

THE ROLE OF UNIVERSITIES
IN REGIONAL INNOVATION SYSTEM DEVELOPMENT:
AN ANALYSIS OF GOVERNMENT POLICY AND UNIVERSITY-INDUSTRY
COOPERATIVE RELATIONSHIPS IN SOUTH KOREA

Thesis submitted for the degree of PhD

by

Jae-Geol Nam

Department of Town and Regional Planning

The University of Sheffield

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Abstract

This thesis is a theoretically grounded empirical study aimed at shedding light on the dynamic interactions of universities with government and industry in response to university-industry cooperation policy in South Korea. It questions the loosely-based assumptions found in current literature relating to the role of universities in their engagement in regional innovative development, that universities may engage actively in localised interactive processes. This study uses the concept of RIS (Regional Innovation System) as a conceptual framework to explore the relationships between theory, practice and policy.

The study analysed new university-industry cooperation policy in South Korea that had been implemented after 2003 to promote RIS building. The empirical fieldwork was completed in two administrative regions, Gyeongsangbuk-do Province and Daegu City, by the selection of four regional universities.

In order to identify the dynamic interactions of universities in response to the policy, this research used a mixed methodology mainly based on qualitative interviews with academics, government officers and firm managers. The Triple Helix Model was adopted to provide an analytical tool to study these responses.

Analysis of the empirical study reveals significant findings: first, the regional universities responded positively to the government policy in terms of outward appearances, but their interactions with government and industry did not develop to the degree of creating new relationships in the triple helix relations; second, therefore, it can be said that it is difficult to co-ordinate universities into the localised interactive processes as a part of regional innovation strategies; and last, it seems that the boundaries for regional innovation system are determined through ongoing dynamic selective processes for maximising the benefits of each organisation.

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List of Abbreviations

CCIs	Contracted Courses with Industry
CUCI	Central University for Cooperation with Industry
ERC	Engineering Research Centre
Gyeongbuk	Gyeongsangbuk-do
HEIs	Higher Education Institutions
HGU	Handong Global University
IACF	Industry-Academic Cooperation Foundation
ITBI	Information Technology Business Incubator
ITRC	Information Technology Research Centre
The KNIT	The Kumho National Institute of Technology
KNU	Kyungpook National University
KRW	Korean Won
LFR	Less-Favoured Region
MEHRD	The Ministry of Education & Human Resources Development
MOCIE	The Ministry of Commerce, Industry and Energy
MOST	The Ministry of Science & Technology
MOIC	The Ministry of Information & Communication
MOGAHA	The Ministry of Government Administrative and Home Affairs
NIC	National Industrial Complex
NURI	New University for Regional Innovation
PAIEIUC	The Promotion Act for Industrial Education and Industry-University Cooperation
PCONBD	The Presidential Committee on National Balanced Development
RRC	Regional Research Centre
SMBA	Small & Medium Business Administration
SME	Small & Medium-sized Enterprise
SRC	Science Research Centre
TBI	Technology Business Incubator
TIC	Technology Innovation Centre
TTC	Technology Transfer Centre
TTO	Technology Transfer Office
UAOs	The University Administrative Offices
UIC	University-Industry Cooperation
UICP	University-Industry Consortium Programme
YU	Yeungnam University
YUCSC	The Yeungnam University Centre for SME Cooperation

Chapter 1 Introduction

1.1 Introduction

This thesis investigates the dynamic interactions of universities with government and industry in response to government policy within South Korean regions. It explores the role of universities in the construction of a Regional Innovation System (RIS) which is applied as a conceptual framework to explore the relationships between theory, practice and policy. The concept of RIS is widely accepted as a useful framework to explain regional development trajectories. In RIS literature, universities are viewed as an important part of the regional innovation infrastructure, and it seems that they actively contribute to the construction of RIS. Changes in the global economy toward globalisation and the knowledge-based economy have increased the consideration that universities are important actors in the construction of regional innovative infrastructure and the promotion of RIS (Braczyk, et al., 1998; Etzkowitz & Leydesdorff, 1997).

Government policy is seen to play a significant role in RIS building and in supporting universities' engagement in it (Cooke & Morgan, 1998; DTI/DfEE, 2001; PCONBD, 2003). In particular, in South Korea, the new government launched in 2003, has implemented a new RIS policy in order to enhance national and regional competitiveness and tackle unbalanced development between the Capital area and other regions. The new policy strongly emphasises UIC (university-industry cooperation) as a way for RIS building, and it places regional universities at the centre of the policy. Four policy programmes for UIC are mainly found such as the establishment of IACFs (Industry-Academy Cooperation Foundations), CCIs (Contracted Courses with Industry), NURI (New University for Regional Innovation) and CUCI (Central University for Cooperation with Industry) programmes. These four programmes intend to promote interactions between universities, government and industry. Moreover, these programmes assume that regional universities are a critical catalyst to regional innovative development and they actively interact with industry in response to the policy programmes.

However, it seems that there is the gap between the conceptual framework of RIS and the actual interactions of universities in regional innovation process (Kitagawa, 2004). Much of the RIS literatures assume a high possibility, at least potentially, that not only universities but also other regional institutions might harmoniously interact and involve in the localised learning process. In particular, with respect to universities' engagement in regional development, the literature generally assumes that universities are active contributors to the construction of RIS. However, the question of how universities actually interact with the regional stakeholders in RIS building, has been, for the most part, neglected in the discussion of RIS.

This thesis begins with a critique of the optimistic considerations that regional institutions, namely universities, will effectively interact to enhance their regional innovative development. In order to investigate and analyse empirically the universities' interactions with other regional stakeholders, it uses the Triple Helix Model, focusing on the dynamic relations between university-industry-government, as an analytical concept. By using this model, this thesis eventually identifies the degree and nature of the interactions between the three institutions, and it also explores the gap of boundaries between the RIS policy and the regional triple helix relations.

In addition, the thesis focuses on government policy and the universities' interactions arising from the responses to innovation policy, and it intends to identify 'what' and 'how' universities do in response to government initiatives rather than 'why' they do so. However, it also pays attention to the 'why' question as a background context to help the analysis of 'what' and 'how' questions.

1.2 The Research

One of the motivations for undertaking this research is the desire to find the answer of the broad question; how can universities promote their territorial development under the globalising and knowledge-based environment at the theoretical, practical, and policy level? This question is mainly originated from researcher's personal

experience of working as regional government officer in the Gyeongbuk province of South Korea. The research is funded by the South Korean government (MOST: Ministry of Science & Technology) as an educational training course preparing professional work, which stimulated this research being close to policy issues. Additionally, since 2003, in South Korea there has been increasing political rhetoric and terminology such as ‘innovation’, ‘regional innovation system’ and ‘RIS building through enhancing regional universities capabilities’, and these terms have been put into policy framework of national government. Thus, it is necessary to apply rational and critical analysis to current policy and its outcomes, keeping an eye on the comparison between political rhetoric and the actual reality of the policy implementation. However, over the course of the research, the broad question has been narrowed down, and the research aims and contribution has also been refined and gradually specified. This section introduces the aims, questions and justification for the research.

1.2.1 Research Objectives and Questions

The empirical research setting of this thesis is located in South Korea, dealing with its university-industry cooperation policy aimed at RIS building. Theoretically, the concept of RIS and the Triple Helix Model are used as conceptual and analytic framework respectively. On the basis of the empirical and theoretical setting, this research sets out to provide knowledge for understanding and explaining of the universities’ interactions with government and industry by examining their responses to government policy.

Thus, the overarching purpose of this thesis is to expand the knowledge about the role of universities in the construction of RIS. The more specific objective of the thesis is to identify and understand the nature of universities’ interactions and engagement in RIS development. The further specific objective is to analyse trilateral interactions between university, industry and government at the regional level as an impetus to regional economic development. Within these trilateral interactions, the third specific objective is to explore tensions generated by the interactions between the three institutions. These interactions occur when two actors need to contact each other, and are viewed as interdependent relations. On the other hand, by interacting

in spite of the strength of interdependencies between them, conflicts may emerge relating to differing perspectives, aims and cultures at a personal and an institutional level. This thesis tries to understand the nature of universities' interactions by identifying of the interdependence and conflicts occurring in interactive processes. Finally, this thesis is to explore regional boundaries where universities actually interact with government and industry in the process of RIS building. This last objective originates from the gap between the functional boundaries where universities engage in practice and the boundaries encouraged by RIS policy.

According to the objectives, the three key questions examined in this thesis are:

- In what ways, and to what extent, have regional universities responded and interacted to government policies to promote innovation-based regional development?
- What is the nature of universities' interactions with government and industry arising from their responses to innovation policies?
- How are the regional boundaries identified in the construction of regional innovation system?

In order to examine the key questions, the Triple Helix Model is used as an analytic concept. The model was initially derived from an analysis of the role of MIT (Massachusetts Institute of Technology) in the renewal of the Boston economy through the cooperative relationships between university-industry-government (Etzkowitz, 2002; Cooke, 2004). The concept of the model highlights the fact that university-industry-government relations are the key to improving the conditions for innovation in the knowledge-based economy. It considers that each institution (called as a helix) increasingly interacts with the other two in a triple helix relation with the changing environment, which makes it develop an overlay of communications and interactions among helixes and the reshaping of institutional arrangements. In this model, the system of innovation can be expected to remain in transition, and it does not become fixed in any specific system and its boundary. These characteristics of

the model may be helpful to grasp the dynamic and ongoing features happening in the localised interactive processes between university-government-industry.

Thus, more specific questions are raised with respect to the regional triple helix relations;

- In terms of the type of interactions in four developmental stages of the Triple Helix Model, at which stage are regional universities undergoing transitional process?
- What tensions emerge in the localised practical process of interactions between universities, government and industry?
- What is the gap in the identification of regional boundaries between the regional triple helix relations and the RIS policy?

These questions are the primary focus of the research. It is my contention that they have not previously been adequately addressed in terms of certain geographical areas in particular, and at a general theoretical level, even though a number of analyses of universities' interactions and engagement in the construction of RIS have been produced.

1.2.2 Justification For the Research

The research was motivated by normative, contextual and academic considerations. It aims to improve the social scientific knowledge in the concept of RIS and the role of universities and their interactions within it: it is based on the grounds for scepticism about the loosely-based assumptions regarding the role of universities and their relationships with industry in current RIS literature, that universities may engage actively in localised interactive processes to promote regional innovative development. It aims to support theoretical contributions to the concept of RIS through furthering an understanding of how universities and other regional stakeholders interact in practice. At the outset of this research, it is conceptualised in terms of RIS policy and universities' responses to it, and it pays attention to the gap between policy objectives and the real response and interactions of universities. Practically, this research contributes to the critical analyses of the university-industry cooperation policy for RIS building in South Korea.

An investigation of universities' interactions and engagement in regional innovative development is very timely. In particular, in South Korea, these issues have increasingly become part of a central agenda to enhance national and regional competitiveness; moreover, the new government has emphasised the construction of RIS and universities' role in it. In the research regions, there are twenty-three universities; however, the actual role that the regional universities play in their engagement in localised learning processes was untouched.

In general, with the knowledge-based economy, the role of universities in their territorial development has been re-evaluated through considering localised interactive learning processes. Furthermore, the concept of RIS is widely used in identifying and understanding regional innovative development emphasising interactive mechanisms between actors. However, even though there is a considerable amount of accumulated knowledge in these issues, there is a lack of a critical perspective and even less micro-analytical work. Most of the work is focused on the normative role of universities' engagement in their communities (Chartterton & Goddard, 2000; Lundvall, 2002; Sutz, 1997) rather than critically examining how universities engage in practice. At a more theoretical level, while there is substantial literature on both the role of universities and the construction of RIS (Nilsson, 2004; Cooke, 2004; Mowery & Sampat, 2005), there is little analysis of how these can and do come together in practice. There are some recent exceptions with a critical perspective viewing universities' role, but these lack a micro-analytic basis in analysing universities' interactions with other stakeholders (Kitagawa, 2004; Gunasekara, 2004a). In order to promote micro-analytic method in examining the dynamic interactions inside regional innovation system, this research applies to the Triple Helix Model. The application of this model contributes methodologically to the development of the analytic method in the localised interactive process, and it allows the research questions to be answered.

In summary, there has been no attempt to analyse and explain the actual interactions of universities in the localised interactive process and the nature of these interactions, with both a critical perspective and a micro-analytic way.

1.3 Structure of the Thesis

In Chapters Two and Four, the literature relating to the concepts and contexts that the research investigates is reviewed and used to identify a conceptual framework and gaps in current knowledge and conceptual understanding. Chapter Two discusses the issue of territorial development and the role of universities with the emergence of globalisation and the knowledge-based economy, and it argues the advantage of localised learning process and universities' interactions within it. Chapter Four critically examines the concept of RIS (Regional Innovation System) in terms of the role of universities, its policy and the interactive mechanisms.

Chapter Three provides some overall information and knowledge to understand the characteristics of higher educational system in South Korea, and it introduces two specific research regions, Gyeongbuk Province and Daegu City.

In Chapter Five the methodology of the empirical work is discussed. The Triple Helix Model is suggested as an analytic concept to examine the above specific questions. The chapter establishes two analytic frameworks explaining how the regional triple helix relations are conceptualised. The conceptualisation is extensively used as main analytic frameworks of this research both to the field research and to an analysis of the findings. This chapter outlines the methodological underpinnings of this thesis and the issues raised by a fieldwork based on qualitative research methods such as interviewing and an analysis of secondary sources.

Chapter Six is to review historically the UIC (University-Industry Cooperation) in South Korea, and to examine new UIC programmes which have been implemented since 2003. The basic aspect in explaining and analysing of the chapter is on the one hand the specific policy context grounded in South Korean situation, on the other hand the theoretical framework of the RIS.

Chapters Seven and Eight present the empirical findings, initially in narrative form and then in a series of analytic sections structured by a consideration of the analytic frameworks and how universities interact in response to government initiatives.

Chapter Seven explores the question of what has been happening to the regional universities in responding to the policy, and it describes some stories happening in each selected university. Chapter Eight analyses the dynamic interactions of regional universities by using three analytic frameworks based on the regional triple helix relations. These chapters provide answers to the research questions.

The final Chapter brings together the empirical findings, the theoretical perspective and research questions. It draws the conclusions of the research, and addresses the issue of generalising from the research results to the development of existing theoretical understanding of regional innovation systems. This chapter also tries to reflect on the effectiveness and the limitation of the approach taken, and identifies area for further investigation.

Chapter 2 Regional Innovative Development and the Role of Universities

2.1 Introduction

There is a general consensus for the view that the emerging economy is best characterized by two key features: 'globalisation' and 'the knowledge-based economy', which are happening simultaneously and ongoing (Gertler, 2000, p. 689). Moreover, the knowledge content, combined with the process of globalisation, has led to an increasing consideration of the importance of geographical concentration with the region becoming more important than ever for economic development (Morgan, 2004; Wibe, 2003).

On the other hand, the convergence of the Schumpeterian approach emphasizing 'innovation' and 'evolutionary economics' focusing on social and institutional factors in economic development, puts into scrutinizing the process of economic and technological change keeping a particular eye on 'knowledge' and 'the interactive learning process' (Witt, 2002; Fagerberg, 2002; Andersen, 1995; Wibe, 2003). Through including innovation and the institutional framework in the economic process, knowledge is regarded as a crucial source of innovation, and interactive learning is emerging amongst institutions as a critical mechanism for innovation.

The increasing importance of 'geographical proximity', 'knowledge', 'innovation' and 'the interactive learning process' has led to changing the perspective identifying the reason for uneven regional development. The degree and existence of innovative capacities such as knowledge and its infrastructure, innovative milieu, and interactive mechanisms, have become a vital component in deciding regional development trajectories.

Based on the above situations of economic geography, the role of universities is increasingly emphasized, because they are viewed as institutions having plenty of

localized advanced knowledge and playing a critical role in transferring it through the interactive learning process. In particular, in the localized learning process, the degree of universities' competence and engagement in a certain region is regarded as one of the decisive factors influencing successful regional development.

It is necessary to problematize the relationship between universities and their territorial development, because this relationship is viewed as particularly essential context in explaining uneven geographical development. There is a growing importance attached to the role of universities at a regional level, with some notable examples where regions and their universities successfully have constructed innovative learning process, such as in Santa Clara County, California so called Silicon Valley and Stanford University; in and around Boston called Route 128 and MIT (Massachusetts Institute of Technology); and Cambridge University and its region (Castells & Hall, 1994; Keeble et al., 1999a; Kitagawa, 2004). However, it cannot be said that universities in all regions actively engage in their regional matters. In reality, it seems that there is a gap between the conceptual and normative model of universities' role and the actual engagement of universities in regional innovative development (Kitagawa, 2004). The universities' engagement in their regional development is uneven, and mediated by several obstacles including regional identity and institutional competition (Gunasakera, 2006; Boucher et al, 2003).

With the above critical perspective, this chapter brings together the diverse concerns of territorial development and universities' role, and it discusses the conceptual framework which helps in making sense of the economic development prospects of regions in an era of pervasive globalisation and the knowledge-based economy. Accordingly, the aim of this chapter is, before examining the specific cases in South Korean regions, to explore the background context of the changes in the current regional economic environment, to discuss what these changes might represent in terms of the regional developmental trajectories, and to critically review the existing available literature in order not only to expand knowledge of universities' role and their territorial development but also to generate some questions uncovered by the current literature and under discussion in this thesis.

This chapter begins with an account of the principal ways in which economy and

society have become globalised and knowledge-based. This is followed, in the second part, by a discussion of the way in and the degree to which these changing processes influence the issues of regional innovative development. This second part critically examines the current literature explaining the evolutionary process inside the region. The third part presents a critical discussion of the literature on the regional role of universities, and explores the explanatory factors shaping universities' engagement in regional development.

2.2 Globalisation, the Knowledge-based Economy and Knowledge

2.2.1 Globalisation and the Knowledge-based Economy

'Globalisation' has been seen as a persuasive argument explaining the transformation of the existing social economic structures and activities (Amin & Thrift, 1994). Globalisation is more than internationalisation, which involves the simple extension of economic activities across national boundaries (Johnston et al, 2000; Dicken, 1992). Globalisation processes are qualitatively different from internationalisation processes, and they emphasize not merely the geographical extension of economic activities across national boundaries but also -more importantly- the functional integration of such internationally dispersed activities (Johnston et al, 2000; Malecki, 1997; Dicken, 1998; Wibe, 2003). Naturally, these processes accompany, and accelerate boundless competition among various economic agents located throughout the world. The increasing boundless competition puts an emphasis on the construction of competitive advantage at individual firm level, regional level, national level and multinational level as well.

In terms of both the geographical unit of competition and the important resource to construct competitive advantage, two major consequences of globalisation can be counted among many of them. One, geographically, is that 'regions' newly emerged as significant units of economic competition. The other is that 'knowledge' is considered as a critical resource in order to survive the boundless competition (Amin

&Thrift, 1994). The two matters of regions and knowledge are mixed together practically and theoretically in regional issues of the modern economic geography such as 'industrial clusters' (Porter, 1990), 'flexible specialization (Sabel, 1994), 'learning regions' (Florida, 1995; Morgan, 1997), 'industrial districts' (Asheim, 1996), 'regional innovation system' (Cooke, 1998), and 'collective learning' (Keeble et al., 1999; Keeble & Wilkson, 1999; Lawson & Lorenz, 1999).

Beside globalised economic process, knowledge has gained a key function in advanced production and characterizing the current phase of socio-economic development. As Lundvall emphasizes knowledge as 'the most fundamental resource' in modern economy (1992, p. 1), knowledge is now almost universally regarded as a source of, or at least a fundamental condition for, competitive advantage (Simmie, 2003, p. 610-1). Considering knowledge as a source of economic growth or development, there are some terms explaining the characteristics of modern economy: 'the knowledge-based economy' (Cooke, 2004; Cooke & Leydesdorff, 2006; Leydesdorff, 2006a; Poyago-Theotoky et al., 2002; Wibe, 2003, p. 4); 'the knowledge economy' (Kitagawa, 2004, p. 836); and 'the learning economy' (Lundvall, 2002).

It seems that generally 'the knowledge economy' and 'the knowledge-based economy' are used with a similar meaning to characterize and explain the modern economy emphasizing 'knowledge'. However, Cooke (2004) strongly emphasizes the difference between 'the knowledge economy' and 'the knowledge-based economy'. He argues that 'the knowledge economy' emerged within the context of the economic analysis of the quality of the input factors in the production process, however the term 'knowledge-based economy' finds its roots in a system perspective and a structural idea linking the knowledge generation subsystem to knowledge-exploitation system via knowledge transfer organisations (Cooke, 2004; Cooke & Leydesdorff, 2006).

On the other hand, Lundvall argues that he prefers the term 'the learning economy' in characterizing the current phase of socio-economic development to 'knowledge-based economy' (Lundvall, 2002, p. 3). Lundvall (*ibid*) puts an emphasis on learning process rather than knowledge itself, as he asserts that:

*Consequently, access to any given knowledge is less important for the economic success of firms and individuals, than their ability to **rapidly acquire new competences** as they get confronted with new types of problems.* (emphasis in original; p. 4)

To sum up, there is a common point between two different terminologies of the knowledge-based economy and the learning economy. They commonly highlight not only knowledge itself but also knowledge transferring mechanisms for its sharing, commercialisation and effective usages.

At this point, questions are raised: what are the characteristics and nature of knowledge involving economy and innovation process? And how is the knowledge transfer process promoted? Answering these questions will help to more concretely understand the attributes of the knowledge-based modern economy and to identify the issues related to the questions of this research.

2.2.2 Knowledge and Its Transfer

One way to understand how knowledge is involved in the economy and innovation process is by using Michael Polanyi's distinction between tacit and codified knowledge (Polanyi, 1966). In Polanyi's words, tacit knowledge refers to intuitive knowledge that is based on personal experiences and cannot be easily captured in a transferable form. It is not easily transmitted through formal means, because the experience tends to be individual and specific to particular tasks (Simmie, 2003). As a consequence, this type of knowledge can be transmitted through concrete experiences, the learning process, and interactions. Codified knowledge, on the other hand, is generated through formal channels, such as books and technical and scientific publications, which are easily shared or exchanged using formal language (Howells, 2002).

This composite quality of economic knowledge generates geographical and policy issues. The geographical issue is how easily knowledge transfers with respect to the distance. Regarding codified knowledge, distance does not dwindle the knowledge but, on the other hand, tacit knowledge does not travel well and is highly personal. Furthermore, human resources are the fundamental tool for its diffusion and

circulation. Therefore, at a certain geographical level, to what extent the regions have the tacit knowledge and to what degree they can use and share it for their regional development, may determine the regional potential and capacities to enhance their endogenous development. It seems that the issue of proximity related to economic actors and boundaries is closely connected to the nature of knowledge.

The other issue is policy intervention. In general, codified knowledge can be traded in the market, so the roles of the government are restricted to articulate such as Patent Acts. However, tacit knowledge has more complicated policy considerations, because its diffusion, circulation and re-creation are unexpected processes. It can be suggested that the policy aimed to diffuse tacit knowledge needs to support communication for face-to-face interaction between actors, and to highlight the fact that the social context and institutional thickness are essential for knowledge diffusion through interactions (Lundvall and Johnson, 1994; Lundvall, 1992; Amin & Thrift, 1994).

These characteristics of knowledge might provide a background to the understanding of diversities in regional development patterns; some regions are rich, others are poor. Questions driving different development trajectories can be addressed with differing intensities of knowledge and its transferring mechanisms (Groot, et al., 2001).

In economic geography, the issue of how to promote knowledge transfer between firms and between firms and universities has become a centre of the discussion about knowledge and its diffusion. Three theoretical frameworks have been mainly elaborated and applied to the research for knowledge transfer since the 1990s (Leydesdorff, 2006); National/ Regional Innovation System (Lundvall, 1992; Cooke, 1998); Mode 2 (Gibbons et al., 1994); and the Triple Helix Model (Leydesdorff & Etzkowitz, 1997).

The National Innovation System underlines user-producer interaction, and the learning process centering around firms. The Regional Innovation System, whose concept originates from the discussion of the NIS, emphasizes the geographical issues at sub-national level. The theory of Mode 1/2 makes the following distinctions (Gibbons et al, 1994, p. 3-5): Mode 1 represents the traditional core research

activities of universities, and in Mode 1, problems are solved in a context governed by the interest of a specific community. Thus, Mode 1 is characterized as 'disciplinary' and 'homogeneous'. Mode 2, on the other hand, is characterized as follows; 'knowledge produced in the context of application', 'trans-disciplinary', 'heterogeneity and organisational diversity', 'social accountability and reflexivity' (*ibid*, p. 5-8). Mode 2 explains the knowledge transfer with the viewpoints that the process of knowledge production changes from Mode 1 to the Mode 2 which is created in broader social and economic contexts. The Triple Helix Model focusing on the university's role stresses the dynamic communicative interactions between universities, government and industry.

Despite some conceptual differences, the theories of National/Regional Innovation System, Mode 2, and the Triple Helix Model commonly emphasize the particular importance of interactions among firms, universities, governments and other institutions. This conceptual convergence mainly underscores how knowledge can transfer between universities and firms, alternatively with the consideration of opportunity for public policy intervention.

In the light of this thought, a question is raised: in what ways and to what extent do these processes of globalisation and the knowledge-based economy influence the localized process of knowledge transfer and the economic developmental trajectories? How does the perspective identifying the reason for uneven regional development change through the inclusion of the knowledge-based economy and globalisation into the economic process? The next section explores the above questions.

2.3 Region and Regional Innovative Development

In the globalised economy, which represents rapid transportation and communication, one could expect location to diminish in its importance. However, it seems that the opposite is true. Regions are increasingly becoming critical agents and units of economic development and competitiveness, as Castells and Hall (1994, p. 7)

underscored it: 'the most fascinating paradox' of globalised world economy. As the economy is globalised, national governments suffer from failing powers to act on the functional processes of their economies and societies. However, regions and cities are more flexible in adapting to the changing conditions and milieu of markets, and technological and innovative capacities. Even though regions have less power than national governments, they have a greater response capacity to i) generate targeted strategic development projects, ii) negotiate with multinational firms, iii) foster the growth of small and medium endogenous firms, iv) create conditions that will attract the new sources of knowledge, wealth, power and prestige, v) promote their own knowledge sources and knowledge transfer process (*ibid*).

With the twin processes of globalisation and localization, regions compete with each other, and each region makes an effort to create a better place to live and a more effective place to do business. In this process of generating new regional development, the diversity and difference between regions becomes another feature. As Amin & Thrift (1994) highlight;

We argue that globalisation does not represent the end of territorial distinctions and distinctiveness, but an added set of influences on local economic identities and development capabilities. (p. 2)

Globalisation does not imply sameness between regions, but diversity. From the viewpoint of the knowledge-based economy, Lundvall and Cooke stress that the knowledge-based economy is closely related to an increasing gap of inequality between regions, which is generated by the 'knowledge intensity' gap within region (Cooke, 2005; Lundvall, 2002). The degrees of knowledge and their intensive dynamics reinforce the disparities between disadvantaged or less-favoured regions and advantaged region. Cooke (2004) insists that

Hence, reducing knowledge economy disparities is a fundamental task in reducing regional disparities in prosperity for less-favoured regions. (p. 4)

However, to enhance knowledge intensity and its dynamic mechanism is a very complicated task because of the nature of knowledge, particularly tacit knowledge, which may transfer through face-to-face contact or interactive relationships between various internal and external institutions. Moreover, at the policy level, the boundary of regions is not fixed, but it is flexible, which makes it difficult to effectively implement the policy for regional innovative development.

In the light of this, this section tries to give the answer to the key questions: how can region be identified when we focus on regional innovation systems and regional innovative development? In what ways can the regional economic disparities be explained and recovered in organised and knowledge-based economic environment? How can policies promote regional innovative capacities? What make successful regions? Why are localized learning processes emphasized?

2.3.1 What is a Region?

A central problem in this respect is the definition of region, which varies from country to country and university to university. Authorities look at administrative borders, whereas the universities tend to look at regions the natural recruitment area of student. This area is most often larger than the administrative region. (Gulbrandsen, 1997, p. 125)

As denoted in the above quotation, in reality, what is meant by the term 'region' varies substantially. Sometimes it means sub-national level, but sometimes it is used at international level like the EU region. At the policy level, it seems that region is an administrative division of a country, that is to say, the sub-level of the country, but above the local level (Boucher, et al., 2003; Looy, et al., 2003). However, in the knowledge-based economy, the concept of region is more abstract than administrative definition, because the consideration of the functional, cultural and social reasons becomes more important than the clear definition of the boundary. If it is considered more practically, the different definition between regional institutions or stakeholders can be a problematic issue especially to policy makers.

