West, and Northern, Western and Eastern Cape provinces. In order to achieve sustained activity, Provincial Innovation Forums are being established, to bring together the leadership from industry, government and the research communities in the provinces. Science Parks are similarly intended to mobilise and energise industry through research partnerships. Advice from NACI was received on this important approach, but the extent to which that advice informed the present plans is not clear, and the Committee has not seen any agendas or minutes of Provincial Innovation Forum meetings, or details of early-stage outcomes. Any extension of these initiatives to the equally important local government level has not been evident so far." (Page 73)
	Joint institution or agency that oversees the implementation	Does not exist	Innovation hub has an oversight on what is happening nationally and regionally in innovation policy	Not mentioned
	Co-financing tools that have been developed to align resources	Not mentioned	Not mentioned	Not mentioned
	Complementary policy instruments	Not mentioned.	Not mentioned.	"robust instruments for performance measurement and evaluation are required for an effective management information system (MIS) that will serve the planning and monitoring requirements of

				any NSI" (Page 92)
	Common assessment, monitoring and evaluation mechanisms/ methodologies, and tools	Not mentioned	Not mentioned	Not explicitly mentioned. "there is no coordination of S&T information or indicators, and thus inevitable duplication and gaps." "the absence of an assigned responsibility for ensuring the availability, collation, maintenance (and even analysis) of the science, technology and innovation indicators, both quantitative and qualitative, needed for monitoring and evaluation, and for planning and management of the NSI as a whole." (Page 94)