Cooke and Morgan regard regions as a 'system of collective order' and 'externalised learning institutions' based on mutual learning and trust among the collective and learning community (Cooke, 1998, p.16; Cooke and Morgan, 1998, p. 66). They also maintain that region should be defined through the two well-debated concepts: regionalisation and regionalism. Regionalisation is associated with economic processes, and regionalism comes into play more as cultural processes comparatively (Cooke & Morgan). From a similar perspective, Massey (1995) argues that region is constructed through the fundamental process of mutual interactions. Amin & Thrift,

while emphasizing institutional relations within and around region, stress that the region should be considered as '*a relational and relative concept*' rather than fixed boundaries (1994, p.8). In particular, Chartterton & Goddard (2000) point out the difficulties of regional boundaries with relation to the role of universities, because various activities occur such as "*by operating within a regional recruitment area, by interacting with regional research partners and the regional industrial base, or by offering service and outreach facilities to the regional community*" (p. 478).

A significant reason why the definition of region is difficult is that region is not static, but it encompasses dynamic tension and process (Cooke & Morgan, 1998). Statically, region has its physical territory and boundary, citizens and organisation; in terms of dynamic perspective, however, it includes economic, social and cultural activities happening inside the region and around the region. In order to capture these features occurring near regional boundaries, the notion of region can be seen as flexible rather than fixed.

Accordingly, it seems that region may be defined in terms of evolutionary perspective focusing on dynamic processes happening in a certain boundary. However, to analyse a region, criteria must be found which defines a functioning unit concerning the objective of the specific research within a specific time (Cooke & Memedovic, 2003). In this research, the term region is used as a sub-national locality, and methodologically two administrative regions were already selected as research areas. However, this research also tries to identify regional boundaries functionally formed when regional universities interact in response to government policy.

2.3.2 Evolutionary Economics and Institutions

During the last two decades, given the prevailing emphasis on globalisation and the renewed concern with regions, the matter of regional economic development has been increasingly discussed with learning and innovation processes focusing on social and institutional conditions within regions (MacKinnon et al., 2002; Morgan, 1997; Cooke, 1998; Lundvall, 1992). A number of concepts based on learning, innovation and institutions such as 'learning region' (Morgan, 1998) 'regional innovation system' (Cooke, 1998) 'collective learning' (Keeble & Wilkenson, 1999)

'institutional thickness' (Amin & Thrift, 1994) have been generated in terms of how they shape the processes of regional economic development. This is a fundamental shift from the previous literature focusing on input-output relations, material linkages and transaction costs toward a broader concern with institutional conditions (Scott, 1988; MacKinnon et al., 2002). The literature on industrial agglomerations and spatial proximity has also come to be treated in a new approach based on institutional atmosphere (Amin & Thrift, 1994).

This new trend of regional development roots its theoretical base in evolutionary economic theory as opposed to neoclassical economic theory (Cooke, 1998; Cooke & Morgan, 1998; Morgan, 1997). Dosi and Nelson (1994) state the purpose of evolutionary theory as;

Their purpose is to explain the movement of something over time, or to explain why that something is what it is at a moment in time in terms of how it got there; that is, the analysis is expressly dynamic. (p. 154)

Unlike the neoclassical theory having somewhat unrealistic hypotheses, evolutionary theory puts propositions more near to reality such as heterogeneity of economic agents, uncertainty, bounded rationality and influences of institutions (Dosi & Nelson, 1994; Boschma & Lambooy, 1999). Neoclassical economics explains economic performance in terms of a production function consisting of two factors - labour and capital - and the development of the economy can only be decided by the increasing input of one or both of these factors. Thus, neoclassical economics does not put into consideration the effects of social and institutional factors (Wibe, 2003). The neoclassical theory considers that technology and learning are exogenously given, whereas the evolutionary theory regards them as the consequence of interaction with other firms and agencies (Cooke, 1998; Nelson & Winter, 1982). Evolutionary theory stresses path-dependent evolutionary change caused by specific institutional rules and practices over time, and the lock-in effect as institutional rigidity (Boschma & Lambooy, 1999; Johnston, et al., 2000).

It seems that academics and policy makers in regional development adopt this theory as a focal perspective when they look into a region, because this theory could extend their understanding of innovation and technological change, and help theoretically and practically to create new pathways of economic development in a certain region. However, it is not easy to study and analyse dynamic and complex relationships

among regional institutions, stakeholders and regional innovative milieus, thus each research related to regional developmental matters is studied from a specific angle as mentioned in the above section such as the learning process, institutional arrangements, and a systematic view of regional innovation.

All these approaches underline the role of institutional contexts and analysis in explaining socio-economic dynamics. A question is raised, what are institutions? The term 'institutions' is used loosely in much of the literature. Institutions are defined with relation to the terms, organisations, rules or laws, and conventions or repeated behaviours. The narrowest definition refers to institutions as non-market, non-profit organisations such as governments, public agencies, universities, etc (Dosi & Orsenigo, 1988, p. 19). But, Storper (1997, p. 268) distinguishes between 'institutions' and 'organisations'. He defines 'institutions' as customary, and informal rules of practice between groups and individuals, whereas organisations are far more prescriptive political and administrative forms. The third, broader definition comprises all forms of organisations, conventions and repeated and established behaviours, and rules and laws that regulate the interaction between individuals and groups (Edquist & Johnson, 1997; Dosi & Orsenigo, 1988). This broader definition also implies, as Dosi & Orsenigo (1988) say;

...the institutions which shape 'visions of the world', behavioural conventions, perceptions of opportunities, and interactions between the agents are an important ingredient in the expectation, what kind of technical progress they expect in the future, what appropriability mechanisms they try to build, how much they cooperate, and to what extent they compete with each other. (p. 19)

This thesis principally adopts the broader definition of institutions, that is to say, institutions comprise organisations, and create the milieu within which innovation is undertaken and establishes the ground rules for interaction between the various economic actors.

In the light of this thought, questions are raised how to analyse and identify the complexity and diversity of institutional arrangements in a certain region. As quoted in the above by Dosi and Nelson's purpose of the evolutionary theory and Dosi & Orsenigo's definition of institutions, the study concerning institutions, on the one hand, could support reasonable background assessing an explanation of

geographically uneven development (Amin & Thrift, 1994). On the other hand, the institutional approach is too complex to analyse practically in a certain region, thus, many of the institutional methods approach a range of middle ways between the theoretical generality and the specific applications using applicable theories such as regional innovation system and the Triple Helix Model.

2.3.3 The Evolutionary Process Inside the Region

Based on this theoretical background, two factors can explain how and why such institutional relationships are emphasized at regional level; one is the highlight of interactive relations in modern innovation process, and the other is the importance of the localized learning process. This section discusses the evolutionary process inside the region, which can be a useful way to explain regional uneven development. The first part discusses the emphasis on the interactive process of innovation, and the second explores how and why the localized 'spatial' processes are emphasized for innovative development. In each part, some questions will be raised with relation to the research issues of this thesis.

■ Interactive process of innovation

Modern innovation theory implies a sociological view of the process of innovation, in which interactive learning is looked on as fundamental aspect of innovation process (Asheim & Isaksen, 1997; Lundvall, 1993). As innovation is viewed as an interactive process, cooperative relationships and learning process between actors are stressed in innovation theories and practices (Morgan, 1997). Lundvall (1992) emphasizes that

the most important process is learning. ... learning is predominantly a interactive and, therefore, a socially embedded process which cannot be understood without taking into consideration its institutional and cultural context. (p. 1)

The emphasis of interactive process arose from a critique of the linear model of innovation, in which innovation is considered to be the result of a linear process of different stages taking place in a sequential and one-way order (Massey et al., 1992; Morgan, 1997). This linear way of explaining innovation leads to 'Technology (Science)-Push' and 'Demand-Pull' models. Technology-push model stresses that

autonomous advances of science and the technological capacity are the main determinants of innovation; on the other hand demand-pull model considers the market forces as the origin of innovations (Malecki, 1997). This linear model is useful to explain a relationship between long-term scientific research and industrial and economic growth, and the need for investment in risky R&D. This model also suggests how to make the relationships between science and production more efficient (Massey et al., 1992).

However, the crucial problem of this model is the simple assumption that innovation takes place when basic research is connected to product and market. This model ignores the factor that more complex process for innovation can occur through the whole process. It considers R&D, in particular, as the only source of innovation, and overlooks the feedback loops and interactions among the different stages of the innovation process. Moreover, this is originated from an elitist view of innovation and knowledge, which undervalues engineering and production skill in the innovative process (Morgan, 1997; Asheim & Isaksen, 1997).

Evolutionary theories of economies and technological change have now replaced the linear model considered as part of the Fordist era of industrial organisation and production (Asheim & Isaksen, 1997; Massey et al, 1992). The interactive innovation model widely accepted in the modern view of innovation is regarded as an ongoing learning process engaged with various social actors such as firms and their customers, governments, universities, etc. The interactive learning of innovation is a complex social process, as Storper & Scott (1995) explained;

the plurality of types of production systems and of innovation, 'small' process of economic coordination, informal practices as well as formal institutions, and incremental as well as linear step-by-step process running and adjustment. (p. 519)

One of the outstanding contributions of the interactive model is to extend the theoretical and practical viewpoint concerning innovation and regional economic development, focusing on various relationships from the ones between firms and basic science infrastructure to interactive relations between producers and user at the inter-firm level, and between firms and the wider institutional milieu. Accordingly, the interactive relationships between regional stakeholders such as firms, governments and universities are considered as critical to constructing regional

innovative development. On the other hand, as interactions are becoming more relevant in the definition of a dynamic and open system, their measurement and the comprehension of their path-dependent dynamic behaviour requires a more detailed analysis.

In the light of this consideration, some questions arise from policy level, analytical level and both of them. The first question at the policy level is how can interactive learning process be enhanced? Interactive relationships engaged with various regional stakeholders are naturally complex, but these processes are viewed as critical to promoting regional development. In reality, the way to support the regional innovative learning process may also vary depending on regional contexts, and various variations can be affect on the process. Therefore, for policy makers, it is a difficult but crucial issue to enhance the interactive process. Secondly, at the analytic level both academically and practically, how can the interactive processes be analysed? It is not easy, in a certain region, to analyse the interactive learning process characterized by complex relations of regional stakeholders. The third and more fundamental question is do the expected participants (individual organisations or groups) in the interactive process really want to interact with others? If so, then to what extent, and proactively or inactively? It seems that there is an assumption in the thought of interactive innovation and learning; the participants are, in some degree, eager to interact with others. However, as the interactive process is complex, there are various forms of interdependence and conflict between regional stakeholders, which originate from different perspectives of regional economic issues and their own aims. Therefore, it is necessary to examine in what way and to what extent regional stakeholders want to take part in the process, and which kinds of interdependence and conflict emerge in the complex process of a certain region.

The last checking point concerning interactive process is the relationships between universities and the emphasis on interactive innovation. In the interactive process of innovation, universities' role in the regional innovative process can be regarded differently from that suggested by the linear model. As the interactive model stresses social process and recursive interactions; the roles of universities are expected not to limit R&D activities but to broadly support and interact with firms and other regional economic agents (Lundvall, 2002). Moreover, as knowledge is considered as a

fundamental resource for innovation (Lundvall, 1992), the importance of universities has increased because universities can be seen as a reservoir of knowledge. Therefore, in academic literature, it seems that it is widely accepted that universities play an important role in regional innovative development; particularly, the interactive process between universities, firms and government are viewed as critical to constructing regional innovation. Here, a question arises with relation to universities and the regional interactive process; in what way and to what extent do universities engage with the regional interactive innovation process? Furthermore, what kind of interdependence and conflict are generated between universities and regional stakeholders?

■ The advantage of the localized learning process

This part explores the other explanatory factor of how and why localized institutional relationships are emphasized. In academic literature concerning regional economic development, the emphasis on the localized process for economic development seems to be widely accepted (Morgan, 1997; Cooke, 1998; Keeble & Wilkinson, 1999; Amin & Thrift, 1994; Capello, 1999; Lawson & Lorenz, 1999). Localized learning and interactive relationships are expected to actively create a number of economic and social relations to support regional innovative development (Morgan, 1997; Capello, 1999; Lawson & Lorenz, 1999). Localized learning and interactions based on geographical proximity are becoming the decisive factors shaping innovation capacity, which is viewed as a way of explaining uneven regional development (Morgan, 1997). There are some academic expressions why these localized processes are emphasized in explaining recent regional economic development, as follows.

Firstly, as Lundvall highlights the fact that innovation is attribute to the utilization of economically relevant knowledge, and regionally embedded knowledge is stressed in localized learning (Lam, 1998). In particular, tacit knowledge is highly personal, thus it is not easily codified and communicated (Morgan, 1997). Tacit knowledge is collective in nature, and it is closely connected to interpersonal relationships, trust and cooperation (Lawson & Lorenz, 1999; Morgan, 1997). Furthermore, formal and codified knowledge is merely the tip of iceberg, because knowledge in nature is felt to be primarily tacit (Morgan, 1997). As tacit knowledge and its diffusion are linked

to geographical proximity and localized process, knowledge transfer enhancing innovative capacities strongly emphasizes the localized process of interaction.

Secondly, trust and institutional routines can be viewed as a regionalized social capital, and they are expected to play an important role in interactive learning (Putnam, 1993; Morgan, 1997). As Lundvall argues that learning is an interactive and a social embedded process, he regards interactive learning as social network and relations. Social relations and networks are based on trust in interrelationships among individuals, because the possessors of tacit knowledge are not completely aware of what exactly they have and are unable to estimate its value. The value of tacit knowledge is difficult to tell before buyers have received it, while the seller has an understanding about it and cannot fully reveal it before clients buy. People cannot buy trust, but it can be learned in and through recursive interactions (Morgan, 1997). Therefore, sharing trust, it needs recursive and routine processes in social networks and interactions. In the question of how to construct the routine process in social interaction, institutions can be an alternative to recursive interactions. Lundvall (1992) explains the need for institutional set-ups with the word '*uncertainty*'. He argues that

The institutional set-up ... is the second important dimension of the system of innovation.....Institutions make it possible for economic systems to survive and act in and uncertain world. (p. 10)

He also explains this characteristic of institutions;

Institutions may be routines, guiding everyday actions in production, distribution and consumption, but they may also be guide-posts for change.... One of the fundamental characteristics of institutions is their relative stability over time. (ibid)

Institutions can play an important role in providing the stability to have trust and diminish uncertainty, and it also supports innovative efforts (Amin & Thrift, 1994). Putnam (1993) thinks of social networks, norms and trust that facilitate coordination and cooperation for mutual benefit as 'social capital'. Amin & Thrift (1994) regards the combination of factors including inter-institutional interaction and shared cultural norms and values as 'a local institutional thickness'. They also argue that "*a thickness establishes legitimacy and nourishes relations of trust*" (p. 15). In this line of thinking, 'trust' as well as 'institutional routines', 'social capital' and 'institutional thickness' is a critical factor in to promoting interactive processes; and they are highly localized characteristics focusing on face-to-face relationships. The idea of

these localized characteristics is similar to what Michael Storper implies by his concept of 'untraded interdependencies' (Storper, 1997). He explains the association of organisation and technological learning within agglomeration with reference to the two concepts of traded and untraded interdependencies. In his terminology, traded interdependencies are localized input-output relations and formal transactions between user-producers in a region. Untraded interdependencies more generally are the intangible assets of localized learning and coordination, such as regional conventions, labour markets, norms and values, and public or semi-public institutions (Storper, 1997; Wibe, 2003; Morgan, 1997). As Storper (1997) said that

Theoretical predictions that globalisation means the end to economics of proximity are therefore likely to be wrong, because they are deduced only from consideration of hard, traded input-output relations, those which are most prone to geographical dispersion at some point. (p. 22)

He emphasizes untraded interdependencies as the crucial localized context for innovation; thus, he argues that the region is a key element for learning and innovation. According to Morgan, untraded interdependencies are an important development of Lundvall's argument of tacit knowledge, which is collective in nature, wedded to its social context and has territorially-specific characteristics (Morgan, 1997; Wibe, 2003).

The above discussions emphasize the localized learning process based on the nature of knowledge and geographical proximity, which eventually argues the relationships between the spatial process and innovative development in the knowledge based-economy. Accordingly, the degree of interactive learning and its infrastructure at a regional level are a way to explain uneven regional development.

However, despite the consensus concerning the importance of localized activities at sub-national level, it seems that the literature is not consistent about the scale at which intervention should take place (Waters & Lawton Smith, 2002). This is mainly because of confusion as to what is meant by region and localities. In particular, with relation to policy intervention, it can be important to identify where the localized learning and interaction actually happen. In Korea, central government implemented its regional innovation policies on the base of administrative boundaries, but recently, it has started to consider the cultural and economical region as a scale for policy intervention. Therefore, it is interesting to examine how the regional institutions

actually respond to the policy in terms of their territorial boundaries, and how regional institutions recognize their boundaries.

Other questionable issues are raised with respect to the gap between the normative emphasis on the localized interactive processes and the actual interactions between regional stakeholders and universities in the innovation process. Even though normatively the localized learning processes are stressed, in reality there may be tensions between regional institutions based on different perspective viewing regional development and their own organisational aims (Waters & Lawton Smith, 2002). Moreover, there is a possibility that regional actors and institutions may try to seek their own benefits rather than regional development, since it cannot be said that their organisational objectives and regional matters can always be harmonized.

In this critical perspective, various tensions may emerge between regional institutions and between them and national government or its regional agencies, over whether to support regional innovative development or not (Waters & Lawton Smith, 2002). The tensions, on the one hand, may have 'interdependencies' as Storper said; on the other hand, conflicts also can be expected.

In order to grasp the localized innovative process, it is crucial to understand interactive processes in the region, and to identify to what extent and in what ways tensions related to interdependencies and conflicts between regional stakeholders emerge. This research starts with the above critical perspective of the interactive process explaining regional innovative development, and tries to identify what tensions actually emerge in the regional interactive processes.

2.4 Universities and Regional Advantage

This section presents a discussion of the literature regarding the regional role of universities, which underpins the basis that universities are increasingly expected to play a significant role in their proximate regions. In the first part, an overview of the literature concerning universities and their regional engagement will be discussed,

and some questions that are not covered by the current literature are raised. The second part explores the reasons why the role of universities has changed in regard to the engagement of regional economic development. The last part addresses the explanatory factors that shape universities' engagement in regional development.

2.4.1 Literature Review and Questions

During the last two decades, universities have been increasingly identified as the powerful drivers of innovation and economic change in the national, regional and international level. Much research has been done concerning universities' role and behaviours engaging in their proximate environment. The research is broadly classified into two groups; one is to deal with 'the process of knowledge transfer' from universities towards firms, and the other is 'the engagement of the universities in their territorial development'. This classification is similar to Gunasekara's (2004a) distinction drawn between 'a generative role' and 'a developmental role' performed by a university. He argues that there are significant differences between the triple helix model highlighting universities' generative role and the university engagement literature in the conceptualisation of the third role of universities in regional economic development. A generative role of universities underlines knowledge capitalization mechanisms, such as incubators, spin-offs and science parks. On the other hand, the university engagement literature points to a broader role to better support regional knowledge needs (*ibid*). Accordingly, it can be claimed that the generative role stresses the process of knowledge transfer focusing on the specific relations between universities and firms or within universities, and the developmental role underscores in terms of more general perspective, the engagement of the universities in their territorial development.

The literature addressing the specific process of knowledge transfer from universities focus on; the relationships between universities and industries (Jones-Evans, et al., 1999; Laursen, et al., 2003; Poyago-Theotoky, et al., 2002; Salazar, et al., 2002; Siegel, et al., 2003; Tomes, 2003; Gunasekara, 2006) and policies to support the cooperative relationships (Looy, et al., 2003; Caloghirou et al, 2001; Azagra-Caro, et al., 2003); the discussion concerning universities' entrepreneurial roles such as university patent, spin-off companies of new ventures and business incubators

(Lazzeroni, 2003; Mian, 1996) ; the knowledge transfer offices within universities (Santoro & Gopalakrishnan, 2000 and 2001; Jones-Evans, et al., 1999; Friedman & Silberman, 2003); and the triple-relationships between universities, industries and governments through a range of boundary spinning and knowledge capitalization mechanism (Leydesdorff, 2003; Etzkowits & Leydesdorff, 1997). The literature generally researches, in the form of case by case, how universities effectively or ineffectively act to transfer and capitalize their knowledge. Even though some of the literature (Siegel, et al., 2003; Looy, et al., 2003; Gunasekara, 2006) critically point out that universities are not well enough equipped to support firms and regional learning processes, most of them start with the unseen assumption that universities are eager to transfer their knowledge, and actively take part in regional economic processes.

On the other hand, the literature focusing on the engagement of universities in their territorial development is found with two directions: theoretically and practically. One is, theoretically, to discuss a normative and conceptual role of universities in their territorial development (Chartterton & Goddard, 2000; Sutz, 1997; Lambooy, 2004; Mowery & Sampat, 2005; Lundvall, 2002; Paterson, 2001; Gunasekara, 2004). The literature commonly emphasizes the third mission of universities, and assumes that universities play a crucial role in the regional innovative development. Furthermore, it seems that the theoretical literature basically looks on universities as proactive actors seeking to engage regional learning processes. Accordingly, the literature pays relatively little attention to the possibilities of inactive behaviours of universities in their territorial development.

The other is, practically, to examine the process of universities' engagement in the construction of regional advantage (Charles, 2003; Boucher, et al., 2003; Glasson, 2003; Dabinett, 1999; Kitagawa, 2003 and 2004; Keane & Allison, 1999; Gunasekara, 2004a). Amongst the empirical literature, Charles (2003) studied, in the UK universities, new institutional arrangements and responses including internal changes within universities such as new regional offices, and more significantly, new collaborative regional arrangements and associations. Kitagawa (2003 & 2004) identified, within England, the different strategic process of networking between universities with respect to current government policies which influence the

resources and strategies of regional universities. Charles and Kitagawa contributed to the discussion surrounding the universities' different engagements in regional developments, but they neglect the complex interactive process between universities and regional stakeholders. A notable empirical contribution to the discussion of universities' regional engagement is presented by Boucher and his colleagues in the paper; *'Tier of Engagement by Universities in their Region's Development'* (Boucher, et al., 2003). They attempt to identify structural, institutional and social factors that interact to shape the participation of European universities in their regional development, by considering specific factors including regionalisation of the higher education system, regional identity and networks, and type of university. They suggest four categories of tier of engagement by universities as a result of the effect of competition and hierarchy between them; single player universities in peripheral regions, multiplayer universities in peripheral regions, traditional universities in core regions, and newer technologically oriented universities in core regions. Their research contributes to understanding the universities' different engagements and how to categorize them, and suggest that policy makers should be more aware of the different range and levels of regional engagement by universities. However, their research focuses on macro-foundation regarding universities role such as the geographical, structural and institutional factors of universities, whereas they overlook interactive relations including interdependencies and conflicts between universities and other regional stakeholders such as government and industry.

This thesis encompasses the two areas categorized in the above literature. That is to say, on the one hand, it examines specific interactions between universities, government and industry, on the other hand, it attempts to identify the nature of universities in relation to their territorial development. However, this thesis begins with the critical view that universities are not benign organisations considering firstly regional development rather than their own benefits. It also critically pays attention to the optimistic perspective of universities' participation in regional innovative processes. Accordingly, universities' real interactions with other regional stakeholders are investigated, which helps to identify how universities take part in regional innovative processes.

The following two parts construct the basic grounding to understand the universities role in regional development in exploring the key questions; in general terms, why have universities changed their role in modern society? What are the current roles of the universities in regional development? What are the variables in deciding their engagement in their regional innovative network?

2.4.2 Changing Roles of Universities In Society

For most of their history universities had taken it for granted that their very presence was for the general benefit of the nation. ... One of the effects of the utilitarian politics of the 1980s was to cause a closer examination of what universities actually do. It was found, for example, that the graduates they produced were not as well as prepared for the workplace as they might be. It was also realized that the universities were more dependent than they had admitted on business and industry, not only for funding but for ideas. Universities also found themselves competing more intensively among themselves for funds and resources. (Gary, 1999a, p. 1)

Increasingly, the nature and role of universities are being re-examined both by national and regional policymakers and university management. Much of the literature about innovation concerning regional or territorial development and technological changes assumes that universities are important actors in constructing regional innovative infrastructure and moreover promote regional innovative networks (Braczyk, et al., 1998; Etzkowitz & Leydesdorff, 1997; Gary, 1999b; Charles, 2003; Mowery & Sampat, 2005; Lundvall, 2002; Chatterton, & Goddard, 2000).

At the policy dimension, the roles of universities in underpinning economic development are also stressed, as exemplarily seen in the following policy statements of the UK and South Korean governments.

The role of universities in the economy is crucial. They are powerful drivers of innovation and change in science and technology, the arts, humanities, design, and other creative disciplines. They are also the seedbed for new industries, products and services and are at the hub of business networks and industrial clusters of the knowledge economy. (DTI/DfEE, 2001, p. 9)

In the knowledge-based society, the universities located in the regions play an important role in producing high-quality labours and creating new technology-based firms. Therefore, it is necessary to strongly promote [the localization strategy through enhancing regional universities' capabilities], and to endow them the roles of central place and planning center for regional development. In addition, regional universities should be promoted as local R&D centres, which support regional firms and regional process of technology transfer. (PCONBD, 2003, p. 12-3)

At this point, the following questions are raised: why are universities' roles in economic innovation more importantly stressed when compared to before? What is the universities' new mission to cope with current economic situations?

The university has changed and expanded its mission to meet the demand of current requirement. Etzkowitz (2004) explains that the focusing mission of the university has been shifted from 'teaching' and 'researching' to 'an entrepreneurial role'. During the 1970s and 1980s, the 'entrepreneurial role' that the university contributed to economic and social development for its society, had been added to meet the need of economic and social development in the USA and some European Countries (*ibid*, p. 71-74). Sutz (1997) states that in modern society it is impossible to explain the new role of the university with a 'two role model'; teaching and researching, and he suggests a 'three role model' which is focused on not only teaching and researching but also the university's direct relation to society. He emphasizes the new role of university particularly in the productive sector, so the third role is that the university has become a direct producer of goods and services for end-users such as firms, social communities and government. This third role of the university, so called 'the third mission' or 'the entrepreneurial university', can be defined that in addition to the university's traditional roles of teaching and research, the university is involved directly in the exploitation of research results, and more intensive collaboration with industry and regional economic development (Lazzeroni, 2003).

However, depending on the regional or national situation and the characteristics of each university, the emergence of the third mission may be different, as evolutionary economics basically assumes that universities are not homogeneous but heterogeneous. Therefore, the changing role of universities can be explained by

various general and specific reasons throughout: from a sort of 'me-too' effect to a specific situation of the university. This part explains general background underpinning the changed role of universities in their society, which may help to understand the specific story of South Korean universities.

The question why the third mission of the university is emphasized in modern society, can be answered in two different ways; one is the external environment of the universities like their socio-economic situation, the other is from the internal needs of the universities.

Aside from the changing of the external environment, why do universities accept the fact that they become entrepreneurial and commercialise their knowledge? And why do they take part in the process of exploiting 'knowledge capital' to enhance regional economic competitiveness? These questions come from the discordance between university's traditional mission and the new third mission. Traditionally the university has the long-term perspective and fundamental R&D for scientific research, but in the knowledge-based economy, industrial R&D stresses the short-term dynamics and objectives which are directly usable outputs and short-term oriented effort (Lazzeroni, 2003). Above all, shortage of the funds is perhaps the main explanatory factor (Sutz, 1997). Since both the increasing costs of scientific research and declining funds from central government make for universities financial difficulties, universities should turn their interest to industry as an alternative source of funding helping to replace some of the budget lost with public research funding cuts (Lazzeroni, 2003; Katagawa, 2004). Nowadays universities are involved in the exploitation of their own research through patent licensing and the start-up of spin-off companies. These financial problems raised the competition between universities to gain more public and private funding, which make universities into survival game to find more funds. There is additional reason in South Korea; new student numbers have steeply decreased, since the offspring of baby boom generation in the 1950s after Korean War finished entering university. Therefore, universities try to find out new ways to survive like public funding and entrepreneurial approach.

The universities' external environment that makes them change can be easily explained with the notion of 'learning region' closely related to the knowledge-based

economy and regionalization. 'Learning region' is originated from the mixture Lundvall's idea of national innovation system and his emphasis on the learning (Lundvall, 1992), and geographical perspective of region (Florida, 1995; Morgan, 1997). Florida (1995) argues the importance of the knowledge and its flow and infrastructure in the learning region that

These learning regions function as collectors and repositories of knowledge and ideas, and provide the underlying environment or infrastructure which facilitates the flow of knowledge, ideas and learning.
(p. 527)

Morgan (1997) stresses that regionally embedded institutional routines including interactive learning processes and networks promote regional innovative capacities, and reduce the uncertainty existing regional economy. He underlines the learning process between regional institutions by which uncertainty can be reduced.

With respect to the above term 'learning' and 'institutions', the role of universities is emphasized as important regional institutions having knowledge and its infrastructure, which can be a base of the learning (Agrawal, 2001). Therefore, learning region and universities cannot be separated. Universities in the leaning region play a crucial role as the knowledge producer and the important institutions for the regional learning process, as Keane & Allion (1999) say that;

a key characteristic of the learning region is the way in which knowledge is transferred from one group to another to create learning systems. Universities are a critical resource in this process. (p. 901)

However, as Lambooy (2004) argues that the paths of learning are strongly related to the capacity of the agents to absorb new knowledge and the priority of their mission to engage regional networks, each university may differently engage in localized interactive processes. Moreover, even though universities are viewed as important parts of regional innovative development, the extent of their actual influence and engagement is not clear (Lambooy, 2004). This is because universities act as an agent which not only interacts with other actors for regional development and but also have their own aims as organisations.

In the light of this consideration, it might be interesting and useful to identify, in a certain region, how universities actually interact with other stakeholders in localized learning processes. It appears that the degree to which universities not only have

competence but also well interact with other institutions is a crucial factor to construct regional innovation system.

2.4.3 Universities and Regional Innovative Development

This section tries to identify the conceptual or normative role of universities for regional development and the variables effecting on their localized engagement through reviewing literature. It may give the background knowledge prior to examining and understanding in the real engagement of universities' in their territorial development. Furthermore, some questions will be generated in this section from the uncovered field by the current literature.

Much of literature has a slightly different viewpoint in classification of universities' role in their regional development. Lazzeroni & Piccaluga (2003, p. 40) identify four specific missions of modern universities; a knowledge factory, a human capital factory, a technology transfer factory and a territorial development factory. Boucher and his colleagues (2003, p. 888-9) classify the universities' role; economic entities, commodified knowledge producers (these two focus on direct economic contribution to their regional development), shapers of human capital and institutional actors in networks (these two include non-economic socio-cultural factors). Cooke (2004, p.13-4) categorizes five main contributions of universities; regional employers and customers as well as suppliers of goods and services, the supplier of intellectual capital to the labour market, research outputs such as publications, innovations and patents, international-standard technical and policy advisor, and regional economic support through entrepreneurship.

These three different classifications imply that the universities' role is not simple, and it is related to various aspects over social and economic parts. However, there are common points amongst the above classifications such as 'human capital' and 'knowledge producer', and 'economic role' concerning the third academic mission is underlined. Accordingly, the universities roles in regional innovative development can be broadly classified into three directions such as *human capital supplier, knowledge supporter and institutional actors in localized interaction*. This classification is from the consideration about personal actor, knowledge and

mechanism as the main elements for regional innovative development related university's capacities.

To begin with, it is widely accepted that universities play a crucial role in supplying *human resources* in their regional territories. Universities produce highly qualified graduates to regional industry, and firms' labours can have a chance to be retrained in the universities. Retaining regionally based human resources, so called 'embeddness of human labour', can be viewed as a crucial factor to construct regional innovative environment with the increasing emphasis of 'tacit knowledge'. Secondly, as *the knowledge supplier*, universities is not only retaining the result of basic research but also involving the transferring process of applicable knowledge to their community and mainly industry. Thirdly, universities are also regarded as the institutional actor and *important node in the localized networks and interaction*, through various relationships with other actors such as governments and industries. With the growing support for the view that innovation is an interactive process (Morgan, 1997; Lundvall), localized network and interactions are increasingly emphasized. As knowledge stock, universities are viewed as one of the crucial stakeholders in the regional learning process.

However, in practice, these general contributions of universities to their regional development might be different depending on the characteristics of individual universities, the political-economical structure of both region and nation, and complex relations between and within universities and other regional stakeholders (Thinki, 1999; Gunasekara, 2004; Boucher, et al., 2003). These variables can be both the drivers and barriers when each university responds to regional needs (Chatterton & Goddard, 2000).

Charles (2003, p. 10-1) suggests two important factors influencing on universities' engagement in their regional development: one is the legal and institutional basis of the university themselves, such as the degree of independence of the institution from regional and national government, the nature of the funding relationships, and the powers, rights and assets of the university. The other is the will and organisational capability of the university, which shows to what extent the university has the intentions and objectives to interact with its communities.

Gunasekara (2004, p. 12-5) proposes six explanatory factors that shape the universities' role in the regional innovative development as follows;

- University's orientation to regional engagement: the nature of the senior management commitment to regional engagement and mechanisms.
- History of university-region linkages: nature of historical linkages between a university and regional actors.
- Complementary of field: degree of alignment between the research strengths of a university and regional knowledge needs.
- Presence and influence of champions: university and regional advocates of university-industry linkages.
- Nature of regional industry base: type of industries in a region, and their demand for university knowledge transfer.
- Political and economic conditions: influence of specific government policies and practices directed to the region and the university. Influence of specific economic conditions in the region.

It seems that Gunasekara develops and expands Charles' simplified factors with adding history of university-region linkages, complementarity of field, presence and influence of champions, nature of regional industry base.

However, Boucher and his colleagues (Boucher, et al., 2003) comprehensively approach to identify structural, institutional and social factors that shape universities' participation in regional development. They use as main factors: the extent of regionalisation in the national higher education system; the type of region in terms of its core and peripheral features; the character of regional industry; the existence and type of regional network; and the number and scale of universities in the region; type of universities (*ibid*, p. 888). They also use national factors to address the characteristics of the country, such as: the institutional arrangement governing universities; the mission and culture of universities; the funding of universities; the policies for research and innovation support (*ibid*). Furthermore, they suggest the factors that explain the nature of links between universities and their regions, such as: universities and the governance of regions; student migratory flows and local labour market dynamics; the role of universities in information society initiatives; management of universities; the social shaping of knowledge workers; universities and regional culture; the role of universities in regional innovation strategies; universities and sustainable regional development (*ibid*). Their main contributions

are to identify the factors that decide universities' regional engagement, and to find out the tiers of engagement by universities depending on the influence of factors.

Table 2.1 Explanatory factors shape universities' engagement in regional development

Classification	Explanatory Factors
The characteristics of individual universities	<ul style="list-style-type: none"> - Type of universities (Comprehensive/Special, National /Private, Old/New) - The will and organisational capability of the university toward regional engagement - Spatial location of the university - Management of universities - Presence and influence of champions - The culture of each university - The difference in international, nation, regional and local orientations by type of university
The National context	<ul style="list-style-type: none"> - Institutional autonomy/independence of the university from national government/ institutional arrangement governing universities - The extent of regionalization in the national higher education system - The powers, rights and assets of the university by national government - The nature of national funding relationships - Other political and economic conditions - The national culture of universities
The Regional context	<ul style="list-style-type: none"> - University and governance of regions/independence from regional government - History and characteristics of university-region linkages - The degree of alignment between the research strengths of a university and regional knowledge needs - Presence and influence of champions - Influence of specific economic conditions in the region. - The existence and type of regional network - The number and scale of universities in the region - The nature and character of regional industry base - The engagement of the regional government - Regional milieu and culture/regional identity - The significant of competition between universities - The type of region in terms of its core or peripheral features - The social shaping of knowledge workers - Student migratory flows and local labour market dynamics
Policy context	<ul style="list-style-type: none"> - Influence of specific government policies and practices directed to the region and the university - The Policy for research and innovation support - The direction of the policy; top-down/bottom-up - The characteristics of the policy

Sources: Summarized from Charles, 2003; Gunasekara, 2004; Boucher, et al., 2003.

As a whole, on the base of the above three literature, the explanatory factors shaping universities' regional engagement can be classified into four categories, such as the characteristics of individual universities, national, regional and policy contexts, which are seen in Table 2.1.

This thesis intends to focus on 'what' and 'how' universities do in response to government initiatives rather than 'why' they do when what they do. However, the 'why' question is addressed as background context to help the analysis of 'what' and 'how' questions. Accordingly, the identification of these explanatory factors underpin the analysis of the universities' interactions and responses. In the next chapter, regional and national context will be discussed.

2.5 Conclusion

In line with the changes of the socio-economic environment such as globalisation and the knowledge-based economy, the relationship between the role of universities and the localization of economic development are themes currently being explored with academic literature. The connection between them is clear. The terms, 'tacit knowledge', 'social capital', 'intangible asset' and 'untraded interdependency' are viewed as key factors in the localized learning processes, and their acquisition and the processes by which they are transferred are more effective when localized. Therefore, the economic performance of regions can be improved when universities are encouraged to become better innovators by interacting with other regional stakeholders.

However, this ideal is highly tempered by the specific contexts of geographical areas such as higher educational governance and economic situations as well as strategies adopted by individual institutions. Therefore, in reality, the issues discussed in this chapter should be considered in relation to socio-geographical characteristics of the individual region. In particular, in South Korea, it is anticipated that higher educational systems may be differently developed from that of Western countries, and its universities may have undergone some problematic issues in their territorial

development. Therefore, the next chapter will address the background context of South Korea and research regions, which underpins the understanding of the explanatory factors influencing universities' engagement in regional innovative development.

Chapter 3 The Characteristics of South Korea and Study Areas

3.1 Introduction

This chapter attempts to understand the socio-economic contexts of the geographical areas investigated in this thesis, the country of South Korea¹ and Gyeongbuk and Daegu regions. Concepts of regional innovative development and localised interactive learning rely on context-dependent factors relating to geo-historical characteristics of regions. As David and Foray (1994) highlight, the concept of the distribution power of an innovation system and the governance structure between national and sub-national government also has an influence on the construction of regional innovation systems at local and regional level. Furthermore, a distinction between the institutions consisting of knowledge infrastructure and their cooperation with firms is important particularly when discussing the regionalisation of innovation system. The degree of interactions between the institutions and firms regarding regional economic development depends highly on a number of the contextualised factors, including the positions of the institutions within national and regional innovation systems and their autonomy to develop their own strategies.

In the case of universities, on the one hand, changes of internal and external environments can stimulate their direct and indirect engagement in the regional development process, yet on the other hand, national and regional factors such as funding and regulations affect their relationships with the regional economy. In the United Kingdom, universities are nationally funded, but in the United States, these operate dual systems of both state and private universities (OECD, 2003). In South Korea there may be a specific characteristic of universities' governance and funding system which determines its unique system of regional innovation.

¹ The administrative and financial systems in South Korea are explained in Appendix A.

In line with these considerations, this chapter introduces some background information required to understand the characteristics of the higher educational system in South Korea, and it identifies the specific contents of the research regions. The first part outlines higher educational governance providing a historic overview, examining current issue and the third mission of South Korean universities. The second part discusses the regional contexts of this thesis, such as the rationale of the selection of research areas and gives profiles of the regional economy and universities.

3.2 Higher Educational² Governance in South Korea

This section identifies and details specific elements of the higher educational system in South Korea. The first part provides a historic overview in the evolution of the higher educational system, and the second part examines the characteristics of higher educational governance such as regulatory frameworks and systems of funding. The last two parts discuss the current status of South Korean universities.

3.2.1 Historical Overview

Even though, historically, Sung Kyun Kwan, which is a higher-training centre for Confucian scholars established by the Chosun dynasty (1392-1910) in 1398, is considered as the first Korean university, higher education in Korea is a relatively modern phenomenon (Kim and Lee, 2006). As Chosun dynasty started to contact with Western civilization at the end of the nineteenth century, Western missionaries established some private higher learning institutions. The beginning of modern education toward the end of Chosun dynasty is a quite significant change, not only being the basis for present higher education, but also, more importantly, representing a shift from a Confucian to a European and American model (Kim, J. 2000). However, with modern higher education in its infancy, Korea experienced Japanese

² HEIs in South Korea can be categorized into 10 groups: (1) universities; (2) industrial universities; (3) universities of education; (4) junior colleges with two or three year courses; (5) air and correspondence universities; (6) cyber colleges and universities; (7) technical colleges; (8) colleges in company; (9) graduate school colleges; and (10) other miscellaneous institutions. Appendix B presents a number of institutions, academic staff, and student enrolments by types of HEIs in 2004 of South Korea.

colonisation between in 1910 and 1945, and the demand for higher education was suppressed. In 1945, when Korea was liberated from Japanese colonial rule, there were nineteen institutions of higher learning with 7,819 students and 1,490 staff (The Ministry of Education, 1963, p. 338-9).

After independence, many new private universities were established along the lines of American style universities, authorized by the U.S.A military government (1945-48). In 1946, Seoul National University was established through reorganisation of the former Kyungshing Imperial University, which had been set up by the Japanese government in 1924. It was the first comprehensive modern Korean university that had undergraduate and graduate degree programmes in accordance with the American public university model (Kim and Lee, 2006). During the period of the U.S.A military government, the overall pattern of college and university programmes was established, and many of the current existing practices in Korean higher education was developed by following the newly introduced American pattern. In 1947 the number of higher education institutions increased to twenty-nine with more than twenty thousand students (Lee, J. k. 2000, p. 51).

In 1948 the Korean government took over power from the U.S.A military and it focused its financial resources on the primary education sector to build universal primary school education. Therefore, the increasing supply of higher education was fulfilled, for the most part, by private universities (Kim and Lee, 2006, p. 7). Even though the private universities had boards of trustees, many of them were under the strong control of the founder and their family.

In 1950, with the outbreak of the Korean War, most universities located in Seoul looked for refuge in the southern provinces. The Korean government realised the deficiency of higher education establishment outside the Capital Area. This prompted the government to assigning a representative of national institution of higher education in each province, based on the belief that higher education should be dispersed throughout the country, rather than concentrated in Seoul Capital City and around it. It has become the framework of current geographical distributions of national universities in Korea. From 1951 to 1954, at least one national university was established in each province of Korea (Kim, J. 2000).

During dictatorial rule after a 1961 Coup d'état, the Korean economy rapidly developed through export oriented industrial policies. In the 1960s and 70s, the military regime strengthened its control over enrolment quotas which were established for each university at the department level. Appointment of professors was also strictly controlled. The Ministry of Education (MOE) had a strong control over the establishment and expansion of private universities, as it tried to prevent corruption in private universities through strengthened regulations (Kim and Lee, 2006). The MOE supplied two-year technical colleges to meet the increasing demand for higher education. The MOE focused its resources on the secondary school sector as the rising income and the expansion of elementary graduates created a strong surge in the demand for secondary education in the 1960s. In light of this, resources to support higher education were scarce. However, in line with economic development, the government increased its efforts to provide specific research funding to individual professors as well as to research institutions attached to colleges and universities. Since 1963, this government-sponsored research funding has been continuously increased in terms of the amount of money and the number of projects (Kim, J. 2000).

In 1980, a new military government was started through another coup d'état. It increased higher education's enrolment quotas in response to an increased expectation for higher education. As a result of this policy, many two-year courses of technical private colleges were converted into four-year university courses (*ibid*, p. 49). Thus, both the number of universities and their students greatly increased. A shift in the policy on higher education occurred after military regime finished in 1995. The new civilian government adopted deregulation as a major policy objective. Although the level of regulation has been relaxed, the government still maintains a high degree of control over the operation of universities, both national and private. One of the major policies was to eliminate enrolment quotas, except for universities located in the Capital area (Seoul Capital City, Incheon Metropolitan City and Gyeonggi-do Province). This policy resulted in many private universities being located outside of the Capital area to increase their student enrolment, which allowed universities to draw more income. Many new small universities were established in regions outside of the Capital area. In order to prevent problems caused by a sudden

increase in students, the MOE planned to connect institutional evaluation with financial and managerial supports and to require institutions to publish the result of evaluations (Park, N. 2000).

However, the expansion of higher education in the 1980s and 90s was soon faced with a declining demand generated by the demographic factors. The children of the 'baby-boom generation' gradually became over twenty years old. Regional universities outside of the Capital area encountered difficulties in both the decline of new students and financial pressures, due to the expansion of higher education outside the Capital area and the demographical reason.

Over the last several decades, Korea has made tremendous strides in its higher education institutions in line with economic development. As seen in Table 3.1, the number of higher education institutions increased from 142 in 1970 to 411 in April 2004. During the same period, the number of students in colleges and universities increased by about 17.6 fold (from 201,436 to 3,555,115). This rapid growth of higher education has contributed enormously to the national development, which was making a transition from a dependence on agriculture to an industrialized economy (Adams and Gottlieb, 1993). However, the expansion of the size of universities did not accompany with the increase of their qualities of education, which became a socio-political issue in South Korea.

Table 3.1 Growth of higher education from 1970 to 2004

Year	No. of HEIs	Enrolled Students	Academic Staff	Student-Staff Ratio
1970	142	201,436	10,435	19.30
1980	243	601,494	20,900	28.78
1990	270	1,691,681	41,920	40.35
2000	372	3,363,549	56,903	59.11
2004	411	3,555,115	62,631	56.76

Source: Educational Statistics Database of KEDI (Korean Educational Development Institute), Retrieved January 11, 2006 from http://std.kedi.re.kr/jcgi-bin/educ/educ_basic_frme.jsp?menuid=1

3.2.2 Higher Educational Governance

The governance issues of higher education can be examined by two categories; external and internal governance (Kim and Lee, 2006). External governance refers to how the HEIs (Higher Education Institutions) have autonomous relation from outside organisations, and internal governance issues determine how to allocate power between the internal actors such as the founder, the Chancellor, the staff, and the University Administrative Offices (UAOs). In Korea, external governance can be viewed as the relationships between the HEIs and the state, mainly with two directions - government funding and regulations. Internal governance varies among HEIs depending on their situations and policies. This part explores the matter of external governance to identify the relationships between HEIs and the state. With respect to internal governance, the differences between private and public or national institutions will be discussed.

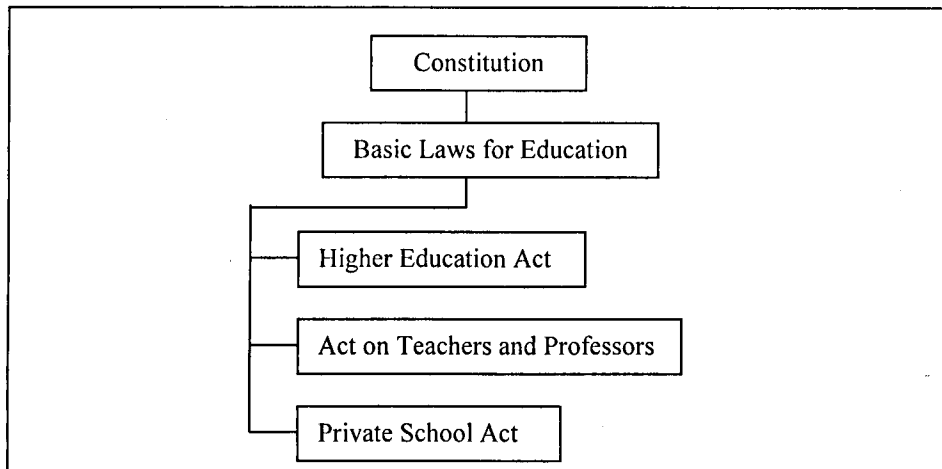
In Korea, HEIs are directly connected to the central government of the MEHRD (the Ministry of Education and Human Resources Development). It is responsible for performing the constitutional mandates for education through making higher educational policies, taking actions for the implementation of policies and regulations, and finally for supervising and supporting higher educational institutions and agencies. With regard to the formal governance structure of higher education, the regional and local government are excluded. Even though primary and secondary school starts as local autonomous systems, higher education is not at present autonomous. Therefore, the formal framework of higher educational governance in Korea is largely based on the relationships between the MEHRD and each of the HEIs.

■ Regulatory framework

As discussed in the historical overview, the Korean government has controlled its HEIs with regulations such as criteria for the foundation of colleges and universities, and student enrolment quotas (Kim, Y.C., 2004). The constitution is the highest law governing higher education in Korea, and various Acts and regulations based on Basic Law for Education (enacted in 1997) directly address higher education. The

most significant three Acts are the Higher Education Act, the Act on Teachers and the Professors, and Private School Act, which are seen Figure 3.1.

Figure 3.1 Major Laws and Acts on higher education in Korea



Sources: Modified from Ryu, et al., 2006, p. 15

Table 3.2 shows major contents related to the supervision of MEHRD in the three Acts and their enforcement ordinance. The contents of supervision can be categorised into four parts as follows: 1) the establishment, merger and dissolution of HEIs, 2) the operation of HEIs; 3) student enrolment and staff employment; 4) the control of the board members of private schools. These regulations explain how the government actually controls the behaviour of HEIs.

Table 3.2 Major contents related to the supervision of MEHRD in Law/Act

Act	Major Contents related to the supervision of MEHRD (the number of Articles)
Higher Education Act	<ul style="list-style-type: none"> - The statement of the principle that HEIs are under the supervision of MOHERD (5) - The Sanction of HEIs' establishment by MEHRD (4) - Reporting each university's discipline to MEHRD (6) - Imposing tuition fees (21) - Approving credit (23) - Student enrolment quota (32) - The way of selection for new students (34)
The Enforcement Ordinance of HE Act	<ul style="list-style-type: none"> - The condition for HEIs establishment and abolition (2) - The contents included in the universities' discipline (4) - The criteria about qualification of HEIs staff (5) - The lecturing time of academic staff (6) - Total teaching dates (11)

Act on Teachers and Professors	<ul style="list-style-type: none"> - Prohibition of too many staff employed from a certain university (1) - The duty and evaluating principles to be performed when employing new staff (11)
Private School Act	<ul style="list-style-type: none"> - Permission for the establishment of private school foundation (10) - The condition for the board member of private school foundation (14) - The condition for disqualification of board members (22) - Accounting management (28-32) - The sanction for Merger, Dissolution, and changing Memorandum of school foundation (34, 36,45)

Source: Compiled by Author

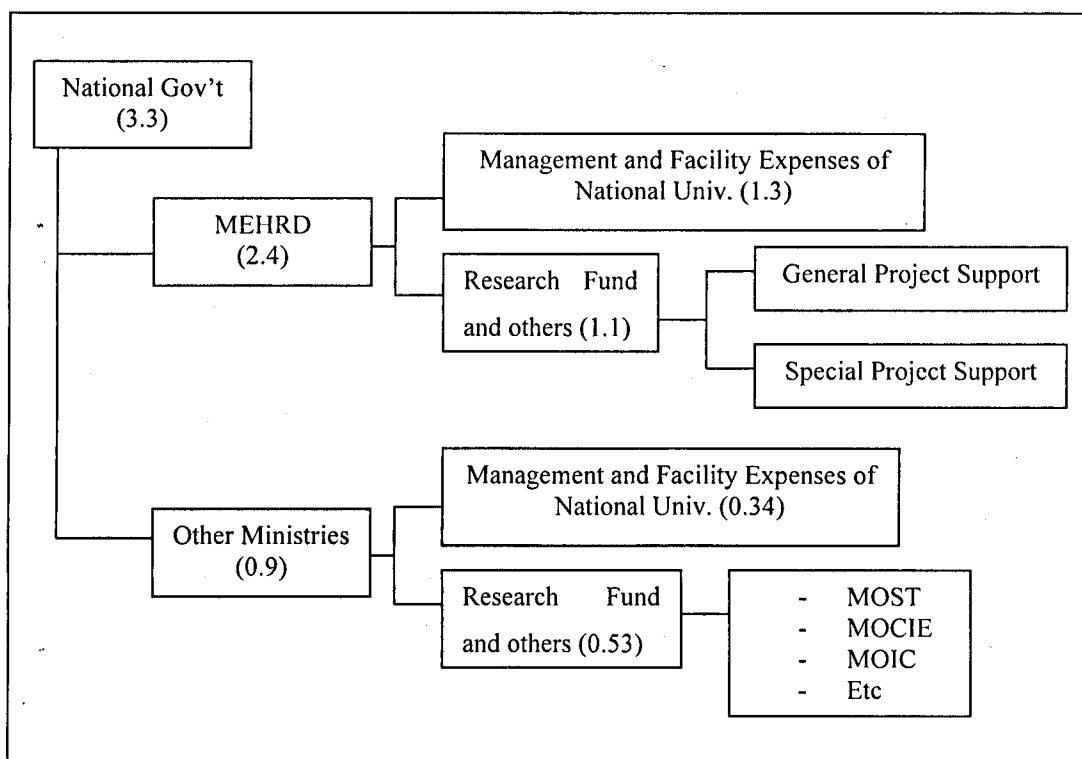
■ Funding system

As seen in Figure 3.2, the MEHRD is mainly in charge of funding for HEIs, and its subsidies usually finance both education and research. Other ministries such as MOST (The Ministry of Science & Technology), MOCIE (The Ministry of Commerce, Industry and Energy) and MOIC (The Ministry of Information & Communication) also provide financial support for HEIs, but their support is limited to research activities whose projects and details are decided by the ministries. Apart from the operation and facilities expenses for national universities, the MEHRD fund finances with two tasks: one is the General Project, which evenly provides signed-up HEIs with basic financial support, and the other is the Special Project, which aims to support the selected HEIs through performance or proposal evaluations for tangible results (Ryu, et al., 2006). Since the mid-1990s, the MEHRD has supported its finance for both the General and Special Project based on its assessment and evaluation on universities. Therefore, the assessment actually becomes an important way to control each university (Kim, H.K., 2004).

From that time, the other ministries have also changed their funding scheme for R&D into a principle of competition between the applicants which may be from different HEIs, and they have increased the specific research fund such as Business Incubators and Regional Research Centres, which will be discussed in Chapter Six. As a result of the increase of the specific research funding by the other ministries, academic departments or project teams of each HEI have directly contacted the other ministries rather than concentration on the funding by the MEHRD.

Figure 3.2 Higher education budget flow in 2000

(KRW: Trillion)



Sources: Modified from Lee & Ban, 2004, p.406

There are two main characteristics of the fund. Firstly, there is a variety of support from many government ministries such as the MEHRD, MOST and MOCIE; however, there was a lack of coordination among the ministries (Ryu, et al., 2006). In the new policy since 2003, the new government has tried to prevent inefficient and duplicated investment by giving a coordinative role to the MEHRD. Secondly, the funding from central government emphasizes competition between HEIs, which gradually becomes a principle in its distribution and allocation. For example, to apply to the NURI Programme, the university should meet certain conditions: the student enrolment ratio should reach 60% out of total enrolment quotas; the students-academic staff ratio should be over 50%. This will be discussed in further detail in Chapter Six.

■ National/public university Vs. private university

In Korea, the universities can be categorised in two ways depending on their funding sources. The first is the national and public university, which are founded, administered and financially supported by the national or regional/local government. The other is a private university, which are founded by private fund, and

administered by each individual trustee. Financial resources for private university come mainly from tuitions fees, endowment from the founder, donation and government subsidies.

As seen in Figure 3.2, nearly half of the government subsidies were spent on financing the management and facilities expenses of national universities, and the remainder was used for both national and private universities. Accordingly, the ratio of government subsidy in private university is very low, and the main sources of revenue a private university is the tuition fees amounting to 67% of total revenue in 2003, with 4% is from government subsidy. Accordingly, it can be said that the national government controls private universities mainly with the regulations and complementarily with funding. For example, as mentioned in the historic overview, the Korean government managed student quotas, which are directly related to the universities' revenue.

In the case of the national/public universities, personnel management of the academic and non-academic members, and financial management and organisational structure are controlled by government regulations and rules. For example, even though, the national government's subsidies for higher education were mainly directed to national universities, an individual national university has to rely on the government apportionment for most of its operating expenditure. Moreover, national/public universities are managed like a government organisation. However, national/public universities have a more competitive position with private universities, because the former have much lower tuition fees. Therefore, the national university does not need to work hard to improve its quality in order to attract better students (Kim and Lee, 2006).

With respect to internal governance, a key issue of the private university is the conflict between the founder and the other stakeholders, such as staff and students (Park, N. 2000, Kim and Lee, 2006). In many cases, the founder and his/her family try to hold power beyond the legal and formal procedures, in the management process and staff's employment. However, generally, the staff and students are reluctant to be excessively interfered with university's founder. This conflict may create an internal dispute, and the internal governance structure is different

depending on which side have the power between the founder and university members. In general, at small and new private universities, the founder has more power than large and old universities. In some cases, the conflicts between founder and the other stakeholders paralyse the management process, and legal actions by national government are only rarely operated. These conflicts based on the founder's moral standpoint may be one of the reasons why the government wishes to control private university.

3.2.3 Current Issues of HEIs in South Korea

In South Korea, the rapid growth of higher education has contributed enormously to its economic development (Adams and Gottlieb, 1993, Kim and Lee, 2006, Weidman and Park, 2000), and access to higher education has expanded greatly, which is reflected by the remarkable progress in the entrance ratio of general high school students to colleges and universities (81% in 2004). However, the rapid growth of higher education has brought several problems, which have become current policy issues.

Firstly, a major drawback of the rapid growth is that a quantitative expansion was not accompanied by an increase in the quality of higher education. While colleges and universities sprang up across the nation, backed by public and private expectations about higher education, the quality of higher education has not been improved. It has been pointed out that some indicators such as the student-academic staff ratio, which increased almost three times, 19.10% in 1970 to 56.76% in April 2004 (seen in Table 3.1), shows that the condition of higher education has deteriorated. On the other hand, the universities in Korea are now faced with the public criticism that Korean universities are not responsive to public or national demands any longer, nor are they internally competitive. In particular, the advent of globalisation and the knowledge-based economy brings new challenges to universities. Thus, it is a policy issue for the Korean government to enhance the qualities and competitiveness of universities at a global level and to make them more specialized.

Secondly, the continuing decrease in the college-bound population is another major challenge to universities in Korea. According to recent population growth projections,

the college-bound population (age 18-21) will drop from 3,278,000 in 2000 to 2,336,000 in 2020. The number will further decrease to 1,511,000 in 2030. This huge drop in the university-bound population means that universities will undergo fierce competition with each other in order to recruit new students. This problem has already emerged in some less prestigious universities. The decrease in the college-bound population is a huge threat to Korean colleges and universities, especially for private institutions located outside the Capital area. In 2003, the deficiency ratio of new student enrolments in Korean universities is 9.3%. Across the country, however, in the Capital area it is only 1.2% and in the non-Capital area it is 12.9% (Back & Ryu, J-S, 2004, p. 138).

Thirdly, regional universities³ outside of the Capital area have more difficulties in both the decline in new students and the expansion of higher education outside of the Capital area, resulting from the elimination by the government of enrolment quotas except for the Capital area. In Korea, many of the economic and cultural assets are concentrated in the Capital area and therefore universities located in the Capital area have a premium as a result of unexpected policy outcomes regarding universities and unbalanced economic development. Therefore, regional universities are confronted with a crisis in recruiting students and an associated financial pressure. However, this imbalance is a complicated issue deeply rooted in the history and character of the uneven national development of Korea. Regional universities become one of the major policy issues in this current government, whose manifestos promise to balance national development and encourage regional innovative development.

3.2.4 The Third Mission of the South Korean Universities

The conceptual frameworks of the theories emphasising knowledge transfer relations such as National/Regional Innovation System, Mode 2 and the Triple Helix Model, stress the changing role of the university from teaching and research to economic and

³ 'Regional universities' imply two different kinds of meanings; firstly, with relation to their geographical function, it refers to 'regionalized universities', which means they mainly play a role within and for their regions. This meaning contrast with 'globalised universities'. Secondly, with relation to their geographical location, it means that the universities are located in a certain sub-national area except for the Capital area. In this thesis, regional universities mainly refer the second, because the focus of this research is the interactions and roles of universities located in a certain region rather than their roles around the country and the world.

social development (Lundvall, 1992; Cooke, 2004; Gibbons et al., 1994; Leydesdorff & Etzkowitz, 1997). They explain that the third mission of the university emerged from the second academic revolution based on the development of European, American, and Latin American universities (Etzkowitz, 2003a, 2003b, 2004; Cooke, 2004). However, as seen in the historical overview of South Korea, the Korean university has a different history and governance structure than that in Western universities. Therefore, at this point, a question is raised: in South Korean universities, is there a third mission, which may be viewed as the basic circumstance to which Regional Innovation System and the Triple Helix Model can be applied?

In European universities, there has been a long-term academic development from teaching colleges in the medieval period to the research university, and then from the research university to the third mission university in recent decades. The research university emerged with the first academic revolution, in the late 19th and early 20th century, when research became a legitimate function of the university (Etzkowitz, 2003a; 2004). With the emergence of the knowledge-based economy, a new role was emphasized, called the third mission the universities are directly related with economic and social development of their societies and state. The emergence of this new role becomes the basic considerations of the knowledge transfer relations from university to firms, and the triple helix relations of three institutions (government-industry-university).

Korean universities have accepted the modern university programme since 1945, the period of the U.S.A military government, and therefore have at least sixty years. When the modern style university was introduced in Korea, the main role of the universities was teaching. Even though, since 1963, when the Economic Development Plan was started. In 1979, Seoul National University, the leading and most prestigious university in Korea, firstly introduced its target of research-oriented university in its 'The Ten Year Development Plan of Seoul National University' (The Planning Committee of Seoul National University, 1979). However, this university failed to attain its target as a research oriented university ten years later. As the research abilities of Korean universities did not reach the expectation of the government, the Korean government implemented 'The Brain Korea 21' project in 1999. This project focused on nurturing highly qualified research manpower through

concentrating governmental funding on research activities at graduate schools. The project planned to allocate 140,000 million KRW over seven years (from 1999 to 2005), and caused many universities to formally announce themselves as a research oriented university.

On the other hand, in the early 1990s, the boom of venture-company appeared in Korea, and many of universities' staff tried to create starts-up firms. At that time, the central government provided funding so that universities could build their Business Incubators inside their territories. In addition, since the middle of the 1990s, some of university-industry cooperation programmes have been implemented such as Technology Innovation Centres, Regional Research Centres, University-Industry Consortium Programme, etc. Most of the universities took part in one of the policy programmes. Moreover, in 1998, six Technology Parks, mainly based in universities, were established with the backing of the MOCIE (the Ministry of Commerce, Industry and Energy). Lots of universities also provided funding to build a branch of Technology Parks inside or near their universities.

The establishment of Business Incubators and Technology Parks, and the promotion of university-industry cooperation programmes can be considered as evidence that Korean universities have become important to the knowledge transfer relations and the interaction with firms. However, the real transformation of Korean universities into the third mission and the direct relationships with their communities is still questionable.

As a whole, it seems that Korean universities have intensively experienced the first and second academic revolution at the same time for the last three decades. Although, it was a totally different historical process compared to the cases of European and American universities, it seems that the outward form of Korean universities has approached the new role model of university with the mixing of the first and second academic revolution. Consequently, it can be said that it is possible the theoretical concepts concerning the role of universities in regional innovation system and the analytic tool of the Triple Helix Model can apply to South Korean universities.

3.3 The Characteristics of Gyeongbuk and Daegu Regions

This section attempts to identify the characteristics of the two selected research areas, and it details the socio-economic features occurring in the localised interactive process. The first part explains the basic profiles of the areas and the rationale of the selection of the geographical areas, and the second part identifies the economic characteristics of the areas. The third part attempts to understand the overall features of regional universities and their regional governance.

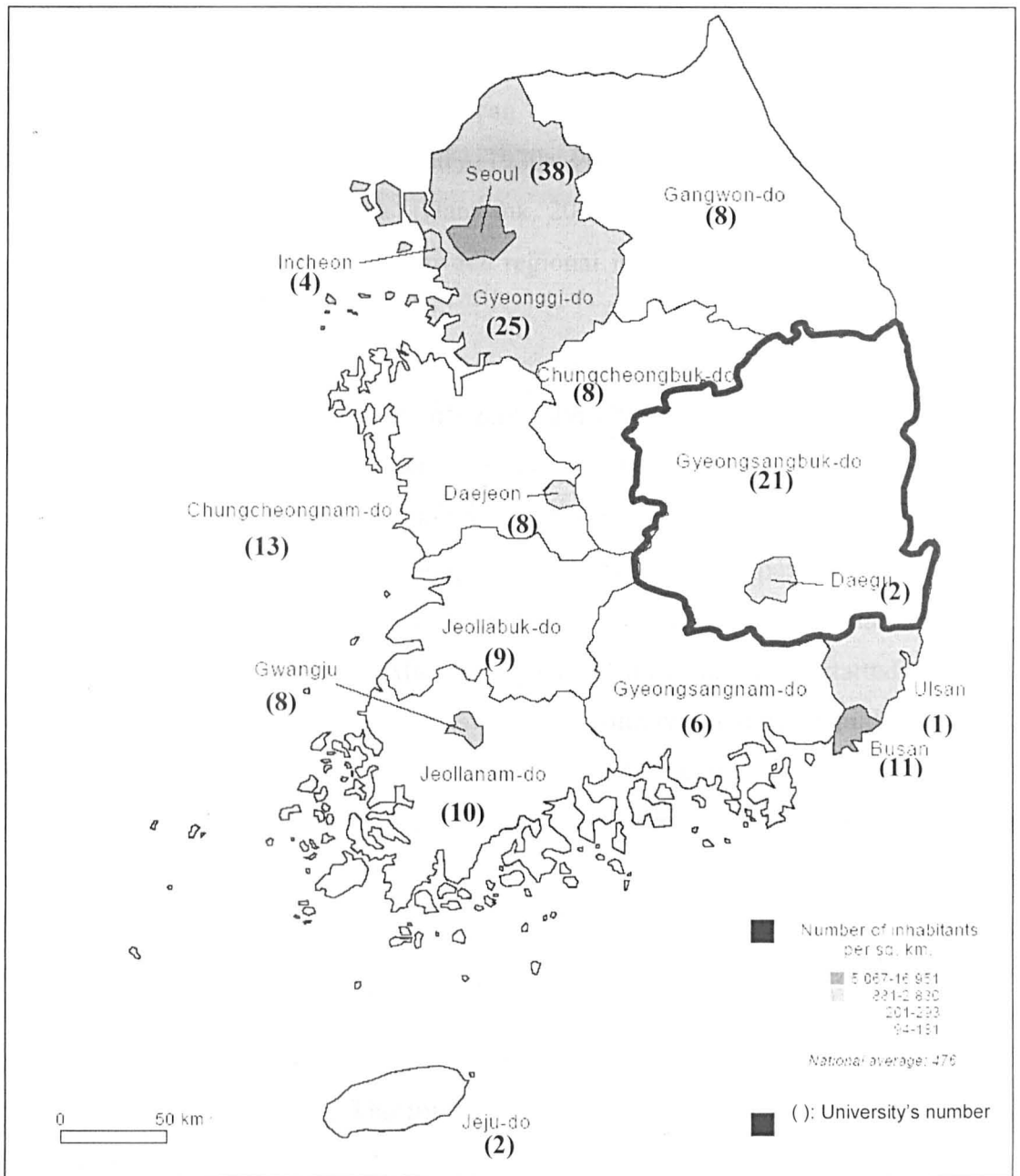
3.3.1 The Selection of Research Areas

This research begins with the consideration of spatial issue in innovation-based economic development; however, it does not pre-define the 'boundary of region' in RIS building. This is because this thesis tries to ascertain the universities' functional boundaries in their engagement of territorial development through qualitative fieldwork. Nevertheless, it is necessary for doing research to select one or more specific spatial areas. Therefore, this research chose two areas following administrative boundaries, because the research is related to government policy which generally implemented through the current administrative region.

The two research areas are: Daegu Metropolitan City and Gyeongsangbuk-do Province. These are upper-level local governments, located in south-eastern area of South Korea, as seen in Figure 3.3. There are some reasons for selecting these regions, which should now be outlined.

Firstly, these two regions are outside of the Capital area. Currently in Korea, the imbalance between the Capital area (Seoul Capital City, Incheon Metropolitan City and Gyeonggi-do Province) and the other regions becomes a socio-political issue, thus the new government focuses its RIS policy outside the Capital area. These non-Capital regions are struggling to promote their regional innovative capacities, and universities are confronted with the regional demand of their engagement in regional development. Therefore, in these regions, the roles of universities in RIS building has become important regional issues.

Figure 3.3 Sixteen upper-level local autonomy, the number of universities and the location of Gyeongbuk and Daegu region



Sources: The Ministry of Government Administration and Home Affairs. Retrieved December 13, 2004 from <http://www.mogaha.go.kr/>

Secondly, outside the Capital area, Gyeongbuk Province has the largest number (twenty-three in total) of universities. Naturally, in this region, not only the universities' role in regional development but also their crisis originating from the decreased college-bound population, becomes a main regional issue. On the other hand, Daegu region has only two universities, which is the second smallest number in the regional area of Korea. By studying these adjacent regions with an unbalanced

number of universities, it is helpful to identify and understand universities' role and interaction, in particular, with relation to the regional boundaries.

Thirdly, the regions represent the regional context of Korean industrialisation very well, as each industrialisation period can be found in the areas: labour-intensive textiles (1960s; Daegu), heavy industry (1970s; Pohang in Gyeongbuk) and high-tech (1980-90s; Gumi in Gyeongbuk) (Hanssink, 2001, p. 1375). By investigating these areas, the relationships or gaps between regional industrial needs and universities' role may be drawn.

Fourthly, these two areas are in different administrative regions, and each is an upper-level local autonomy. Throughout history and even today, these two regions have shared not only a common political, economical and cultural background but also a single zone of life, although these have been separated as different administrative regions since 1981 when Daegu became a metropolitan city and independent from Gyeongbuk. After the system of local autonomy started in 1995, there has been a constant discussion as to whether the two regions should be unified or not. One illustration of this argument is that the Provincial Office of Gyeongbuk is still located in Daegu as the capital of Gyeongbuk prior to 1981. This is the reason why these two regions are studied together. This characteristic of the two regions is helpful to identify and understand the issue of boundaries in RIS development and cross-border collaboration among stakeholders from different administrative areas.

Lastly, the researcher's professional position at Gyeongbuk Provincial Office is a relatively important reason. The researcher worked at Gunwi local government of Gyeongbuk from 1999 to 2003, and since 2003, has worked in Gyeongbuk Provincial Office.

In 2002 Gyeongbuk Province and Daegu Metropolitan City have 2.78 and 2.54 million inhabitants respectively, and these populations represent 11.1% of the total population in South Korea. As seen in Figure 3.3, Gyeongbuk is the biggest region of the 16 regions, enclosing 19.1 % of the nation's territory. Daegu is generally accepted as the third-largest metropolitan city next to Seoul and Busan, even though the population of Incheon City has become larger than Daegu since 2001.

Gyeongbuk and Daegu are composed of twenty-three and eight respectively lower-level local governments in their boundaries.

3.3.2 Regional Economic Profiles

■ A historical overview

The current economic situation of the two regions can be understood through their industrial, economic and historic backgrounds. Since the early 1990s in Daegu, the textile industry composed of home industry and manual factories has started to supply modern-style clothing and socks for the people living inland near Daegu (DPAKNU, 2003). In the 1960s, the national government proposed 'the First Five-year Economic Development Plan' (1962-1966) providing the impetus for the restructuring of the agricultural society and encouraging the support for the export-oriented industries. During the period of the Plan, labour intensive and light industries such as textile, clothing and shoe manufacturing were developed. In line with the national Plan, the textile industry of Daegu was quickly developed, which is based on cheap and abundant labour living near Daegu mainly from Gyeongbuk. Moreover, in the Second Five-year Economic Development Plan (1967-71), as the textile industry was appointed as one of strategic industries for export by the national government, it gradually became a dominant industry of Daegu.

In Gyeongbuk, agriculture, fisheries and mining were the main industries until the 1960s. During the early 1970s, with the shift of the national government policy from labour-intensive light industries to capital-intensive, heavy industries such as iron, steel and electronics and these along with petrochemicals became the new industries for economic growth (Kim & Gallent, 1997). In 1973, the national government established a large-scale electronic complex in Gumi located north-west of Daegu in the hometown of the President, Park Jeong-Hee who was in power during 1961-79. This National Industrial Complex contributed to the export expansion of electronics including IT (Information Technology) and semi-conductors, which became a major industry helping leads to the economic growth of the country.

At the same time, the national government also built an integrated iron and steel factory in Pohang in the eastern area and on the coast of Gyeongbuk. This state-built

factory, currently called POSCO, became one of the largest steel factories in the world. The National Industrial Complex of Pohang is composed of this dominant company and many small steel-processing firms.

An interesting point in the above historical overview is that the national government dominated the formation of these industrial features. Regional actors such as regional governments and universities, did not play an important role in the decision process. Therefore, it seems that the growth of these industries and Industrial Complexes in two regions has been generated exogenously rather than endogenously (Hassink, 2001).

■ Economic bases and its relations between the two regions

Table 3.3 Economic status of the research regions in 2004

(KRW: Million)

Classifications	Nation	Daegu	Gyeongbuk
Population (Population Projection based on 2000)	49,052,988 (100%)	2,539,738 (5.2%)	2,718,613 (5.5%)
GRDP (At current price)	786,362,375 (100%)	26,046,026 (3.3%)	56,466,056 (7.2%)
Per capita GRDP (At current price)	16	10.3	20.8
Manufacturing firms			
Number of firms (Over 5 persons employed)	113,310 (100%)	7,068 (6%)	5,838 (5%)
Value of Shipments (At current price)	788,633,397 (100%)	18,610,863 (2.4%)	98,285,901 (12.5%)

Source: Korean Statistical Information System, Korea National Statistical Office, Retrieved 30, November, 2006 from <http://kosis.nso.go.kr/>

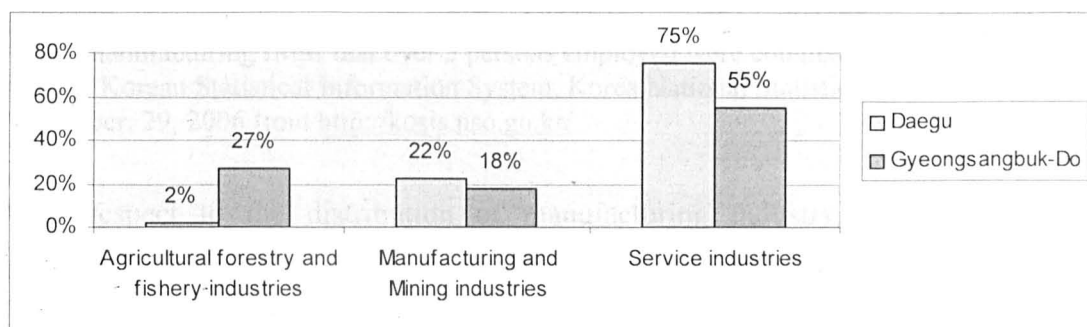
This section tries to identify the characteristics of the regional economic structure, and can help to understand the regional university-industry cooperative relations in terms of industrial base. As seen in Table 3.3, GRDP (Gross Regional Domestic Product) of the two regions represents 10.5% of the country, which is similar to the ratio of the population (10.7%). An interesting point in the Table is that between two regions there are considerable gaps in the amount of GRDP, its per-capita and value

of shipments in manufacturing firms, even though the population are similar to each other. Additionally, Daegu has a larger number of firms than Gyeongbuk, but its GRDP is less than half of Gyeongbuk's.

These peculiar phenomena can be broadly explained in terms of the industrial structure. In Gyeongbuk, large global firms such as Samsung and LG Electronics in Gumi NIC (National Industrial Complex) producing high value products represent its industrial structure of GRDP. However, in the case of Daegu, even though it has larger number of firms than that of Gyeongbuk, 99.8% of manufactures are SMEs producing less value-added products such as textile fabrics than global firms of Gyeongbuk (DPAKNU, 2003). Geographically, in Gumi NIC, nearly half of manufacturing products of Gyeongbuk are concentrated; the total value of shipments in manufacturing of Gumi NIC is composed of 47.4% of the total amount of Gyeongbuk.

On the other hand, in terms of employment rates, the industrial structure of Daegu and Gyeongbuk is respectively composed of 2% and 27% of primary sector, 22% and 18% of secondary sector and 75% and 55% of the tertiary sector, which is seen in Figure 3.4. A point to note is that in Daegu the service sector is considerably larger than the manufacturing sector, but in Gyeongbuk, the employees of the agricultural, forestry and fishing industries are larger than that of the manufacturing industries.

Figure 3.4 Industrial structure based on employment rates in 2003



Source: Korean Statistical Information System, Korea National Statistical Office, Retrieved 29, November, 2006 from <http://kosis.nso.go.kr/>

Figure 3.4 implies the functional relation between two regions. Daegu, as a big modern-style city, has played a role in supplying to service industries such as

education (middle and high school) and culture to Gyeongbuk, and has therefore, also become a residential place for people working in Gyeongbuk. Therefore, these two regions are functionally very closely related to each other; Daegu is a supplier of services to its hinterland, and Gyeongbuk is a consumer.

Table 3.4 Distribution of manufacturing industry in 2004

(KRW: Million)

	Whole country		Daegu		Gyeongbuk	
	Number of firms	Value of Shipments	Number of firms	Value of Shipments	Number of firms	Value of Shipments
Total	113,310	788,633,397	7,068	18,610,863	5,838	98,285,901
Manufacture of Food Products	8,051	47,766,619	224	1,031,873	619	2,664,845
Manufacture of Tobacco Products	12	4,378,671	-	-	2	-
Textiles	8,971	22,882,946	1,773	3,342,956	981	3,851,055
Apparel & Fur	8,410	12,015,469	334	254,362	28	25,657
Tanning & Dressing of Leather	1,985	4,616,081	19	15,121	7	46,026
Wood Products of Wood & Cork	2,002	4,309,523	73	70,468	113	204,798
Pulp, Paper & Paper Products	2,953	14,662,152	158	758,069	152	611,437
Publishing & Printing	6,027	12,026,035	187	197,243	75	235,084
Coke, Refined Petroleum Products	111	47,489,047	-	-	12	43,152
Chemicals and Chemical Products	3,894	76,294,349	115	400,633	342	4,693,864
Rubber and Plastic Products	8,568	32,148,458	418	1,056,568	484	2,608,714
Non-metallic Mineral Products	4,105	23,434,373	104	395,930	403	3,275,851
Manufacture of Basic Metals	2,832	75,365,997	153	1,138,641	242	23,097,088
Fabricated Metal Products	14,629	33,796,130	1,309	2,058,389	598	2,285,165
Manufacture of Other Machinery	15,339	65,302,585	1,033	2,560,950	550	2,113,844
Computers and Office Machinery	746	12,103,796	11	12,911	62	3,494,933
Electrical machinery	5,973	28,956,783	259	1,084,872	237	3,825,470
TV and Communication Equip.	4,886	134,834,171	62	961,929	371	38,849,427
Medical, Precision & Optical Instruments	2,802	6,949,794	305	291,795	58	358,036
Motor Vehicles & Trailers Mfg.	3,639	87,655,828	316	2,660,111	282	3,489,640
Manufacture of Other Transport Equip.	1,094	29,139,328	24	39,128	38	156,462
Furniture; Articles	5,846	10,772,728	169	174,846	128	671,647
Recycling	435	1,732,534	22	104,068	54	279,964

Note; manufacturing firms that over 5 persons employed were counted

Source: Korean Statistical Information System, Korea National Statistical Office, Retrieved November, 29, 2006 from <http://kosis.nso.go.kr/>

With respect to the distribution of manufacturing industry, textile companies comprise the largest number of firms in the two regions, as seen in Table 3.4. However, the biggest industry in terms of value of shipments is different between the two regions. In Daegu, textile industry is the first; but in Gyeongbuk, TV and Communication Equipment is composed about 40% the regional total amount, and

Basic Metal is the second. Both of the two main industries of Gyeongbuk are mostly located in Gumi and Pohang NIC respectively.

To summarise, the two regions share functional relations economically, and the manufacturing products are geographically concentrated on Gumi NIC and Pohang NIC respectively, which are created and developed with the encouragement and support of central government. In addition, the main manufacturing products of the two regions consist of communication equipment, metals, textiles, machinery (computer and others) and motor vehicle, etc.

With its historical base and industrial characteristics, the industries of the two regions are confronted with a new challenge. A further emerging issue at the regional level is how to construct regional competitive advantage with those existing industrial bases coping with a new knowledge-based economic environment. Since the late 1980s, the textile industry of Daegu has declined with the increasing labour cost of the country and the advent of China in the east-Asian economy with its cheap labour costs. From the mid-1990s, Daegu regional government launched the '*Milan Project*' for city regeneration with a mixture of textile and design regarded as value added industries. A further illustration of this is that; as LG Electronics which was placed its main factory in Gumi NIC (National Industrial Complex) constructed a new LCD (Liquid Crystal Display) factory in Paju of the Capital area, regional stakeholders in both of Gyeongbuk and Daegu acknowledged this as a dangerous situation for the regional economy. They regarded the lack of high-quality human resources in their regions as a reason why LG Electronics selected the Capital area (*Maeil Shinmun* Newspaper, 11, November, 2005). These examples denote the current situation of regional industries, which is confronting new challenges.

3.3.3 Universities in Daegu and Gyeongbuk Regions

As outlined in the above, in South Korea, central government has traditionally been responsible for higher educational governance under the supervision of MEHRD. It is difficult to describe the regional governance of HEIs, and thus, this part provides basic information on and profiles of regional universities in the research regions.

■ The overview of the universities in the two regions

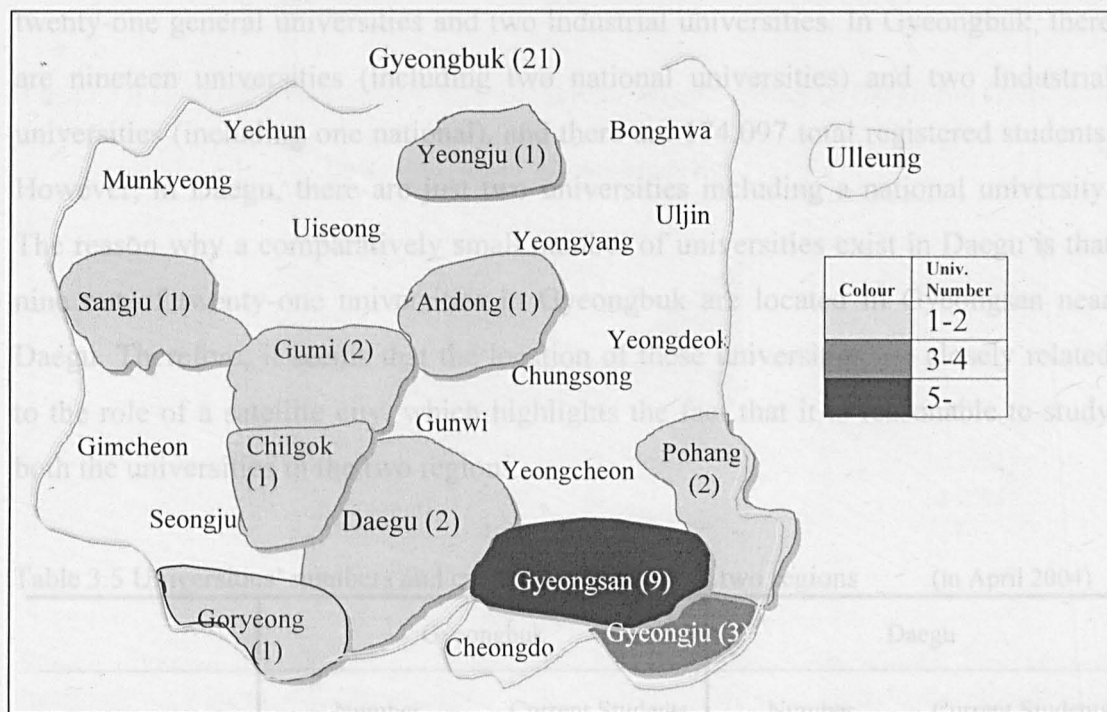
Universities in Daegu and Gyeongbuk regions have evolved in line with those of the rest of the country. Until the middle 1970s, a national university (Kyungpook National University) and three four-year colleges (these became universities with the title of Keimyung, Daegu and Daegu Catholic University) were operated in Daegu. In Gyeongbuk, a private university, Yeungnam University which had moved from Daegu in 1972, was placed.

In the late 1970s, three more colleges (four year course) were sporadically established in Gyeongbuk region: Andong National College was established in Andong City reflecting the educational needs from northern Gyeongbuk, and the Kumoh Institute of Technology was built as a private university by President Park Jeong-Hee to support high quality engineering for Gumi NIC (National Industrial Complex). Dongguk University in Seoul founded its branch college in Gyeongju of eastern Gyeongbuk. Therefore, at those times, the higher educational landscapes of the two regions can be said that two universities (Kyungpook National University and Yeungnam University) dominated, and six four year colleges followed them. From the late 1970s, the location of universities was spread geographically from the Daegu to Gyeongbuk area.

Since 1980, when the national government increased the university's enrolment quotas in response to the increased expectation for university education, the number of universities in the two regions was increased steeply. All of the above four-year colleges extended the number of students and departments, and recognised into universities except for the Kumoh Institutes of Technology. Four new universities were founded: Daegu Hoony University (1980 in Gyeongsan), Pohang University of Science and Technology (1986 in Pohang), Gyeongil University (1985 in Gyeongsan) and Gyeongju University (1987 in Gyeongju). Geographically, from this time, universities gathered in Gyeongsan City located near Daegu; Daegu and Daegu Catholic University were moved from Daegu to Gyeongsan, and Daegu Hoony and Gyeongil University were newly established. This change was due to the needs for larger capacities with increasing students and the escape from the expensive estate within Daegu. At present, as seen in Figure 3.5, nine universities are located in Gyeongsan City. This geographical phenomenon concerning the universities'

location can give a rationale that the universities in Gyeongbuk and Daegu cannot be separately considered.

Figure 3.5 Universities and their location in Daegu and Gyeongbuk



Source: Author

Since the early 1990s, nine small private universities have been established, most with specific purposes; Christian education (Handong Global University, Taeshin Christian University, Youngnam Theological College & Seminary), Buddhism education (Uiduk University), arts education (Daegu Arts University) and foreign language education (Daegu University of Foreign Studies). Even though these universities had specific purposes, they operate various academic departments not only following purposes such as theological courses, but also capturing 'niche' academic fields that developed universities did not open, such as police administration courses, tourism information and practical language courses, and jewellery material courses. Accordingly, these new universities started with specified academic fields, however, they extended in order to increase student numbers directly connected to their revenue. This characteristic of new small universities, operating various courses if it can be sure to acquire new students, is the same as that of Korean universities in general. Most of the Korean and the regional universities

are not specified in a certain field but operated as it is a 'department store' with various academic courses in a broad area.

As seen in Figure 3.5 and Table 3.5, there are twenty-three universities including twenty-one general universities and two industrial universities. In Gyeongbuk, there are nineteen universities (including two national universities) and two Industrial universities (including one national), and there are 174,097 total registered students. However, in Daegu, there are just two universities including a national university. The reason why a comparatively small number of universities exist in Daegu is that nine out of twenty-one universities in Gyeongbuk are located in Gyeongsan near Daegu. Therefore, it seems that the location of these universities are closely related to the role of a satellite city, which highlights the fact that it is reasonable to study both the universities in the two regions.

Table 3.5 Universities' numbers and current students of the two regions (in April 2004)

	Gyeongbuk		Daegu	
	Number	Current Students	Number	Current Students
University	19(2: National)	158,973	2(1: National)	59,478
Industrial Univ.	2(1: National)	15,124	0	0
Total	21	174,097	2	59,478

Source: Educational Statistics Database of KEDI (Korean Educational Development Institute), Retrieved December 4, 2004 from http://std.kedi.re.kr/jcgi-bin/educ/educ_basic_frme.jsp?menuid=111

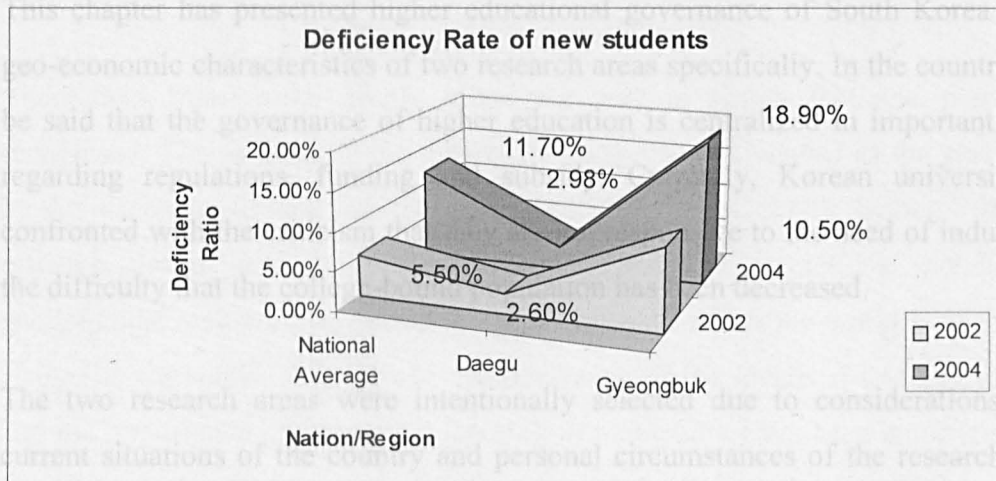
■ Current issues related to the universities in the regions

The current issues confronted with the regional universities are similar to those of the other regions in the country. In terms of the university standpoint, the increasing deficiency rate of new students is the most crucial issue to the regional universities mainly caused by the decrease of college-bound population. As seen in Figure 3.6, in Gyeongbuk, the deficiency rate has been steeply increased from 10.5% in 2002 to 18.9% in 2004. The deficiency of new students has a crucial influence on the revenue of the universities, because, as mentioned earlier, in Korea, most private universities are highly dependent on the student tuition fees. It seems recently that the regional universities recognized their difficulties more directly, and they tried to find new

revenue sources. In this situation of financial deficit, it is important to explore the following questions; how do the regional universities respond to the government policy programmes following funding? And the extent to which are they interested in the cooperation with industry?

3.4 Conclusion

Figure 3.6 Deficiency ratio of new students of regional universities in Daegu and Gyeongbuk



Source: Educational Statistics Database of KEDI (Korean Educational Development Institute), Retrieved November 20, 2005 from http://std.kedi.re.kr/jcgi-bin/educ/educ_basic_frme.jsp?menuid=15

In terms of the consideration of the regional innovative development, not only the retention of the high-qualified regional graduates within the regions, and but also the university-industry cooperation to bridge the gap between the university education and the demand of firms have become regional issues. These issues were generated by the fact that, on the one hand, the high-qualified graduates flow out of the regions toward the Capital area where they have more opportunity than in the regions (DPAKNU, 2003); and on the other hand, the regional industries demand highly-qualified graduates to be directly posted in the field. In addition, there is more practical and urgent difficulty for regional universities to recruit new student.

Consequently, in Gyeongbuk and Daegu, the transformation of the regional universities has become a problematic issue from the universities' standpoint and the perspective of regional economic development as well. In addition, central government has implemented university-industry cooperation policy with a funding scheme since 2003, to help construct regional innovation system. In line of these considerations, a question is raised; to what extent do the regional stakeholders

interact in order to tackle the above current problems in response to central government policies?

3.4 Conclusion

This chapter has presented higher educational governance of South Korea and the geo-economic characteristics of two research areas specifically. In the country, it can be said that the governance of higher education is centralized in important matters regarding regulations, funding and subsidy. Currently, Korean universities are confronted with the criticism that they are not responsive to the need of industry and the difficulty that the college-bound population has been decreased.

The two research areas were intentionally selected due to considerations of the current situations of the country and personal circumstances of the researcher. The industrial features of the regions had been mainly driven with the support of central government. The two regions are closely related economically and historically. There are twenty-three universities (general universities and industrial universities), and their current issues are similar to those in the rest of the country.

These national and regional contexts may aid the analysis of the localised learning process focusing on the dynamic interactions of regional universities. However, the localised interactive processes may be too complex to grasp the features with the background information and literature and socio-geographical contexts, which are discussed so far. Therefore, at this point, it is necessary to adopt a particular theoretical angle to look into the relationships between universities and their territorial development, and it can help to arrange and interpret the complex realities and meanings happening in practice. Accordingly, in the next chapter, the theoretical bases will be discussed to examine and analyse universities' interactions occurring in the selected research regions.

Chapter 4 Regional Innovation Systems: A Conceptual Framework

4.1 Introduction

Theoretical frameworks deeply affect the way in which fact and practice are recognised. This is because the theoretical perspective is viewed as the glasses used by the researcher to look into the world (NÆSS & Saglie, 2000; Sanders 1986). The research design and focuses such as universities, interactions, policies, and geographical area are also reflected on the ways in which the world is seen and its change is explained. Recently, as the advantage of the localised learning processes and the importance of interactive learning in innovation have been emphasised with the changing environment of globalisation and the knowledge-based economy, the concept of RIS (Regional Innovation System) has emerged to provide a conceptual framework which explains regional innovative development. Unlike the traditional approaches to economic growth and development, the concept of RIS tries to take into consideration the intangible aspects such as cooperation, institutional set-up and interactive learning. It does so with particular reference to innovation, institutions, interactions and policy (de la Mothe & Paquet, 1998). Regional innovation system is partly a new theoretical construction with a reference to some actual development tendencies in the building of localised interaction and innovation in particular region, as well as a tool in policy making to create systems of innovation in support of innovation-based competitiveness on a regional scale (Asheim & Isaksen, 2002).

In South Korea, new government has tried to support the construction of Regional Innovation Systems in every region except for the Capital area. Even though the real features of RIS building are varied from country to country and from region to region, the main concept of RIS may help to identify and understand the specific processes and outcomes of a certain Korean region. Moreover, this research takes the concept into consideration critically, and it attempts to provide a critical examination of the

concept with theoretical and empirical account of the weaknesses and potentials as a concept to be applied for further research.

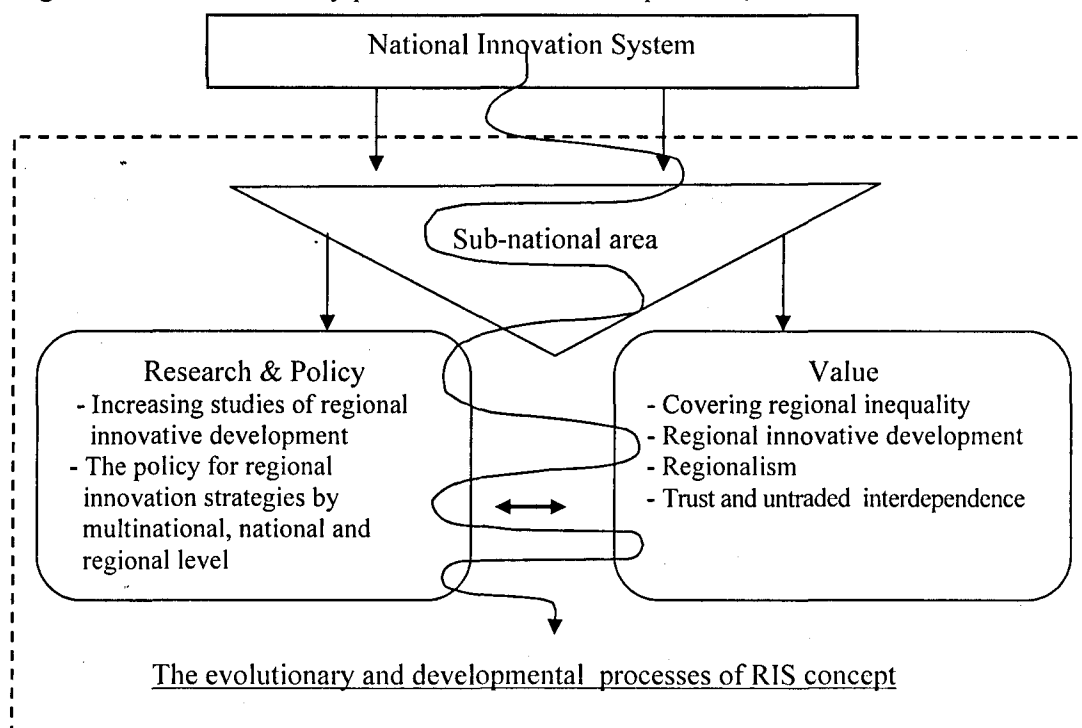
Accordingly, the purpose of this chapter is to raise some questions about the relevance of Regional Innovation Systems as a conceptual framework from practical and theoretical perspectives and to outline some weaknesses and strengths in its utility. This chapter firstly sketches out some features of the evolution of RIS concept, and discusses practices and values in the concept. Secondly, it explains the characteristics of the RIS, in particular, with the role of university, policy and interactive mechanisms. Lastly, it critically debates the strengths and weaknesses of the RIS as a conceptual framework.

4.2 The Evolution of RIS Concept

The characteristics of RIS could be found by studying its evolutionary process, because this concept has been developed with the accumulation of empirical research and the reflection on the political and economic environments. This section attempts to unravel the evolution of RIS from four different directions: its theoretical roots; the development of its research and policy; an example of its building in practice; and values it implies. The understanding of the rationale of the RIS concept will help to explore the currently emerging issues such as the role of universities and regional innovation policy perceived by the concept.

In the light of thought, this section raises some questions to be answered; in what processes has the RIS concept been constructed? Is it a prescriptive concept or descriptive concept? In what processes have RISs been evolved in terms of its research and policy? When governments promote RIS building, what is the RIS? Which kinds of values in RIS are found from its developing process?

Figure 4.1 The evolutionary process of the RIS concept



Source: Author

The Figure 4.1 maps the evolutionary and developmental process of the RIS concept, and the following part will discuss through the logic of the figure.

4.2.1 From NIS to RIS – the background of the emergence of RIS

It is generally accepted that the outline of the RIS concept puts its origin in the discussion of the national innovation system. The origin of NIS (national innovation system) concept may be traced back in three directions: firstly, evolutionary economics has provided a theoretical base and micro foundation to understand innovation within NIS; in particular, Nelson and Winter's '*An Evolutionary Theory of Economic Change*' (1982) has directly supported the theoretical background for the idea of national innovation. Secondly, as de la Mothe and Paquet (1998, p. 103) argue, in terms of analytic unit for competitive performance, the notion of a 'national system' is thought to owe much to the German economist, Friedrich List's '*National Systems of Political Economy*' written in 1841. This book contains some key elements of current NIS concept, such as government responsibility for education

and the development of industrial infrastructure (Freeman, 1995; de la Mothe and Paquet, 1998; 2000; Freel, 2002; Lundvall, 1992). Thirdly, however, the main idea of contemporary NIS has its roots in the analytic and empirical efforts of Freeman (1987), Lundvall (1992) and Nelson (1988; 1993a).

Christopher Freeman (1987) first used the concept of a national innovation system in 1987 by analysing economic development in Japan. He highlighted the network of institutions in the public and private sectors in order to import, modify and diffuse new technologies, and also stressed the interactions between the production system and the innovation process (Freeman, 1988). Richard R. Nelson (1998) studied the institutional structures supporting technical advance in modern capitalist countries, with particular focus on the U.S.A system of innovation. He found the fact that

In the United States there is no single agency responsible for looking at the national innovation system as a whole and recommending or mandating needed changes. Rather, new institutions and institutional assignments are created pluralistically, and the structure itself changes through an evolutionary process. (p. 325)

Freeman and Nelson emphasise institutions, and their networks and support for technical change, but these approaches lack more concrete analytic foundation and concept.

Lundvall supplies more micro analytic idea for the notion of NIS by using the term 'interactive learning' (Lundvall, 1992). His point of departure is that innovation should be regarded as a gradual and cumulative process, and that interactive learning is fundamental to the innovation process (Lundvall, 1992). Interactive learning includes imitation, searching, exploring and any other activity that will lead to increase sharing and using of economically significant knowledge (Johnson, 1992). Different learning processes such as learning by doing, learning by using and learning by interacting, construct the innovation process, and these processes occur in a production related setting of the firm not the result of formally organised company learning activities (Lundvall & Johnson, 1994). Lundvall (1992) also emphasises the role of institutions that;

The institutional set-up (of a specific firm, a constellation of firms, or a nation) is the second important dimension of the system of innovation. Institutions provide agents and collectives with guide-posts for action. ... Institutions make it possible for economic systems to survive and act in an uncertain world. (p. 10)

He argues that institutional set-up helps to construct routine activities that may support interactive learning processes occurring unintentionally (*ibid*). Furthermore, he distinguishes five areas as the elements of NIS: internal organisation of firms; inter-firm relationships; role of the public sector; institutional set-up of the financial sector and R&D intensity; and R&D organisation. Lundvall's contributions have encouraged scholars and policy makers to rush to the NIS as the basis for a possible conceptual framework to look into national economic development (de la Mothe & Paquet, 1998).

Some characteristics implying the NIS are found from the above attempts to describe the national features of innovation: firstly, the NIS concept emphasises that firms cannot be viewed as isolated economic agents but as part of a network engaging in public and private sector institutions. Secondly, it underlines not only the linkage between institutions, but also learning between them as a key economic source (de la Mothe & Paquet, 1998). Thirdly, it highlights the need for national policies and government intervention to primarily shape the overall structure of production and the institutional set-up, which may promote self-organised learning (Dalum et al., 1992). de la Mothe and Paquet (1988) well explain the characteristic of the NIS that;

the idea of NIS asserts that a country's economy is more than the simple sum of its firms' activities but is rather the result of synergies that arise from the interactions and dynamics between economic actors in a country. (p.105)

It seems that the rise of the NIS concept in both policy and research level has been mainly driven by three direct contexts: first is OECD and its member countries which paid much attention to understanding the reasons why firms and nations differ in economic performance over time, and it stimulates the empirical research based on NIS concept (de la Mothe & Paquet, 1988; OECD, 1992, 1994, 1994a & 1997). The European Union also takes a special interest in the technical and scientific support programmes through a super-national science funding mechanism (Cooke, 1998). As a result of the special attention from these multi-national organisations, secondly, this concept has been developed by way of empirical observation rather than theoretical consideration (Lundvall, 1992a; Nelson, 1993a; Mowery & Sampat, 2005; Freel, 2002). Lastly, political impetus and rhetoric to attain national economic development lead to the development of NIS concept (de la Mothe & Paquet, 1998).

However, the notion of NIS does not cover the gap emerging between its conceptual framework and practical research. Much of NIS research has been done with comparative research between countries based on the evaluation of their economic performances with reference to such macro-indicators as a percentage of GDP (Gross Domestic Product), the number of highly qualified personnel per capita, the number of Nobel Prizes awarded to nationally-based researchers, the number of citations that published papers received, and so on (Freeman, 1995). But, these kinds of macro-indicators ignore the key concept of NIS such as interactive learning, linkages, networks, interdependences, synergies, etc (OECD, 1994, 1994a & 1997; de la Mothe & Paquet, 1998). This gap may be inferred from a Metcalfe's (1995, p.41) view that the national unit may be too broad as a category to allow a clear understanding and identifying of the dynamic process. Cooke (1998) also points out that the nation state is too broad as a unit of analysis, in particular in larger countries, but less so for smaller.

Moreover, the twin effects of globalisation and localization have resulted in the nation state no longer being the appropriate unit of innovation analysis. This is because, on the one hand, nations gradually become dependent on the political and economic decisions that are taken elsewhere in the world. In addition, the knowledge-based economic features stress highly localized interactive processes such as face-to-face contacts. These activities have resulted in the nation-state being characterized by 'fuzzy boundaries' (de la Mothe & Paquet, 1998, p.107), as Cooke and Morgan (1998) argue that '*national systems are becoming more variegated, as they are reshaped from 'above' by globalisation and from 'below' by regionalisation*' (p. 29).

In addition, but more importantly, the research literature focusing on NIS reflects the fact that each nation has its cultural homogeneity or homogenous spatial systems of innovation; however, within national specialization, the industry and innovative milieu are highly uneven in regional spatial distribution (Howell, 1999; Nilsson, 2004). Many studies have shown that there are highly significant regional differences not only in research and technical activity but also in the innovative milieu of different regions within a national territory (Braczyk et al., 1998; Archibugi et al., 1999; Etzkowitz & Leydesdorff, 1997; Morgan & Nauwelaers, 1999; Boucher et al.,

2003). For example, core and metropolitan regions have been seen as being much more innovative than more peripheral areas or regions (Boucher et al., 2003; Howell, 1999).

To sum up, a national perspective of innovation systems is unlikely to lead to useful insights into analysing innovation process because it is too macro-scope to identify the interface between the evolving techno-economic change and the innovation system (de la Mothe & Paquet, 1998). A much smaller geographical unit of analysis is needed, and at the same time, the recognition of the region as a geo-economic unit is also important, which is fully argued in Chapter Two. Accordingly, many academics and policy makers have begun to favour sub-national geographical systems of innovation over national systems in attempting to unravel the different spatial systems of innovation at sub-national level (Howell, 1999; Freel, 2002). The next three sections will discuss the developmental process of the RIS concept being considered as one of widely used concepts in analysing sub-national system of innovation.

4.2.2 The Development of RIS Concept at Research and Policy Level

An important tool for analysis of regional performance in the knowledge-based economy is the concept of RIS which appeared in the early 1990s (Cooke, 1992 & 1998). The region has been seen as an important basis of economic coordination and governance at the meso-geographical level between the national and the local (Asheim & Coenen, 2004a). Thus, over the last decade, the concept of RIS has been increasingly used among academics and policy specialists (Braczyk et al., 1998; Morgan & Nauwelaers, 1999). This section will explore the way in which the RIS concept has evolved at research and policy level. More specifically, at research level, this section will also consider the characteristics of the evolutionary process of the RIS.

A special interest in regional economic development of Wales in the UK by Cooke and Morgan who might be viewed as the main advocators of the RIS concept, leads us to pay more attention to the region as a place to construct localised innovation systems rather than nations (Cooke & Morgan, 1998). Since the early 1980s the economic crisis had been set by the affection of the neo-liberal policies of the

Thatcher government, and the endeavour to promote economic regeneration had also been set out by the Welsh Development Agency and the territorial government in the latter part of 1980s and early 1990s (*ibid*). During these periods, Cooke and Morgan (1992; 1994; 1994a; 1998) drew much attention to finding the answer of the questions: how a public policy properly supports the attainment of regional economic restructuring in different regions; and how and why regions have been differently developed in terms of innovation, learning and technology transfer. These questions encouraged Cooke and Morgan to conduct comparative research between regions such as Wales in the UK, Basque County in Spain, Baden-Württemberg in Germany, and Emilia-Romagna in Italy. In this early stage of the regional innovation research, it seems that their research was done in descriptive and explanatory ways to identify the differences between less-favoured regions and advanced regions.

Based on this initial research, Cooke (1992; 1998, p. 19) tried to make a classificatory schema of the RIS to capture 'the conceptual variety and empirical richness that inform the idea of the RIS', and to assist 'in understanding of the differences and similarities in terms of level and degree of institutionalisation of the RIS'. He classified three different types of RIS depending on the governance dimension such as initiation, funding, research & support, specialisation, intra-regional cooperation and coordination (Cooke, 1992 & 1998). Such a typology consists of Grassroots RIS, network RIS, and Dirigiste RIS.

In Grassroots RIS, innovation activities occur through localised learning processes simulated by geographical and cultural proximity. Innovation support system and policy are mainly initiated and funded by firms themselves or local and regional authorities rather than national government. Network RIS represent a mixture of national, regional and local initiatives, and public and private sector institutions are both involved in the regional partnerships. Dirigiste RIS is central government driven with the public governance of innovation system, and regional R&D and innovation are planned in line with national objectives and by national government. Asheim (2001) also categorises three main groups of RIS based on empirical research in regional innovative development, which resemble the typology of Cooke. Asheim 's typology consists of territorially embedded regional innovation networks, regional networked innovation systems and regionalised national innovation systems. These

are similarly matched with Cooke's typology respectively.

These typologies of RIS denote, on the one hand, the empirical richness concerning RIS research, on the other hand, the development of RIS as a conceptual framework in analysing regional innovative development. Moreover, it seems that this conceptualisation of RIS has come to lead to a new phase of RIS research and policy, from descriptive and explanatory concept to prescriptive and normative concepts. As Cooke's (Cooke, 1998) comment that "*the typology helps draw out some of the important relationships and impulse moving innovation activities forward in specific regions and types of regions*" (p. 19) implies, the concept of RIS has gradually become an ideal type in construction of regionised innovation systems at research and policy level (Cooke & Morgan, 1998; Braczyk et al., 1998; Morgan & Nauwelaers, 1999). For instance, Hassink (2002) compared RIS between Germany and East Asia, and he used the Cooke's typology of RIS as a theoretical framework to test whether there are regionally embedded innovation systems.

For the last decade, a number of studies have been undertaken to identify and sometimes analyse the nature and dynamics of RIS and its application. Amongst these research, two main groups which used RIS concept are found: comparative empirical studies; and specific research of a certain individual region (Doloreux & Parto, 2004). The main objective of comparative research is to understand how RIS functions differently, to identify desirable factors and mechanisms for promoting competitiveness and innovation, and to assess the implication of policy (Sternberg, 2000; Asheim, 2004; OECD, 2001; Doloreux, 2004; Hassink, 1993 and 2003; Koschatzky & Sternberg, 2000; Nilsson, 2004). These comparative studies mainly contribute to identifying the impact of different types of RISs in different countries or the same country. On the other hand, the research of individual RIS aimed at the understanding to what extent, a certain region corresponds to the conceptual framework of RIS (Asheim, 1997; Braczyk et al., 1998; Cooke, 1994; Cooke et al., 2003; Doloreux et al., 2003; Morgan & Nauwelaers, 1999). This research provides insights into the nature and dynamics of regional innovative development. Both of the two groups in RIS studies conclude that there is no single model to generalize the dynamics of successful RISs.

Even though what a RIS would look like in reality is not clear, the RIS concept has been widely used in the research and policy of regional innovative development not only descriptively but also prescriptively. This approach is popular for a number of reasons: firstly, this concept provides an analytic and strategic framework on the intangible dimension of regional innovative development and the processes of knowledge transfer and learning at more manageable regional scale (Doloreux & Parto, 2004). Secondly, the economic success stories of territorially agglomerated clusters such as the Third Italy, Baden-Württemberg and Silicon Valley stimulate the other regions to begin economic regeneration and development. Thirdly and academically, it seems that there is an increasing awareness of the significance of the regional level among researchers working within the fields of evolutionary and institutional economics (Asheim & Isaksen, 1997).

Lastly, and more importantly, policy and political initiatives lead to the extensive use of RIS concept in reality in order to promote regional innovative development which is a common point of interest to most regions in the world. According to Doloreux & Parto (2004), *"a simple rationale for the widespread adoption of regional innovation system approach may be that, from a policy perspective, it is much easier to manage economic policy at a regional rather than a global scale"* (p. 7). Storper & Scott (1995) also argue the emerging features of policy initiatives in promoting the competitiveness of regional economics that *"a new 'heterodox' economic policy framework has emerged in which significant dimensions of economic policy at large are being reformulated in terms of regional policies"* (p. 513). Cooke (1992) highlights that *"it is clear that innovation has moved up the political and economic agenda in a big way during the past two or three years"*(p. 370). It seems that the conceptual characteristics of the RIS such as the term 'region' and 'innovation' not just 'industrial district', 'cluster', 'science park', and 'development' or 'growth', are well matched with not only political rhetoric appealing to their citizens but also the implementation of policy initiatives at more manageable regional scale rather than national or local level. For instance, in Korea, as the new ruling 'Participatory Government' selected 'balanced national development' and the construction of regional innovation systems for it as one of the main political rhetoric and manifestos, the research and policy concerning RIS has increasingly emerged (PCONBD, 2003 and 2004). In particular, Asheim and Isaksen (1997) argue that *"the result of the new*

political initiatives towards a 'European region', where the development prospects of the lagging regions of Europe in particular have been a great concern for the EU" (p. 305). The European Union has played an active role in the construction of RISs by launching regional innovation strategies (European Commission, 1994 and 1995; Cooke & Morgan, 1998; Lagendijk & Rutten, 2003; Landabaso & Reid, 1999; Morgan & Nauwelaers, 1999; Komminos, 2002). The following part will address, in detail, the characteristics of the EU policy concerning RIS building, which will help us to understand how the RIS concept is implemented by policy initiatives in reality, and how it has been developed in terms of its policy.

4.2.3 An Example of Regional Innovation System Building in Practice: regional innovation strategies by the European Union (EU)

This section will briefly examine the EU's regional innovation policy as an example of how the concept of regional innovation system has developed and applied in reality with a form of policy. Two questions are raised: how has the changing environment affected the formulation of regional innovation strategies facilitated by the EU? What kinds of characteristics are found when the concept of regional innovation system is put into practice in terms of the experience of the EU's regional policy? However, this section will focus on the discussion of the reflection and characteristics from the EU's policy experiences rather than deeply studying the rationale of each policy programme and its implementing process. This is because the aim of this section is to identify how the RIS concept is actually applied at the policy level rather than the EU regional policy itself.

In line with the emphasis on regionalized innovative development, European policy-makers have acknowledged increasingly the need to improve the interactions between the creation of new technological resources and their dissemination and commercialisation mechanisms (Landabaso & Reid, 1999). As Cooke & Morgan (1998) highlight that "*nowhere has regional role in innovation been more forcefully championed than in the European Union (EU)*" (p.12), since in the middle of 1990s, the European Commission has introduced some new set of policy schemes with strategic view over regionalized innovation such as Regional Innovation Strategies, and Regional Innovation and Technology Transfer Strategies (RITTS). These policies

are viewed as a part of the theoretical construction and evolution of the discussion on 'regional innovation system' (Komnious, 2002; Cooke & Morgan, 1998; Morgan & Nauwelaers, 199a). *The Green Paper on Innovation* (European Commission, 1995) well explains the Commission's view of the background for regional strategy for innovation;

The local or regional level is in fact the best level for contacting enterprises and providing them with the necessary support for the external skills they need (resources in terms of manpower, technology, management and finance). It is also the basic level at which there is natural solidarity and where relations are easily forged. It is therefore the level at which small enterprises can be encouraged and helped to pool their strengths in partnerships in order to compete with bigger enterprises with greater resources or to make the most of the opportunities which these enterprises can offer. These issues are of special importance in the less favoured regions. (p. 45)

The rationale behind these policies to promote regional innovation is to cover the development gap between European regions. It seems the European Commission has the view that many of the causes of EU regional disparities in economic development may be traced to disparities in regional innovative capacities and mechanism based on technological competitiveness and institutional set-up (Dabinett & Gore, 1999). Therefore, the starting point for regional innovation policies by EU cannot be divorced from its political agenda to minimize the cohesion gap between the regions of member states.

Against this background, the European Commission changed its policy direction to support the less-favoured regions from focusing on 'heavy' infrastructures (roads and buildings) to 'soft' infrastructures (innovation-support services) (Morgan & Nauwelaers, 1999). This new focus is partly explained by the fact that the Commission has more intention on addressing not just economic indicators such as unemployment and GDP per capita, but also the innovative capacities such as regional knowledge infrastructure and the degree of localized networks. With this consideration, the Structural Funds⁴ were extended to encompass the technological

⁴ The Structural Funds are allocated by the European Union for the purpose of the provision of heavy infrastructures in the less-favored regions, such as transport, buildings, basic training and so forth. Under the Structural Funds there are 3 Objectives: Objective 1: promoting the development and structural adjustment of regions whose development is lagging behind; Objective 2: supporting the

innovation through new policies; the STRIDE (Science and Technology for Regional Development in Europe) programme aiming at upgrading the RTD (Research and Technological Development) potential of the regions; the RTP (Regional Technology Plan, a forerunner of Regional Innovation Strategies, which refer to Regional Innovation Strategies), RITTS (Regional Innovation and Technology Transfer Strategies) attempting to develop not only technology but also technology dissemination and innovation support. The policies have been developed from the STRIDE started in 1990 to RTP/RIS/RITTS in 1994/1997/1996. The former concentrated on supply-side measures and treated innovation as if it were the same as RTD activities, however; the latter three policies are designed to build a balance between supply and demand including cooperation and interaction between institutions (European Commission, 1997; Morgan & Nauwelaers, 1999; Landabaso & Reid, 1999; Lagendijk & Rutten, 2003). The paper of *Competition and Cohesion: Trends in the Regions* (European Commission, 1994) denotes the objectives of RIS (Regional Innovation Strategies);

to respond to the question of how to improve the innovative capacity of regional firms through the strengthening of the regional innovation system and aimed at promoting public/private co-operation and creating the institutional conditions for a more efficient use of public and private resources for the promotion of innovation, especially in the less favoured regions. (p. 56)

In parallel, support to innovation, and technological development and diffusion at regional level was given by the policies of the Framework Programmes⁵, which are the main instrument for promoting RTD in the EU.

Currently, more than one hundred regional innovation projects (RTP, RIS, RITTS) have run their course. Some meaningful characteristics and questions are found from the cases of EU policies and *the Green Paper on Innovation* (European Commission, 1995), other policy papers (European Commission, 1994, 1994a, 1996 & 2002) and literature (Cooke & Morgan, 1998; Lagendijk & Rutten, 2003; Landabaso & Reid, 1999; Morgan & Nauwelaers, 1999; Komninos, 2002) which studied the policies.

economic and social conversion of areas facing structural difficulties; Objective 3: supporting the adaptation and modernisation of policies and systems of education, training and employment.

⁵ The Framework Programmes, also called Framework Programmes for RTD, are funding programmes created by the European Union in order to support and encourage European research. The detailed objectives and actions vary from one funding period to another, and currently, the Sixth Framework Programme (2002-2006) is operating.

Firstly, it is true that the EU regional policy gives us a lesson in how to operate multi-level governance in practice, but the tension emerging between three governments (multinational, national and regional) is still not clear in reality. Cooke and Morgan (1998) underscore the mixture of top-down and bottom-up process of the EU policy that

While the new regional innovation strategies in the LFRs are moving in the right direction, these bottom-up initiatives need to be complemented and nurtured by stronger top-down support from national and supranational initiatives with respect to investment, training, technology-transfer, and institutional capacity-building. (p. 127)

However, to find trilateral-interdependencies is not easy, and there are some possibilities occurring the tension and conflicts of interest between the governments. It seems that innovation policy focusing on intangible aspects such as cooperation, institutional set-up and interactive learning is different from regional development policy focusing on more tangible things such as resolving structural economic and social problems. This characteristic of innovation policy might generate more tensions. In addition, policy papers and literature slightly neglect the tense could emerge in reality, and it can be assumed the reason of which is the funding mechanisms involving power might hide the tension.

Secondly, the central focus of the EU regional policy is to enhance regional knowledge transfer mechanism, as the Green Paper on Innovation (European Commission, 1995) discusses the problems that "*one of Europe's major weaknesses lies in its inferiority in terms of transforming the results of technological research and skills into innovations and competitive advantages*" (p. 5). The regionalized knowledge transfer to forge a stronger interface between research and innovation is also emphasized by *an Action Plan for Innovation in Europe* (European Commission, 1996). However, it is still not clear, in what specific ways the knowledge transfer can be promoted at policy level. This question is generated according as the obscure meanings of 'learning' and 'interactions' are put into practice as a form of policy. Moreover, in various regions, the ways for knowledge transfer may differ.

Thirdly, regional innovation paradox happens, even though the first aim of the EU regional policy is to cover regional disparities (Oughton et al, 2002). The paradoxical situation of regional innovation means that; while LFRs (Less-Favoured Regions)

should spend more on innovation, they have less capacity to absorb available funding for innovation than advanced regions (Oughton et al., 2002; Lagendijk & Rutten, 2003). With relation to the EU policy, the paradox can be explained: the Structural Funds cannot cover the gap of available funding between LFRs and advanced regions, and the Framework Programmes are allocated to the key centres of excellence (Cooke & Morgan, 1998). This paradoxical result raises a question that regional innovation system and its policy is applicable to tackle the regional inequalities in practice.

Fourthly, the concept of regional innovation system that is the eventual objective of the regional policy is ambiguous in reality. Edquist (2005, p.192) points out that; although most of the OECD and EU contributions have mentioned 'regional innovations strategies' in the title, many of them actually use this approach more as a label than an analytic tool. There have been lots of regional innovation strategies in the EU regions, but there is no optimal regional innovation system. For instance; innovation system seems to refer to different processes between advanced regions and LFRs. For advanced regions, it refers to the development and commercial application of new technology, whereas, for LFRs, innovation may primarily means modernization and catching-up, by creating access to external sources of knowledge (Lagendijk & Rutten, 2003). It seems that the specific feature of regional innovation system building in every region is different, although its theoretical concept is comparatively simple. In the light of these considerations, when any government (multinational or national or regional) planned to build regional innovation system, the meaning of it may be peculiar, which reflects the characteristics of its region. Accordingly, a fundamental problem of the policies and studies using regional innovation system is that it cannot yet be determined; what a regional innovation system would be like in reality; moreover, what type of innovation must occur within a region being considered as a regional innovation system (Doloreux & Parto, 2004).

However, fifthly, even though regional innovation system is not clear in reality, the European Commission uses the concept in a prescriptive and normative way (European Commission, 1994, 1994a, 1996). This is mainly because the EU selected regional innovation system in order to tackle the gap of the regional disparities, which implies political intention to bridge cohesion gap among European regions. It

is generally accepted that the normative and prescriptive concepts imply value by their nature, because of rationale and philosophical discourse involved in problem-solving process (Gregory, 2000). The next section will discuss the value the concept of regional innovation system implies in terms of its evolution and policy processes.

4.2.4 Value in RIS

This part will explore the question: what kinds of values are found in the evolution and development process of the RIS concept? The value in RIS can be explained with the evolution and experiential process of the concept, because it has been developed with empirical research and policy rather than theoretical discussion. To understand the value in RIS is helpful to identify the valuational process when it is applied and used as a prescriptive concept. It may also extend our knowledge about RIS by comparing the gap between the values it implies and the practices in reality.

As discussed with the case of Wales, the concept of RIS had its root, in a descriptive way, in the question of why some regions grow and others stagnate. As the concept has been spread out to academia, policy makers and politicians, it has extended in a prescriptive way in order to answer the question of how LFRs can attain regional innovation to cover economic gap with advanced regions. For instance, EU's regional policy tries to tackle regional inequality as a significant policy objective; in South Korea, recent policy of RIS building is originated from the political agenda of the balanced national development; and in the UK, the aim of regional innovation policy is summarised as "*the Government is committed to increasing the prosperity of all regions while narrowing inter- and intra-regional disparities*" (DTI, 2003, p. 100).

Therefore, the RIS can be assessed as not only an explanation, but also prescriptive to solve the problems of geographically uneven development. When it comes to the individual regional level of RIS policy, promoting innovative development may become a main issue. Accordingly, it can be generally said that RIS tries to bridge the innovative gap between regions in the national and multinational level and to enhance regional innovative development in the individual regional level. This value may be identical with the notion of 'constructed advantage' to which recently more

attention has been devoted in comparison to other well-known forms of economic advantage by De la Monthe and Mallory (2003). Cooke & Leydesdorff (Cooke & Leydesdorff, 2006; European Commission, 2006) explain the notion;

construct advantage is both a means of understanding the noted metamorphosis in economic growth activity and a strategic policy perspective of practical use to business firms, associations, academics, and policy makers. (emphasis in original: p. 10)

The notion of 'construct advantage' focusing on governance and interface amongst stakeholders, community, culture and economic capacities is viewed as the other explanation of RIS building.

The terms 'uneven regional development', 'regional innovative development', and 'regional constructed advantage' reflect on the increasing competitions between regions in organised economy (Uyarra, 2005, p. 5). The regional competitiveness stimulates that each region should try to construct regional advantage, and to adopt applicable models and concepts to its region in order to catch up with advanced regions. This is one of the reasons why RIS becomes popular to policy makers. In the light of these considerations, it can carefully discuss regionalism as the rationale and value in RIS. Regionalism is defined as "a political or cultural movement which seeks to politicise the territorial predicaments of its regions with the aim of protecting or furthering regional interests" (Smith, 2000, p. 686). Cooke & Morgan (1998) argue that 'region' in terms of the evolutionary process cannot be separated from the dynamic tensions between 'regionalisation' and 'regionalism'. They comment;

regionalism that comes into play more as cultural processes, combining with political and economic ones ...regionalism involves political demands, 'from below', for often culturally defined territorial autonomy in the face of perceived neglect or discrimination by the superordinate authority. (p. 64)

It cannot be said that the development of RIS concept and its popularity is, to a large extent, related to regionalism, but, it is also true that the RIS is not totally separated from 'regionalism' in terms of two reasons: firstly, the trial process for RIS building has been closely related to the devolution from state, for instance in the UK by Labour Government since 1998 and South Korea by the current 'Participatory Government' since 2003 (House of Commons Library, 2003). This is partly because the efforts for RIS building by state or multination deliver little or nothing unless there is adequate endeavour or response by regional level. Secondly, as Cooke and

Morgan pointed out, the term 'region' implies the dynamic features of cultural and political processes. This is different from the other terms used in economic geography such as 'industrial district', 'cluster', 'science park', 'technopole', which do not imply geographical identity and ethic.

Inside of the region, the RIS concept emphasises 'trust' as a necessary value for RIS building. Cooke (1998, p. 4-5) underscores that "*trust is of enormous value to economic processes*", and Cooke and Morgan (1998, p. 30) define it as "*the confidence that parties will work for mutual gain and refrain from opportunistic behaviour*". To enhance the interactive mechanism which is one of the critical elements for RIS, high-trust relationships between regional stakeholders is viewed as a crucial point with some reasons; i) trust-based relationships are devoted to the economic efficiency because people can easily rely on the word of one' partner; ii) trust-based relationships have a greater capacity for interactive learning because of the high possibilities that thicker and richer information can be exchanged (Cooke and Morgan, 1998). This intangible factor in the construction of RIS is similar to the notion of 'untraded interdependencies' by Stoper's (1997), which is discussed in Chapter Two. Accordingly, as the RIS concept stresses interactive mechanism, 'trust' between regional actors may be considered as a necessary value for RIS building.

4.3 The Characteristics of a RIS

The previous section has sought to put forward the argument of the evolution of RIS concept, which helps to understand the rationale behind this approach widely used recently. This section explores the RIS concept itself more deeply with four parts: the first part simply defines the concept of a RIS, and identifies key elements of it. The general discussion about universities' role in knowledge-based economy has already been argued in Chapter Two, thus in the second part, in term of RIS, universities' role and engagement will be explored. The third section sets out the characteristics of RIS policy comparing regional economic development policy and the science and technology policy, and discusses the policy process of RIS. The last section explores the key internal mechanisms involving the RIS concept.

4.3.1 The Concept of a Regional Innovation System

In understanding and analysis of an innovation system, determining which sub-systems and social institutions should be included or excluded is a basic task (Lundvall, 1992). Lundvall (*ibid*) distinguishes an innovation system between 'a narrow' and 'a broad definition';

The narrow definition would include organisations and institutions involved in searching and exploring –such as R&D departments, technological institutes and universities. The broad definition ... includes all parts and aspects of the economic structure and the institutional set-up affecting learning as well as searching and exploring - the production system, the marketing system and the system of finance present themselves as sub-systems in which learning takes place. (p. 12)

Cooke (2001, p. 958-61) explores the key dimensions of innovation systems providing 'infra-structural issues' and 'super-structural issues'; 'infra-structural issues' including financial system, policy influence on infrastructure, and regional university-industry strategy; 'super-structural issues' refer to mentalities among regional stakeholders or the culture of the region, and can be divided into the institutional level and the organisational level for firms and governance. Asheim and Isaken (1997, p. 304) distinguish an innovation system as 'a production structure' (techno-economic structures) and 'an institutional infrastructure' (political-institutional structures). These categorisations commonly highlights the fact that innovation system encompasses socio-political and institutional structures with broad sense, as innovation process is normally referred to as interactive mechanism,

In the light of this, the definition of a RIS is highly dependent on the fact; in what ways it includes the social, cultural and institutional factors. This is also the reason why there is not a single commonly accepted definition of a RIS, although many attempts have been tried to define what it means (Doloreux, 2004). Cooke (1998, p. 25) argues that regional innovation systems can be conceptualised in terms of "a collective order based on microconstitutional regulation conditioned by trust, reliability, exchange and cooperative interaction" and he and his colleague define a RIS as "in which firms and other organisations are systematically engaged in interactive learning through an institutional milieu characterized by embeddedness" (Cooke et al., 1997a, p. 1581). They stress the interactive relationships between different types of organisations such as firms universities, research institutes,

innovation support agencies and governments. Doloreux (2004) attempts to define it with a similar perspective; *“A set of interacting private and public interests, formal institutions and other organisations that function according to organisational and institutional arrangements and relationships conducive to the generation, use and dissemination of knowledge”* (p. 9). From more practical perspective, European Commission (2002) simply defines it as *“co-operation between firms and different organisations for knowledge development and diffusion”* (p. 14).

The above definitions, even though slightly different, commonly emphasise the role of institutions and their interactive relationships. This is similar to the basic consideration of the NIS focusing on interactive relationships and institutional set-up, however; the RIS is geographically concentrated on sub-national area where some different issues involve such as proximity (region), regional institutions and milieu, regionalized interactions, and complicated policy level (multinational, national and regional level) and process (bottom-up by state or top-down from region or local). It seems that the main argument of a RIS is how a set of distinct institutions can produce systematic effects with the form of so called interactive relationships to enhance regional innovative capabilities and economic advantages.

From the above considerations, four key elements consisting of a RIS are found; ‘region’ as a geographical area for innovation; ‘institutions’ as crucial actors; ‘interactive relationships’ as a mechanism; and in addition, ‘policy’ as a promoter of innovation (Howell, 1999; Doloreux, 2002; Cooke & Morgan, 1998). The study of these elements may extend the specific knowledge about the concept of a RIS and to provide the basis in the construction of the conceptual framework in this research. However, the issues of geographical proximity in innovation are already discussed in the Chapter Two and the first section of this Chapter, thus this section addresses the other three elements. In addition, the next part discusses the three elements with respect to the focus of this research.

4.3.2 Universities’ Role Within a RIS

The universities’ role within a RIS is largely based on the issues of universities and regional innovative development already discussed in Chapter Two, thus this part

discusses some issues directly related to the construction of RIS rather than general issues concerning their territorial development.

It is widely accepted that the firm is viewed as the main key agent of innovation to promote regional economic development in the RIS (Cooke & Morgan, 1998), and it is also true that much research in RIS focuses on only firms and their behaviours (Braczyk, et al., 1998). However, focusing on the firm is too narrow and too restrictive to develop a better understanding of innovation, thus, it is needed to extend the field of research toward the ensemble of relations in which firms, universities and government interact. With recent emphasis on the knowledge and its transfer, the role of universities and their cooperation with firms are strongly stressed in RIS setting.

Cooke (2004, p. 13-4) argues five main role of universities in RIS building; regional employers and customers as well as suppliers of goods and services; the supplier of intellectual capital to the labour market; research outputs such as publications, innovations and patents; international-standard technical and policy advisor; and regional economic support through entrepreneurship. In RIS literature, universities are considered as important institutions to construct regional innovative development, because they have a stock of knowledge and high quality labour as well (Cooke, 2004). Moreover, the cooperation between firms and universities are viewed as one of the main localised interactions occurring between regional institutions (Caloghirou et al., 2001; Adams et al., 2001; Azagra-Caro et al., 2003; Salazar & Georghiou, 2002). Accordingly, an increasing number of academics, politicians and planners regard universities as indispensable elements for creating regional innovation systems. However, the assessment of the actual importance of universities as the driving force in RIS building is an extraordinarily complicated question (Maskell & Törnqvist, 2003). There are emerging grounds for scepticism about loosely-based assumptions regarding the role of universities and their relationships with industry. Lambooy (2004) clearly argues that "*universities are important part of regional innovation systems, but the extent of their actual influence is not clear*" (p. 650-1).

As the actual features of RIS are diverse in nature, the role and engagement of universities in RIS may also be varied such as the intention and location of each

university, regional economical situations and firms' characteristics. For instance, as Laursen and Salter's (2003) research title '*Searching Low and High: What types of Firms use Universities as a Source of Innovation?*' indicates, it cannot say in a lump that universities' engagement is an essential factor in the construction of RIS in every region.

In addition, it seems that much of literature and policy related to universities in RIS emphasises the normative role of universities and their active engagement in regional innovation processes (Cooke, 2004; Nilsson, 2004; Mowery & Sampat, 2005; OECD, 1999). However, in modern economic situations, universities can be viewed as agents seeking benefits by way of knowledge capitalization rather than benign organisations for common good. Even though one of the long-standing debates in the social science on 'structure/agency' are not discussed in this place, in modern society universities' behaviours may be considered, on the one hand with the regulatory framework by state, and on the other hand with their own intention (Granovetter, 1985). As seen in Chapter Two, universities have gradually pursued the third mission and entrepreneurial role. The increasing gap between the expected role of universities for RIS and actual engagement of universities can be a new emerging issue in the policy and research of RIS. Accordingly, it is time, in RIS research and policy, to look into universities with more objective perspective than the consideration, sometimes potentially (Charles, 2003; Siegel et al., 2003) and sometimes expressively (Howells, 1998; Lambert, 2003) that they actively respond to policy and engage in regional development matters.

However, it cannot be denied that the universities engagement in regional developmental issue and their interactions with other regional stakeholders can be a critical factor determining the innovative capacities in a certain region. In reality, the degree of universities' interactions with firms and government may represent the degree of localised interactive mechanism in a certain region. This is why some RIS literature focuses on the interaction between universities and firms, and recently the Triple Helix Model emphasising the trilateral interactions between universities, firms and government is increasingly used in the study for regional innovative development.

To sum up, it is not clear to what extent universities actually influence the construction of RIS, and the degree of their engagement in their region is also varied. Universities should be viewed as an agent in modern society. However, universities' interactions with other regional stakeholders are still emphasised in order to enhance regional innovative capacities. In the view of thinking, this research using the concept of RIS as conceptual framework tries to find how universities really respond to government initiatives and interact with other institutions.

4.3.3 RIS and Its Policy

The policy issue in regional innovation system may be discussed with, on the one hand the characteristics of the concept of 'innovation' and 'innovation system', on the other hand the different perspectives between top-down and bottom-up involving geographical matter. The former discussion identifies 'innovation policy' with 'regional economic development policy', 'science policy' and 'technology policy'. The latter discussion tries to catch the characteristics of innovation policy concerning its implementation processes.

■ Innovation policy

There is an interesting tension, not to say contradiction, implied in the two concepts 'system' and 'innovation', the one emphasizing stability, the other change. (Cooke & Morgan, 1998, p. 72)

In the light of the above comment, the policy in RIS seems to give an impetus to shake up the tension between 'system' and 'innovation' toward any change. In terms of the innovation policy, there are two different kinds of discussions; one is a classic controversy about government intervention between neo-classical economics and Keynesian economics (Dalum et al., 1992; Cooke & Morgan, 1998); the other may be presented as the 'systemic' approach which implies that the innovation policies should be considered how they contribute to innovation (Lundvall & Barras, 2005; Cooke, 1998). Rather than the basic controversy about the justification of the public policy, this paper, focusing on the second issue, deals with the question; what are the characteristics of the policy in innovation system?

The promotion of 'innovation' becomes a main issue in practical consideration of the policy in innovation system (Doloreux, 2002; Dalum et al., 1992). However,

questions are raised; what is innovation policy? And what are the differences between innovation policy and the others such as 'science policy' and 'technology policy'. The characteristics of innovation policy can be drawn from the concept of 'innovation' and 'innovation system' (Lundvall & Borrás, 2005).

Firstly, innovation policy pays special attention to the institutional dimension and why best-practice cannot be transplanted from one innovation system to another, this is because 'innovation' is generally viewed as a cumulative process that is path-dependent and context-dependent (Lundvall, 1992). The cumulative process of innovation emphasises the competence of various factors such as institutional set-up, knowledge infrastructure and policy makers rather than single firm itself. Thus, innovation policy does not focus on a simple specific factor but various contexts.

Secondly, as innovation is seen as interactive process rather than a linear process, innovation policies stress the term, 'cooperation', 'collaboration', 'network' and 'linkage' between various organisations and actors.

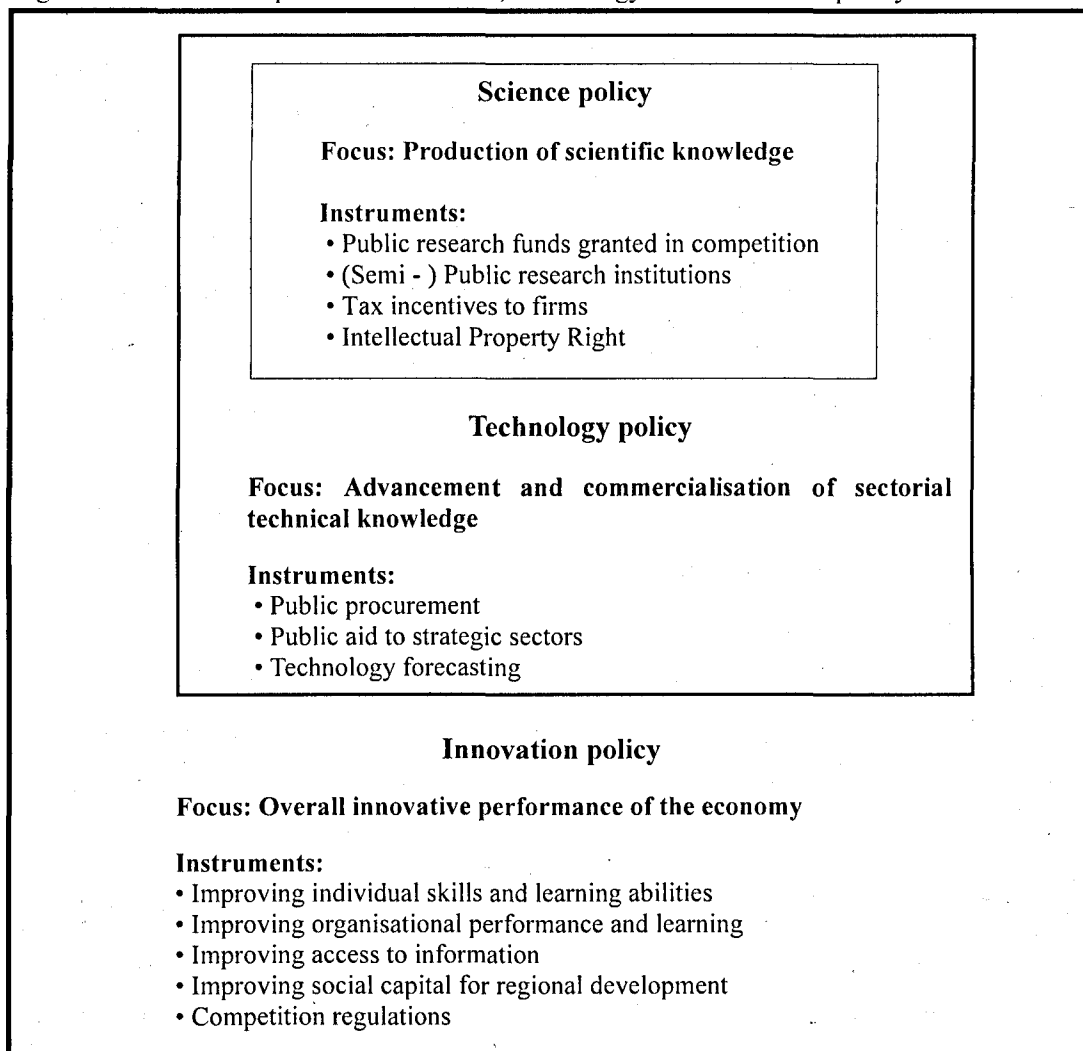
Thirdly, 'innovation system' may be viewed as a framework for innovation and competence building (Lundvall & Borrás, 2005), and 'learning process' taking place between people and organisations is highlighted. In addition, the innovative milieu including trust, power and loyalty contributes to the outcomes of learning process.

Therefore, innovation policy takes into consideration the broader social framework, even though its objective is to promote economic development (*ibid*; Lundvall, 1992; Cooke & Morgan, 1998; Cooke, et al., 2000). Innovation policy can be distinguished from traditional regional economic development policy which is concentrated on a strategy of providing the physical infrastructure for industrial development and attracting investors to the region often with financial incentives such as tax exemptions, grants, cheap land and facilities (Cooke et al., 2000).

Lundvall and Borrás (2005) distinguish innovation policy from science and technology policies as seen Figure 4.2. They highlight the focus of policy moves from research institutions and technological sectors in science and technology policies, toward all parts of the economy that have impact on innovation processes.

The instruments of innovation policy include those of science and technology policy. Cooke and his colleagues (Cooke et al, 1997, p. 489) identify finance, learning and productive culture as key subsystems to be considered in innovation policy. They emphasise that innovation policy creates a climate and certain attitudes that enable coordination between the agents to achieve innovation.

Figure 4.2 Relationships between science, technology and innovation policy



Source: Adapted and summarised from Lundvall and Borrass, 2005, p. 615.

Accordingly, innovation policy encompasses various aspects of policy instruments such as institutional set-up, supporting learning and interactive process, and creation of innovative culture, etc. Lundvall and Borrass (2005) give a good comment of the characteristics of innovation policy as; “*innovation policy calls for ‘opening the black box’ of the innovation process, understanding it as a social and complex process*” (p. 615). However, in terms of practical points of view, it is not clear what

the innovation policy would be like in reality, this is partly because it encompasses too broad instruments and policy target including social and cultural dimensions. This is also partly because the social-political, economic and cultural environments where the policies are implemented are varied from country to country and from region to region.

■ Regional innovation policy

If 'region' is put into consideration in the policy of innovation system, two different kinds of policy processes may be categorised; one is a top-down process; and the other is a bottom-up process (Howells, 1999; Cooke et al., 2000; Etzkowitz & Leydesdorff, 1999a). This distinction is related to the different perspective looking at regional innovation between a national perspective and a regional perspective. In most nation-states both the techno-economic structure and the institutional infrastructure are primarily national in character, thus being viewed from national perspective of innovation. However, in some countries the regional governance structure has an independent role to play, either because the countries are federal states such as Germany, or because of a weak national political system as in Italy (Asheim & Isaksen, 1997). These distinctions, top-down and bottom-up of policy process, are closely related to Cooke's typology, the Grassroots and Dirigiste RIS respectively. By understanding the characteristics of these two policy processes, the framework for regional innovation policy may be identified.

Howells (1999, p. 72) describes three dimensions which could be used to analyse the policy of RIS from a top-down perspective:

- the regional governance structure, both in relation to its administrative set-up and in terms of legal, constitutional and institutional arrangements;
- the long-term evolution and development of regional industry specialisation; and
- additional core/periphery differences in industrial structure and innovative performance.

Howells suggests that these three dimensions are a basic consideration to look into regional policy from a top-down perspective. He (*ibid*) emphasises that in a top-down perspective, the differences between regions in 'delivery' and 'response' to policy implementation process are identified, with the following reasons;

firstly, even though innovation systems at the same level (for example regions) may share common components in the form of similar, shared regulatory and educational environments, how these are delivered at a

*regional level are likely to be subtly different; and, secondly, how firms and organisations **respond** to the separate components and their delivery is also likely to vary.* (emphasis in original: p. 77)

Asheim and Isaksen (1997, p. 306-7) identify this top-down perspective as a 'regionalized national innovation system' which is part of the production structure and the institutional infrastructure located in region, but functionally integrated in or equivalent to, national innovation systems. They argue that this regionalized national innovation system is a lack of territorial embeddedness, and it can be viewed as linear model of innovation. On the other hand, they also identify a bottom-up perspective as a 'territorial embedded innovation system' constituting by the parts of the production structure and institutional set-up that is embedded within a particular region. They argue that this bottom-up perspective matches with interactive model of innovation.

Howells (1999) also suggests a bottom-up perspective to look into regional system of innovation as '*specific innovation systems should also display their own **internal set of interactions between players and institutional set within the system***'. (emphasis in original, p. 78). He (*ibid*) identifies five key dynamic processes that are fundamental to the operation of innovation policy in a bottom-up perspective, and they are;

- localised communication patterns relating to the innovation process, both at an individual level, and firm or group level;
- localised search and scanning procedures relating to innovation and technology;
- localised invention and learning patterns;
- localised knowledge sharing
- localised innovation performance (p. 82)

These key processes represent the internal dynamic of regional systems, which is viewed as a crucial arena for localised learning and tacit know-how sharing. Accordingly, Howells, and Asheim and Isaksen identify the process of regional innovation policy as a 'top-down' and a 'bottom-up' perspective, and a 'regionalized national innovation system' and a 'territorially embedded system' respectively.

On the contrary to this dichotomy, Cooke and Morgan (1998) suggest an 'associational perspective' which emphasises the affiliation of the policy role between state and region. They refer to the state as "*the main regulatory mechanism ... of the environment in which innovation takes place*" and "*animateur: creating a*

milieu for innovation" (*ibid*, p. 17). In associational perspective, the key issue is not the scale of intervention but its mode for effective intervention, thus the main role of the state is to create the conditions whereby firms and other institutions can effectively interact. Regional governments focus on innovation in indigenous companies, supporting inter-firm networking, local research-industry interfaces, and making better relations possible between regional stakeholders (Cooke et al., 1997; 2000). Iammarino (2005) also highlights an 'integrated view' of regional innovation policy between top-down and bottom-up characteristics, and he argues that the overall technical change and the character of the regional knowledge base can be grasped by a top-down view, but informal mechanisms for knowledge absorption, integration and diffusion is more suitable to a bottom-up view.

In sum, the policy for regional innovation can be implemented by various processes and perspectives; top-down, bottom-up, and associational view. However, it seems that there is little or no rational agreement as to what is the appropriate balance and role between state and region, or top-down and bottom-up process in regional innovation policy (Cooke & Morgan, 1998). This is because regions have different socio-economic environments as their numbers, and the degree of regional autonomy from state is also different from country to country.

■ RIS policy in reality

Accordingly, in the research of RIS policy, it is useful to look into the implemented policy with a situational perspective rather than with a fixed analytic framework. Rather than to determine whether the policy has top-down or bottom-up process, regionalized national innovation system or territorially embedded system, or associational perspective, it is more important to examine the questions: what are the policy focus and instrument? Does the policy reflect the regional needs and situations? How do regional firms and other stakeholders respond to the policy? Do the policy aims come true? This thesis approaches with these questions looking into regional innovation policy of South Korea.

4.3.4 The Interactive Mechanisms of RIS

This part explores the internal dynamics of RIS, which is generally viewed as decisive factors to construct successful RIS (Doloreux, 2002; Cooke, 1998; Howells, 1999). It also suggests some critical points concerning the gap between the internal mechanisms of the RIS concept and actual relationships of interactions.

In RIS literature, the terms, 'internal dynamic mechanisms' (Doloreux, 2002) 'institutional learning' (Cooke, 1998; Johnson, 1992) 'interactive relationships' (Cooke & Leydesdorff, 2006) 'interactive learning' (Morgan, 1997; Lundvall, 1992; Cooke et al., 1997) and 'internal dynamics' (Howells, 1999), are widely used emphasising the interactions with and links between several institutions and actors aiming at producing innovations. Then, a question is raised; why are interactions at the centre of the RIS concept? Howells (1999) clearly explains the importance of the internal mechanism in regional innovation systems building:

There has been an important long-term interest in the internal dynamics of regional systems. It has been that regions do display significantly different structures of innovation system components, but it is at the level of the internal dynamics of the interaction of firms and organisations and their links back to the wider institutional structure within the regional system of innovation that is so important and make regions valuable for study in their own right. Regional systems of innovation represent crucial arenas for localised learning and tacit know-how sharing. (p. 78)

The aim and content of interactions are closely related to 'learning' and 'knowledge' in particular 'tacit knowledge' based on the knowledge-based economy. Lundvall (1992, p. 1) regards knowledge as "*the most fundamental resource in modern economy*" and learning as "*the most important process*". Learning processes are identified in different stages; 'learning-by-doing' that is conceivable as the repetition and improvement, through practice of a task; 'learning-by-using' is that the practices borrowed or copied from somewhere are implemented and adjusted in the process of use; 'learning-by-interaction' shares the know-how with other institutions and actors with a closer approximation and a well-developed learning culture; the last stage is 'learning-by-learning', which is the former processes are embedded in the systems (Cooke, 1998; Lundvall & Johnson, 1994; Arrow, 1962).

The concept of RIS more incorporates with learning-by-interaction and learning-by-learning rather than the former two processes. This is because it considers that in

modern economy, the ability to innovate is highly dependent on the degree of knowledge transfer and diffusion rather than knowledge in itself. Therefore, the interactions of the RIS concept can be understood as "*the process that generates learning between actors who participate in the innovation process*" (Doloreux, 2002, p. 249).

As mention earlier in Chapter Two, this interactive process of innovation is influenced by institutional set-up and routines, and social conventions. Learning-by-interaction requires a high degree of 'trust' among participants and sharing of cultural and institutional activities. This is because knowledge, in particular, tacit knowledge is transferred mainly through local face-to-face contacts, and being socially embedded and reproduced through social interaction. Therefore, the complexity of the RIS concept is closely related to the fact that its central processes, interactive mechanisms are highly dependant on the social context.

Furthermore, a simple question is raised; what is the optimal feature of interactions in the RIS? It seems that the notion of 'social embeddedness' gives a clue to the answer. This notion emerged from the literature about industrial districts and firms' networks, but it is still a vague notion (Doloreux, 2002; Grabher, 1993). Lyons (2000) comment concerning firms' behaviours may be helpful to understand this notion, he put it this way;

... embeddedness of firms is expected to strengthen the milieu by developing a sense of common industrial purpose and social consensus; common ways of perceiving economic and technical problems and solutions; and the development of extensive institutional and informal support that encourage innovation, skill formation, and the circulation among the firms. (p. 892)

Cooke (1998) highlights the fact that RIS and its institutional milieu is 'characterized by embeddedness', thus, to him, this notion seems to be used as regionally rooted interactions influenced by all social, institutional and cultural aspects. In the line of thinking, embeddedness emerges in regions that have a significant concentration of firms and other institutions and a high degree of localised learning in sharing social and cultural values (Doloreux, 2002). The notion of embeddedness implies the interactive mechanisms that have the reflection of regional social and cultural values, and sharing various resources that can be used to generate innovation.

At this point, however, some issues emerge with relation to internal mechanisms of RIS concept. Firstly, it seems that the dynamic interaction would imply interdependent relationships between regional institutions. But, there may be other possibilities that tensions and conflicts of interest may occur rather than ensemble of interactions based on interdependence. Thus, it seems that interactive mechanisms in RIS should be considered with wider perspectives, for instance; the classification of the interactions into conflict-based and interdependent-based interactions.

Secondly, it is not sure that interactive relationships are always connected to learning, and there will be a gap between simple contacts and learning-by-interaction. Therefore, some academics use interactive learning when they explain the internal dynamic of RIS (Morgan, 1997; Lundvall, 1992; Cooke et al., 1997). Moreover, thirdly, how the interactive learning that is the centre of the RIS concept can be analysed. This may be a difficult question because interactive relationships are understood as socially embedded processes within institutional and cultural contexts, and many regional institutions and actors are closely or loosely connected in this process. This research reflects the above critical questions, trying to analyse interactive relationships in RIS setting of South Korea.

4.4 The Strength and Weakness of the RIS as a Conceptual Framework

This section seeks to critically examine the strength and weakness of the RIS as a conceptual framework in the research. The arguments of this section are reflected not only on the discussion about RIS literature, but also on the characteristics of the RIS concept and value in it. A number of criticisms can be made of the RIS approach. Each is reviewed and discussed below.

4.4.1 The Boundary of the RIS

One of the most controversial points concerning the RIS concept is how its units of analysis and geographical boundary are defined (Doloreux, 2002; Gunasekara, 2006;

Gulbrandsen, 1997). In terms of the units of its analysis, within the RIS approach, the term 'region' has been variously applied to territories as different as cases; local (cluster) level (Asheim & Isaksen, 2002; Porter, 1998); metropolitan level (Diez, 2002); a supra-regional/sub-national scale (Dabinett & Gore, 2001; Cooke et al., 2003; Morgan, 1997). This diversity of the units of analysis has been employed in studies of RIS, on the one hand it may be viewed as the advantage of the RIS concept being able to be applied to any geographical level, on the other hand it becomes "*a major problem in developing a unified conceptual framework toward a construct of the region as a theoretical object of study*" (Doloureux & Parto, 2004, p. 18).

The more fundamental issue is, in reality, how to define the territorial boundary of 'region' when called the construction of the regional innovation system. This is because at the policy level, region is mostly viewed as an administrative division of a country, but in the RIS concept, region is more abstract than administrative boundary. Socio-economic aspects and cultural values are regarded as a significant factor in the RIS setting, moreover, these activities are occurring not only inside a certain geographical area but also around it. The RIS concept implies region is not static but it is dynamic focusing on evolutionary process (Cooke & Morgan, 1998; Cooke, 1998). The difficulty in fixing region's boundary is viewed as a weak point of the RIS concept in application to a certain territory. In theoretical argument, the RIS is based on systematic approach, but the boundary of system, which is an important theoretical element consisting of system, is blurry (Edquist, 2005; Cooke, 1998).

Accordingly, when the RIS concept is applied in a certain area, it is necessary to decide how to deal with the boundary of 'region'. With reflection of these critical considerations, this research selects two administrative areas, and tries to identify regional boundaries functionally formed when universities interact in response to government policy.

4.4.2 The Gap Between the Concept of RIS and Actual RIS Building

Compared to the increasing political rhetoric emphasising on the RIS building, the outcome of real RIS building is less discussed, and this discrepancy between political rhetoric or policy and actual RIS building is a problem in theoretical development of

the RIS. The political encouragement and policy imply values in RIS setting such as covering regional inequalities between regions, and enhancing regional innovative capacities in individual region. As seen in the case of the EU policy, the political rhetoric and policy aims in regional innovation strategies result in regional innovation paradox (Oughton et al., 2002). For instance; in the UK, one important aspect of political rhetoric of Labour Government is 'innovation' and 'devolution', however; there is no well-known result of territorial innovation (DTI/DfEE, 2001; House of Commons Library, 2003).

Three main reasons can be considered in explaining why the gap happens; firstly, the concept of RIS and its policy emphasises not only tangible things such as resolving on structural economic and social problems, but also intangible aspects such as cooperation, institutional set-up, and social and cultural values. However, it is a really difficult task to enhance the intangible regional asset for innovation, because lots of socio-economic variations are engaged in it.

Secondly, Asheim and Isaksen (2002) argue that "*RIS may be a theoretical construct fruitful to study ... in only some limited regions ... it may not be a fruitful analytic framework and policy tools in ...declining industrial regions... an important condition for localized learning and knowledge bases is missing*" (p. 84). However, in political and policy perspective, the LFRs (Less-Favoured Regions) are firstly considered as a policy target region, and the RIS has been widely used within a decade because of its merit as a tool in enhancing economic situations of LFRs.

Consequently and thirdly, when RIS has application to a certain region, long term perspective is needed. It may be difficult in a short-term perspective to bring about the kind of trust and cooperation between regional stakeholders (Asheim & Isaksen). LFRs can be a suitable policy target of RIS, if they are supported by long-term perspective. However, politicians and policy makers generally expect a quick outcome from their strategies (Morgan & Nauwelaers, 1999a). Accordingly, it seems that the gap between the political rhetoric and actual RIS building may be a continuing argument in RIS research and literature, because the period of time is a problematic issue, for example; if called 'long term', and then how long exactly.

The above critical consideration can be an inevitable limitation of this research as well, because, in this research, the time period from policy implementation to study of universities' response is quite short (about two years). However, this research reflects the above critical issues, and it tries to find the gap between the policy for RIS building and actual engagement of universities and to explore how the gap occurs.

4.4.3 Ensemble or Tensions in Interactive Relations

As mentioned earlier, interaction between institutions is a centre of the RIS concept. Much of the RIS literature studies the interactive relationships descriptively or prescriptively, and they assume a high possibility, at least potentially, that firms, universities, and other regional institutions might harmoniously interact and involve the localised network each other (Cooke & Morgan, 1998; Cooke et al., 1997; Braczyk, 1998). It seems that there is a prepositions not explicitly but implicitly in the thought of interactive relationships in RIS; the participants are, basically or in some degree, eager to interact with others.

However, the regional institutions have different background such as different aims, functions, roles, histories, there are much more possibilities to emerge tensions including conflicts rather than ensemble of interaction. Moreover, it is not certain that the regional participants really want to interact with other institutions, and the degree of their engagement is varied from proactively to inactively. If there is an interdependence among institutions, the need for policy engagement is less. Therefore, the RIS study needs to concentrate more on the tensional situations between institutions, but there is little research focusing on the tensions and conflicts relationship between institutions in the construction of the RIS.

Based on the critical perspective, this research tries to identify; what tensions emerge in the localised learning and interactive processes between universities, government and industry; and what is the nature of the interactions between regional stakeholders. This critical approach helps to understand the characteristics of interactions happening in a certain region, and to generate policy implication by reflection on the possible conflict and interdependence.

4.4.4 The Lack of Micro-analytic Background

The internal mechanism of RIS building is dynamic and complex process in creation of innovation. It encompasses various regional institutions and actors, and has relation to not only behaviour and interaction but also the values that the participants have. The concept of RIS emphasises dynamic interactions between participants to share know-how being embedded in the region.

However, the RIS concept does not provide the answer of the question; how can the interactive process be analysed? Cooke's (1998) suggestion in typology of RIS is only helpful to classify the result of analysing the policy and interactive processes. His other suggestion, the division of '*infrastructural level*' and '*superstructural level*', for analysing the condition of RIS potential just gives criteria to classify the regional innovative potential, but does not provide micro-analytic tool. Thus, most of the RIS research selects different analytic method case by case (Brazyk, 1998; Morgan & Cooke, 1998).

Accordingly, in order to analyse the interactions between regional stakeholders in detail, this research uses the Triple Helix Model, focusing on the dynamic relations between university-government-industry as an analytic tool to examine the interactions. The concept of the Triple Helix Model and its conceptualising for this research will be discussed in the next chapter.

4.5 Conclusion

Regional innovation system is a normative and descriptive approach that aims to capture how regional innovative development takes place in a particular geographical area (Doloreux & Parto, 2004). The concept has been widely adopted to stress the importance of regions as units of economic and innovative entity, and as reflection of policies that attempt to increase the innovative capacities of a certain region. It is generally accepted that the innovative performance of regions is improved when

regional institutions such as universities and firms are encouraged to become better innovators through interacting with each other.

However, the concept of regional innovation system encounters a significant degree of empirical validation issues, which makes it difficult for researchers and policy makers to acknowledge what a regional innovation system is or should be. In the above discussion, some critiques and problematic issues were generated such as 1) the role of universities in RIS building (see Section 4.3.1), 2) the issue of RIS policy, and the gap between the policy and actual RIS building (see Section 4.3.4 and 4.4.2), 3) the high-possibilities of unreality of the ensemble interactions in the RIS (see in 4.3.4 and 4.4.3), and 4) the boundaries of the RIS (see Section 4.4.1).

Through the critical examinations, it is revealed that the regional innovation system puts far too much emphasis on 'interactions between institutions' without a satisfactory explanation as to how the institutions play or how they interact in practice. Thus, some questions with respect to the problematic issues of the regional innovation system were also generated, which will be investigated through the empirical study.

On the grounds of theoretical discussions, there are a number of methodological issues which arise in the application of the framework to this research. In terms of the methodological perspective, the framework is still loosely defined, and several methodological alternatives are available. In particular, as the regional innovation system emphasises the interactive relationships between regional institutions, the methodology should be sensitive to generate rich descriptions and explanations of interactive processes and to grasp the institutional context and nature of the university in its territorial development. However, as mentioned earlier, the concept of the regional innovation system lacks a micro-analytic background. Therefore, the creation of a suitable analytical framework is a critical of component of the methodology of this research. The next chapter explores research methodology and method.

Chapter 5 Research Methodology

5.1 Introduction

The broad purpose of this research was set out in Chapter One: *to expand the knowledge about the role of universities in the construction of RIS*. The importance of this lies not only in the localised learning process to enhance regional innovative development, but also in the theoretical understanding of the interactive relationships between university, government and industry and the RIS policy to promote these interactions. Empirically, this thesis tries to grasp the dynamic interactions of regional universities arising from the responses to RIS policy in South Korean regions.

This chapter focuses on the methodology and the methods of analysis to examine universities' interactions with government and industry. There are a number of methodological issues arising from the applications of the argument generated by the literature review and the theoretical perspective, and several methodological alternative are available. The first section of this chapter discusses the methodological issues in relation to the study of universities' interactions. As indicated in Chapter Four, the concept of RIS is of limited use in analysing these issues, thus, the second section discusses the model of triple helix relations as an analytic concept. Furthermore, it tries to conceptualise the model, which can be applied to empirical research.

The third section suggests the rationale of the selection of universities for empirical research, and it also explains the process of fieldwork through interviews and the analysis of the collected empirical data. The last section discusses ethical issues emerging in the process of data collection and analysis, and it also presents the summary of the research framework and process.

5.2 Methodological Issues

The universities' interactions are a central unit of the analysis in this dissertation. However, there is not a single angle which looks into a university, comparable to the way a firm is viewed as a profit-seeking economic agent. Moreover, in recent decades, the emphasis on the third role of a university makes it more complex and difficult to study the university from a certain fixed perspective. Therefore, most research concerning the roles or behaviours of universities is approached from a comprehensive viewpoint rather than a single or fixed perspective (Chatterton & Goddard, 2000; Kitagawa 2004; Charles, 2003). Alternatively, a specific field of a university's activities such as the business incubator of a university, the role of the knowledge transfer office is studied (Mian, 1996; Jones-Evans et al., 1999).

The reason for the above characteristics of the university related study, it seems, is partly that the functions, objectives and behaviours of the university are not simple, which makes researchers approach from different perspectives. It is also partly because the behaviours of a university are influenced by the degree of their independence from regional and national governments, which leads the researcher to examine a university and its socio-economic environment together. These rationales give a warning that adopting a specific perspective when looking into the university, such as regarding it as simply a service institution or an economic agency, may lose sight of its other features. Hence, this thesis examines the role of universities encompassing the specific interactions between universities-government-industry as well as the nature of universities with relation to their engagement in regional economic development, with the following definition and assumptions of the university.

In this thesis, 'university' refers to 'an institutional type' and 'an organisational species', which is viewed as a part of the higher educational systems of the nation and sub-national area, and as an institution consisting of RIS buildings and the localised learning processes (Duke, 2002, p. 2-3; Gray, 1999b, p. 3-5; Lambooy, 2004, p. 651). More specifically, amongst many different kinds of HEIs in South Korea (seen in Appendix B), the universities discussed in this thesis are confined to

general universities and industrial universities. This is because, in terms of the research aim, it is reasonable to examine the university that has more potential to cooperate with firms. Practically, this research is not broad enough to encompass all kind of HEIs. Theoretically, it seems that university-industry cooperation focuses on the high-skilled graduates and R&D relations, which may support regional endogenous development, rather than technical training or education itself.

In this sense, this thesis begins with some assumptions about the university based on the literature and evolutionary perspective in which the RIS concept is rooted.

The first assumption is that the university is not a static, but a dynamic institution. Most literature dealing with the university's role and behaviour empirically or theoretically examines the activities of the university with relation to its surrounding communities. The university interacts with other institutions and its outside societies to gain external resources such as updated knowledge, funding, new students, etc., and these activities make it possible to exist and to upgrade its competence.

The second assumption is that universities are not a homogenous unit (Cooke, 1998). From an evolutionary and institutional perspective, universities are differentiated through making use of variable proportions of non-homogenous inputs depending on their situations and competence, and they are conceived of as organisations with a certain degree of resource-development capacity of their own (Boschma & Lambooy, 1999; Fagerberg, 2002; Witt, 2002). However, there may be some routine processes or common characteristics among the universities placed within a certain geographical boundary and engaged in the localised interactive process. Thus, this research also explores the similarities of regional universities, which are reflected by the regional or national contexts.

Thirdly, it is assumed that the role and interactions of the university are influenced by the legal and institutional basis of the university itself. The ability of the university to participate the localised interactive relations, somewhat depends on the degree of its independence from regional and national governments (Charles, 2003). The university operates within nationally regulated and funded regimes, which may

vary from country to country. As the OECD (2003) reported in its 'Educational Policy Analysis 2003', the university's autonomy from the state varies:

Universities in three English-speaking countries (Australia, Ireland and the United Kingdom) as well as those in Mexico, the Netherlands and Poland have high levels of autonomy over most areas of their operation. In Austria and the Nordic countries, their autonomy tends to be more constrained, especially in regard to borrowing funds and setting tuition fees. Among the countries, the fewest areas of autonomy are reported in Korea and Japan, at least for their national (public) universities, and in Turkey. In these three countries' public universities are essentially treated as part of the government, and the State owns their assets and employs their staff. The basic structure of the universities' management, including faculties, staff and student numbers, salaries and tuition fees, is determined by government legislative and budgetary instruments. (p. 62 - 3)

Hence, research looking into the role and interactions of the university should consider the legal and institutional basis of a specific country. Fourthly, the university's engagement in regional economic development is also influenced by the specific regional contexts, such as the regional industrial base, the number and size of regional universities and regional specific milieu and regional governance of higher education, etc. The university's interactions with regional stakeholders may be highly determined by regional demand for the university's engagement, and the regional demand may be decided through the complex process of various regional contexts.

These assumptions have critical implications for the research methodology. They demand that the methodological and analytic framework should capture universities' dynamic interactions with other institutions. They also ask that the methodology should be sensitive in order to describe and explain the dynamic interactions in response to government initiatives following the legal and institutional background. With reflection on the above considerations, this thesis selects the Triple Helix Model as an analytic tool to examine the dynamic interactions of universities, and the use of this model covers the lack of micro-analytic background in the RIS concept.

5.3 The Triple Helix Model as an Analytic Concept

This section looks into the theoretical contexts of the Triple Helix Model, and tries to critically review this model in terms of its strength and weakness as an analytic concept for this research. In addition, this section also attempts to conceptualise the model in order to explore the research questions and to bridge between the theoretical context and the empirical research. The following questions will be answered within this section: what is the Triple Helix Model? What are the main characteristics and issues relating to this model compared to the concepts of NIS and RIS? What are the possibilities and limitations of this model as an analytic concept for analysing universities' interactions with government and industry? How can this model be conceptualised in this research?

5.3.1 What is the Triple Helix Model?

With the increasing importance of knowledge and the role of the university in the current knowledge-based economy, the Triple Helix Model has been noted by both academics and policy makers. The model was initially derived from an analysis of the renewal of the Boston economy and the role of MIT (Massachusetts Institute of Technology), through the cooperative relationships between university-industry-government for firm-formation which were encouraged by academic research carried out since the 1930s (Etzkowitz, 2002; Cooke, 2004). This analysis points out that a region with a cluster of firms, rooted in a particular technological paradigm is in danger of decline once that paradigm runs out (Etzkowitz, 2002; Etzkowitz & Klofsten, 2005). In order to respond to the continuous need for renewal in the industrial and technological bases, it is necessary for this renewal to be undertaken by a variety of actors, typically including a triple helix of university-industry-government relations.

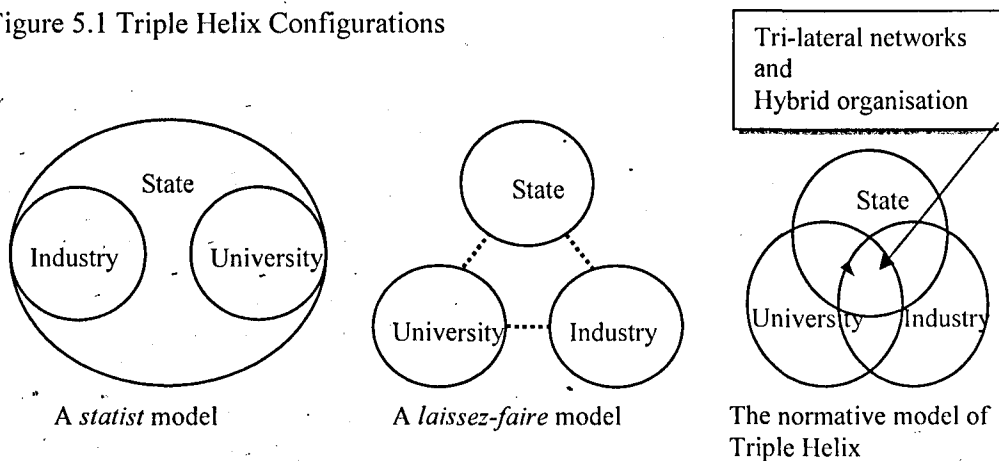
'The Triple Helix—University-Industry-Government Relations: A Laboratory for Knowledge Based Economic Development' by Henry Etzkowitz & Loet Leydesdorff (1995) is the first article to introduce the concept of the Triple Helix theory. In this article, Etzkowitz and Leydesdorff suggest that the new model is needed to look into the complex innovation processes arguing that *"a spiral model of innovation is*

required to capture multiple reciprocal linkages at different stages of the capitalization of knowledge” (p. 15). Soon afterward, the Triple Helix Conference Series was launched in *Amsterdam* in 1996 with a meeting titled “*A Triple Helix of University-Industry-Government Relations*”. The continuing conference series (Purchase, New York, 1998; Rio de Janeiro, 2000; Copenhagen, Lund, 2002; and Turin, 2005) have provided the discussion of theoretical and empirical issues by academics and policy analysts (Etzkowitz & Leydesdorff, 2000, p. 110).

Etzkowitz and Leydesdorff (*ibid*) in referring to the Triple Helix relations of university-industry-government argue that “*a triple helix in which each strand may relate to the other two can be expected to develop an emerging overlay of communications, networks, and organisations among the helices*” (p. 112). University-industry-government relationships can be considered as a triple helix of evolving networks of communication. The concept of the model highlights the fact that university-industry-government relations are the key to improving the conditions for innovation in the knowledge-based economy.

The Triple Helix concept suggests one normative model of institutional arrangement which is generating a knowledge infrastructure with each institution ‘taking on the role of the other’ and with ‘hybrid organisations’ emerging at the interfaces (Etzkowitz, 2003a, p.302; Etzkowitz and Leydesdorff, 2000, p. 111). This normative model begins from two opposing standpoints; one is a statist model of government controlling academic and industry; the other is a laissez-faire model in which the institutions are separated from each other with strong boundaries between them.

Figure 5.1 Triple Helix Configurations



Source: Adapted from Etzkowitz & Leydesdorff, 2000, p. 111, Figure 1,2,3.

This model assumes that there is a movement from either of two opposing standpoints to a normative model, because most countries and regions want to realize an innovative environment for knowledge-based economic development. Thus, it is an unstable model, any country to which this model applies is in a transition process at a certain point between either of the two opposing models and the normative model.

At this point, with relation to the biological term 'triple helix', questions are raised; why not double or quadruple but triple, and why is the word 'helix' used? Industrial and economic policies have traditionally focused on a bilateral interaction between government and industry; however, in the knowledge-based economy, the university becomes a crucial institution in the innovation system because of its role as a knowledge stock and its capitalization. The Triple Helix Model considers the university and its changing role as a central institution and actor in innovation within increasingly knowledge-based societies, and this is a different viewpoint from the NIS (National Innovation System)/RIS (Regional Innovation System), which regards the firm as having the leading role in innovation (Etzkowitz & Leydesdorff, 2000; Lundvall, 1992; Cooke, 1998). In addition, it seems that the term 'helix' is used to explain the overlay of communications and expectations at the network level guiding the reshaping of institutional arrangements.

One of the outstanding points of this model is that it is by its nature unstable and transitive system (Etzkowitz & Leydesdorff, 1995; 1998; 1999a). The triple helix hypothesis is that systems can be expected to remain in transition, which can be regarded as characteristics of the knowledge-based economy and trilateral interaction. That is to say, when a certain technology or knowledge is increasingly used as a resource for the current production system, creative destruction could be followed as a reconstruction course. Moreover, in opposition to a double helix, a triple helix is not expected to be stable. This is because the three strands continuously reflect each other, and there are ongoing transformations between helices and within each of helices (Leydesdorff & Fritsch, 2006). Each string relates to the other two in a triple helix, which makes it develop an overlay of communications, networks and organisations among the helices. In this line of thinking, the model highlights the fact

that the system of innovation can be expected to remain in transition, thus it does not become fixed in any specific system and its boundary. From these perspectives of unstable and transitive system, the triple helix model criticizes the 'national innovation system' and the 'regional innovation system' as 'a reified system', because a system may always be redefined (Leydesdorff, 2005).

With relation to the transitive system, what are the driving and binding forces that make the system or the three helixes continuously interact? Above all, the sharing of functions between university, industry and government is viewed as a rationale and encouragement of their interactive relationships including trilateral overlay (Leydesdorff & Etzkowitz, 2001). With the changing socio-economic environment, each institution wants to take on the role of the other, which creates interdependent relations between three spheres. Institutions and actors take on multiple roles compared to their previous behaviours as they find new ways of interacting with each other (Beesley, 2003).

By interacting, complex and dynamic relationships emerge because the participants are based on the different system of reference, and they respond to a perception of each other's position (Leydesdorff & Etzkowitz, 2001). Through the consequent process of negotiations and interactions, the institutional actors will be reproduced and changed, which may be viewed as a reflexive process. Within these processes, trilateral network and hybrid organisations are created to solve social, technological and economic problems (Etzkowitz et al., 2000). Thus, Etzkowitz and Leydesdorff (2000, p. 115) regard a triple helix dynamic of university-government relations as being 'generated endogenously'. They also point out that the changing role in each helix and between helixes over time is the driving force of the interaction (*ibid*). These explanations provide a basis for the construction of a micro-analytic framework for the investigations of the interactive relationships between the three helixes.

In sum, the Triple Helix Model comprises four basic elements. Firstly, it puts an emphasis on the more significant role of the university in innovation, in a knowledge-based economy on a par with industry and government. Secondly, it stresses the interactive and reflexive relationships between three major institutional

spheres, and it considers that innovation policy is increasingly an outcome of interactions rather than a simple prescription by government. Thirdly, with the changing socio-economic environment, in addition to their traditional functions, each institution takes the role of the others, which encourages their interdependent relations. Fourthly, by its nature, this model is an unstable and transitive system. This characteristic enables us to study the various species of chaotic behaviours that have been described in evolutionary economics (Leydesdorff, 1997).

5.3.2 The Strength and Weakness of the Triple Helix Model As an Analytic Tool

This part critically examines the possibilities and limitations of the Triple Helix Model as an analytic concept for the dynamic interactions between university-industry-government in response to government policy. A number of criticisms can be made of the Triple Helix Model approach. Each is discussed below:

Firstly, the Triple Helix Model puts its locus in the university, and its focus on the interactive relationships between university-industry-government. This perspective is very helpful, on the one hand to understand the changing role of the university in terms of its relationships with the other two institutions, and on the other hand to simplify and intensify a number of possible institutions being engaged in the innovation process into the three main institutions. In particular, with the increasing importance of the knowledge-based economy, this model becomes a useful concept to identify and analyse the university's role and the process of its knowledge capitalisations. However, in the application of this model, it can only be used the region or territorial areas where the universities have enough knowledge capacities and their infrastructures to provide for industries. Many peripheral areas often have too few universities or too few research and knowledge capacities to respond to industrial needs, and in these areas the interactive process between the three helices may be missing. Moreover, not all universities want to play an entrepreneurial role emphasising on their third mission, thus the variations in universities should be considered. With this critical viewpoint, this research takes into account the different capacities of regional universities when the universities for fieldwork are selected.

Secondly, the Triple Helix Model stresses the terms 'dynamic', 'transitive' and 'ongoing' process of innovation. Compared to the NIS and RIS, this model has, a somewhat more developed perspective in terms of taking the complex and endless features into account in the explanation of the knowledge transfer and innovation process. However, the terms 'dynamic', 'transitive' and 'ongoing' meet the difficulties in fixing time and spatial scales in doing real research. This is because this model is not a reified system but transitive model, thus the boundary of the system is not pre-fixed. By reflection on this criticism, in terms of geographic scale, this research tries to find the regional boundaries where universities actually interact with government and industry in the process of RIS building. This approach will be helpful in identification the real boundaries of universities' interactions compared to the area pre-defined by RIS policy.

Thirdly, the Triple Helix Model highlights the notion of 'hybrid organisations' and 'trilateral organisations', which are viewed as the optimal outcome from the trilateral and recursive relationships. Beyond establishing links with existing organisations, the university as entrepreneur also develops capabilities to assist the creation of new trilateral organisations (Etzkowitz, et al., 2000). The notion of 'hybrid organisations' provides the outline and framework to analyse the trilateral interactions enhancing knowledge transfer. However, there is no clear answer to the questions; 'what is a hybrid organisation' and 'how can the trilateral organisations be constructed?' Etzkowitz (2003a; 2004; Etzkowitz, et al., 2005) suggests cooperative Business Incubators engaged by university's know-how and human resources, venture firms and government's funding as a typical hybrid organisation, but he has not suggested the other form or feature of hybrid organisations. It is also questionable that even though there is a hybrid organisation in reality, whether or not it can play the expected role that the Triple Helix Model insists. This is because the hybrid or trilateral organisation also cannot help the organisation in escaping the general problems such as organisational inertia and path dependency. With respect to the criticism, this research takes universities' Business Incubators and regional Technology Parks into consideration in terms of the possible hybrid organisations to be developed.

Lastly, the most prominent contributions of the Triple Helix Model as an analytic tool in this research are its four developmental processes related to the knowledge transfer relationships between the three helices, and the tensions implying interdependence and conflict seen as driving and binding forces of innovative interactions between the three. These two points will be discussed in the next section.

5.3.3 Conceptualising of the Triple Helix Model

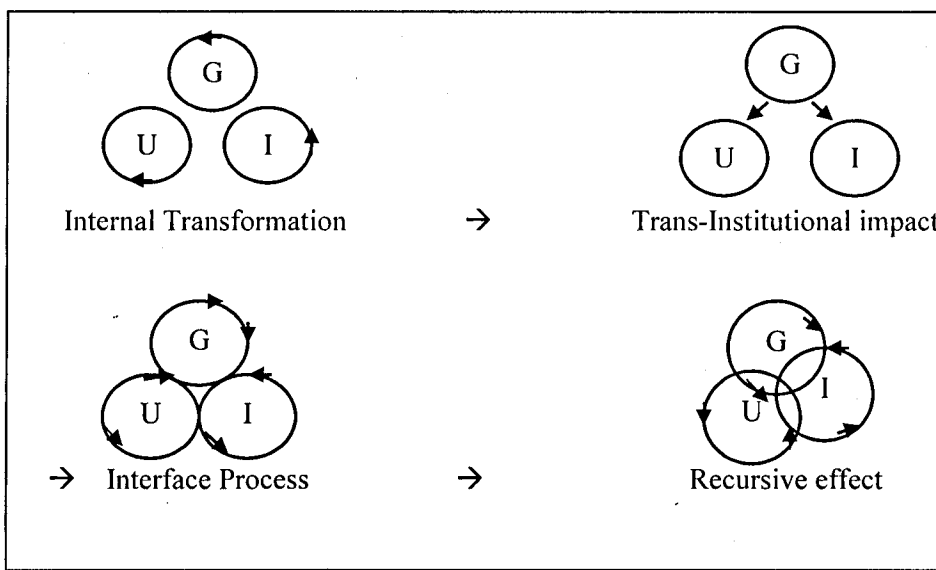
This part attempts to conceptualise the Triple Helix Model to analyse universities' interactions with government and industry in response to the policy. It tries to conceptualise in two directions; the first is in a relatively macro perspective to capture the degree of interactions; the second is in a micro perspective to identify the nature of interactions. The following conceptualisation is associated with the key questions of this research in order to make a bridge between the conceptual framework and the empirical research, and it is reflected by the characteristics of the Triple Helix Model such as the feature of interaction explained by four developmental processes, the tensions behind dynamic interactions, and relationships between the three helices.

■ Four developmental processes of universities' interactions with industry and government

The triple helix model has identified four developmental processes related to major changes in the production, exchange and use of knowledge between university-industry-government (Etzkowitz et al., 2000, p. 315; Etzkowitz, 1997, p. 142; 2003a, p. 301): the first is '*internal transformation*' in each of the helices. At this stage, traditional academic tasks are redefined and expanded according to the needs of new functions. The second stage refers to '*the influence of one helix upon another*' in bringing about transformation. For instance; the government instigates new rules or laws or funding to encourage the spread of knowledge transfer and cooperation, which influences the behaviours of universities and industry. The third stage is '*the creation of a new overlay*' of trilateral linkages, networks, and organisations among the three helices, serving to institutionalise and reproduce the interfaces as well as stimulate organisational creativity and regional cohesiveness. The fourth process is '*the recursive effect*' of these inter-institutional networks representing university,

industry and government, both on their originating spheres and the larger society. These four processes focusing on patterns of interactions between the three helixes are seen in Figure 5.2. A point to keep in mind is that, as the Triple Helix Model is not a stable model, any feature of the interaction is not static but a process of ongoing transition.

Figure 5.2 Four developmental processes of the Triple Helix Model



Sources: Modified from Etzkowitz et al., 2000; Inzelt, 2004, p. 978

These four developmental processes are helpful in analysing the universities' interactions with industry and government for the following reasons: firstly, the classified four stages give a useful analytic framework to look into the interactive relationships which are viewed as a central issue in innovation theories. Secondly, the limitations and problems of the current interactions, in a certain area, can be identified through comparisons with different patterns of interactions. Lastly, these developmental processes give not only an analytic framework to analyse the degree of the interactions, but also a normative guide to encourage the development and evolution of the current interactions. Accordingly, with respect to the research objectives and questions of this thesis, these four developmental processes are seen as a suitable framework to analyse trilateral interactions between university-industry-government in response to government initiatives, and to identify the degree of universities' interactions happening in the research regions.

At this point, it is necessary to create specific questions in each stage of the four developmental processes to examine the interactions between the helices in response to the government initiatives. The specific questions examining the interactions should be linked to theory and reality. Theoretically, the questions are involved in the characteristics of each stage in terms of the triple helix relations, and practically, they try to catch the features of real interactions in response to government policies. The questions of interaction in each stage are seen in Table 5.1. Answering these may reveal the overall positioning of universities' interactions with governments and industry. At this point, the first key research question is more specified (see Section 1.2.1):

- In terms of the type of interactions in four developmental stages of the Triple Helix Model, at which stage are regional universities undergoing transitional process?

Table 5.1. Analytic Framework One: Four developmental processes and the questions of interactions

Developmental stages	The questions of interactions
Internal Transformation	<ul style="list-style-type: none"> - Have these universities made any internal change related to knowledge transfer in response to the government policies, such as establishing new organisations and rules, or changing their mission and their members' perspectives? - Have any lateral tie been newly created between regional universities in response to government policies?
The Creation of New Relationships	<ul style="list-style-type: none"> - Do the industry and governments recognise that these universities have been changing to such a degree that they consider these universities as their cooperative partners?
Interface Process	<ul style="list-style-type: none"> - Do the universities influenced by the new policy create any new substantial overlay for trilateral interactions between the three helices?
Recursive Effects	<ul style="list-style-type: none"> - Have these universities played an initial role in forming regional trilateral organisations to foster regional innovative capacities?

Source: Author

■ The dynamics of interactions: interdependence and conflict

As mentioned earlier, the triple helix relation is by its nature unstable and an endless transition model as a result of the dynamics of interactions. However, the pattern and degree of interactions identified by the four processes do not explain the dynamic relationships between the three helixes. It is necessary to identify the nature and characteristics of the interactions in order to understand the process of innovation happening in the research areas. Accordingly, another step is needed to find the hidden meaning of the interactive relationships and to analyse the dynamics of interaction and innovation.

The second analytic framework can be drawn out through the understanding of 'tension' emerging in the relationships between the three institutions. The triple helix relations imply that the tensions based on conflict and interdependence may drive the dynamic interactions, which may eventually create innovation. The conflict is mainly caused by the institutional and functional differentiations such as roles, histories, publicity, perspectives and objectives between the three helixes. Over time, with the increasing importance of the knowledge-based economy, a transformation in the functions of university, industry and government has taken place as each institution can assume the role of the other. This transformation taking the role of the other generates the interdependent relations through sharing knowledge and promoting knowledge transfer process. Leydesdorff and Etzkowitz (2001) explain that:

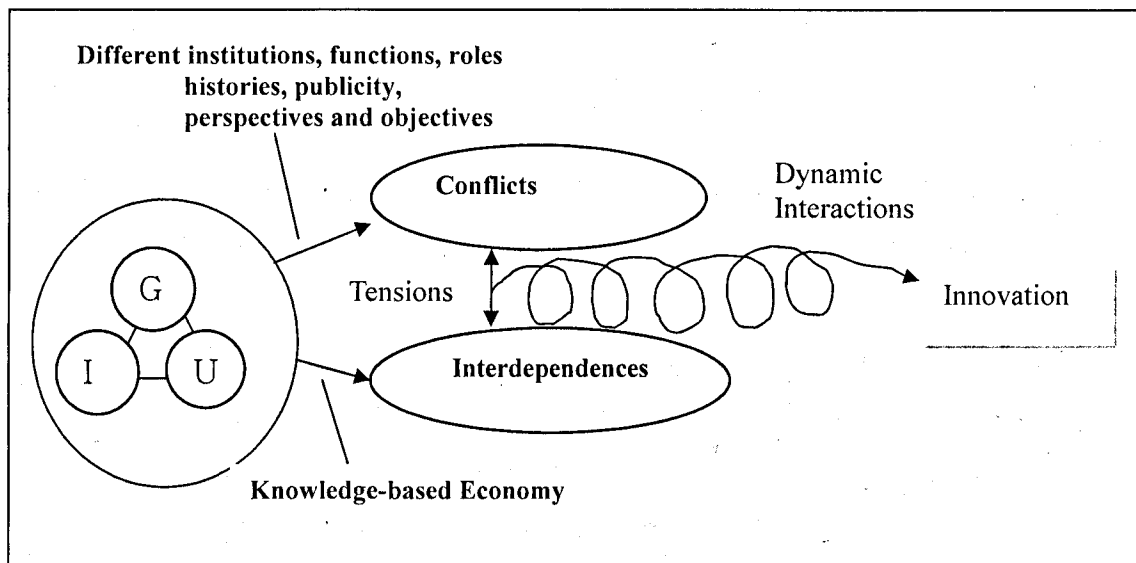
Under certain circumstances, the university can take the role of industry, helping to form new firms in incubator facilities. Government can take the role of industry, helping to support these new developments through funding programmes and changes in the regulatory environment. Industry can take the role of the university in developing training research, often at the same high level as universities. (p. 3)

In these transformational and interdependent processes, government, industry and university become closer, and increase their interaction to cope with the changing environment. However, the closer the interaction becomes, the more tension emerges from different institutional interests. Interactions between different perspectives are complex because the participants of the three institutions are related to different system references. All three helixes develop a partial perspective, and they are reflectively aware of doing so. The result of overlap and interaction between the three institutions cannot be completed, because the tensions caused by the partial

perspective and cooperative interactions remain, which can drive another change that is a part of ongoing transition process (*ibid*). This model also explains that ‘*the tensions need not to be resolved*’, because a resolution would prevent the dynamics of interactions among its subsystems (Etzkowitz & Leydesdorff, 2000, p. 119).

In the Triple Helix Model, there are different explanations of the tensions such as; ‘the frictions between the partial perspective and cooperative interactions’ (Leydesdorff et al., 2001, p. 16); ‘the process of dissensus and consensus formation’ (*ibid*, p. 9); and finally ‘the edges of fractional differentiations and integrations’ (Etzkowitz et al., 2000a, p. 119). These different explanations are overall connected to on the one hand the conflicts being applicable to the first of each point of terms, and on the other hand the interdependences being applicable to the second terms.

Figure 5.3 Analytic Framework Two: The dynamics of interactions and tensions driven by conflicts and interdependences



Source: Author

With the above considerations, Figure 5.3 shows an analytic framework of the triple helix relations, which focus the dynamics of interactions driven by conflicts and interdependences. Analysing the tensions between conflict and interdependence may support the understanding of the nature in the dynamic interactions of universities in response to government policies. At this point, the second key question of the thesis is more specified (see Section 1.2.1):

- What tensions emerge in the localised practical process of interactions between universities, government and industry?

• **Interdependence**

Håkansson and Johnson (1993) explain the relations between interdependence and interaction with the network perspective that;

When two actors perceive their activities as being interdependent, they are inclined to start an interaction with each other. When exchanging, they learn about each other's capabilities and needs. As they learn, they utilize and strengthen the interdependencies of their activities. Thus, there is a circular causality between activity interdependencies and exchange relations. (p. 40)

With the emergence of the knowledge-based economy, interdependence between university, government and industry becomes inevitable. Therefore, the interdependence can be regarded as a crucial factor to explain and understand the localised learning and interactive relations between regional stakeholders.

The term interdependence, simply defined, means '*relations of mutual dependence*', and it refers to situations characterized by reciprocal process among organisations or actors (Lee, R. 2000, p. 402). There are mainly two issues concerning the definition of interdependence (Keohane, et al., 2001, p. 7-11). Firstly, whether the term interdependence is limited to situations of mutual benefit or cost-effective? Secondly, whether interdependence includes asymmetry as well as symmetric mutual dependence. In this thesis, the purpose of using the concept of interdependence is to identify the nature of interactions rather than arguing about the characteristics of interdependence in itself; thus a broader definition may be chosen. The term interdependence of this thesis includes mutual benefit and cost-effectiveness, and symmetric and asymmetric dependence. Accordingly, in this thesis, interdependence will be used as an analytic concept to identify and understand the nature of cooperation and collaboration between actors or organisations. It can be found through the interviewee's expressions and the interpretation of these.

• **Conflict**

The growth of interdependence inevitably generates disharmony and conflict, because relationships should not be viewed as entirely cooperative. In every relation,

there are not only common interests but also conflicting interests between participants (Håkansson & Johnson, 1993). In some aspects, relationships between participants can be considered as a cooperative process of handling their conflicts (Axelrod, 1984). In the triple helix relationships, the conflicts emanating within each helix and between helices are not always being interpreted as negative, moreover, it may be viewed as a sign of change from a positive perspective. Without evidence of conflict, it is more likely that the spheres are operating at a distance (Etzkowitz, 2003; Etzkowitz et al., 2000a).

The term conflict is simply defined as '*a situation involving struggle among two or more protagonists*' (Johnston, 2000, p. 105). Conflict will be used as an analytic concept to identify and understand disharmony and discontent between actors and organisations. In this thesis, the data expected to show conflicts are collected from interviewees' direct and indirect expressions of their discontent of being involved in the relationships with the actors and organisations. The counterpart of disharmony and discontent can be not only the specific behaviours of individual actors, but also organisational or institutional actions; for instance, a university's member of staff may be discontented with a certain specific government policy which creates new relations between university and industry.

The notion of conflicts in this research includes both healthy conflict and disruptive conflict, because both of them can have an effect on the changes of the interactions. With relation to the term 'a conflict of interest', which is increasingly used at university as the functions of universities change. With the issues of managing research results and cooperation with industry, the issues of conflict of interest are more disputed. For example, it can be viewed a conflict between 'internal values' (university) and 'external values' (economic) (Etzkowitz, 2003, p.116). Accordingly, the notion of conflicts in this research includes conflicts of interest, because conflicts of interest are viewed as a disharmony happening within institutions.

5.3.4 The Triple Helix Relations and Regional Boundaries

This thesis is particularly interested in the spatial processes of universities' interactions with others as stakeholders in the regionalising knowledge economy.

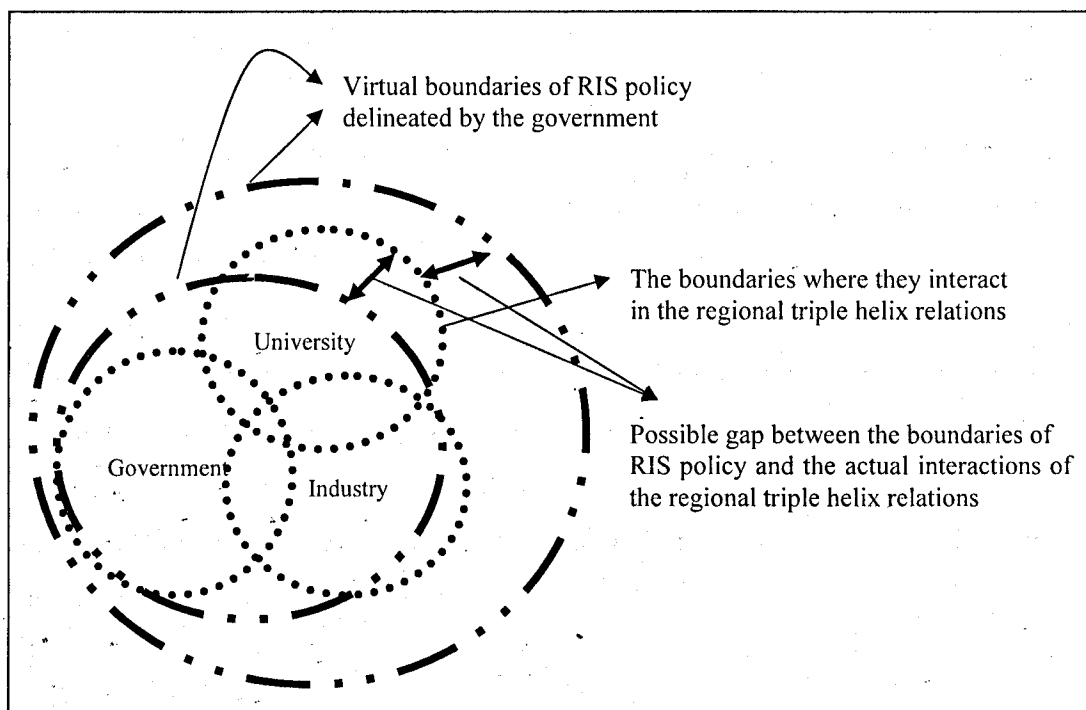
Universities are not discrete entities. They are separate from, but interact with many different types and levels of communities such as the local, regional and global level (Charles, 2003). Therefore, an important methodological issue is to identify a spatial boundary for a university's interaction in doing this research. This research will not follow any pre-definition of regions or spatial boundaries for the universities' engagement.

However, it will try to empirically identify the actual boundaries where universities interact in the localised interactive processes with a specified question of the third key question (see Section 1.2.1):

- What is the gap in the identification of regional boundaries between the regional triple helix relations and the RIS policy?

This research, firstly and for the sake of convenience, uses administrative regions as a geographical unit, mainly because public policy is generally implemented according to administrative regions. Through fieldwork, it will try to identify the regional boundaries universities engaging, and to understand the mechanism of universities' identification of their communities.

Figure 5.4 The gap of boundaries between the RIS policy and the regional triple helix relations



Source: Author

Accordingly, by examining the boundaries of the regionalized triple helix relations explaining functional spheres, this thesis explores the possible gap between the boundaries of RIS policy and the actual interactions of the regional triple helix relations, as in Figure 5.4. There are two reasons both theoretical and practical why this research attempts to empirically construct the regional boundaries of universities interactions in the engagement of the cooperation.

Theoretically, this is a method to recover the gap between RIS and the Triple Helix Model. The concept of regional innovation system is grounded in geographical issues, but the Triple Helix Model emphasises functional relations between different institutions originally based on structural functionalism (Leydesdorff, 2005). The gap emerged from two theories in terms of the perspective of geographical space: RIS needs any territorial area as a boundary for innovation system, whereas, the Triple Helix Model concentrates on functional and communicative relations between three helixes regardless of a specific territorial boundary. However, by using the above framework, the gap emerging between the two concepts becomes an advantage to examine and identify the boundary of universities' interactions in RIS building. This is because the boundaries universities actually engaging may be identified through investigating the interactions with government and industry using the Triple Helix Model as an analytic tool.

Practically, the two administrative regions selected are different upper-level local autonomies; however, the two regions shared an economic and historical consensus in which various industries are highly connected to each other and Daegu City was separated administratively from Gyeongsangbuk-do Province in the early 1980s. The characteristic of two regions will be helpful to identify and understand the issue of boundaries in RIS and cross-border collaboration between stakeholders from different regions. Moreover, this study deals with policy response, thus, universities' responses related to their administrative boundaries and the RIS policy may be viewed as an interesting point.

5.4 Research Method

Reflecting the analytic framework based on the triple helix relations, it can be said the methodology of this thesis should be sensitive in order to describe and explain the dynamic and ongoing interactions of regional universities. Therefore, it seems that qualitative methodologies are suitable for the empirical analysis of this research. As opposed to the quantitative approach which seeks to generalise and simplify the complexities of organisational contexts by drawing on standardised measures, the qualitative methods of analysis are based on an understanding of knowledge situated in individuals and groups (Silverman, 2000). Qualitative methodology is useful as:

A systematic, empirical strategy for answering questions about people in a bounded social context, and ... a means for describing and attempting to understand the observed regularities in what people do, say, and report as their experience. (Locke et al., 1993, p. 99)

Qualitative methodology is mainly used in this research in order to obtain rich descriptions and explanations of interactive processes occurring through certain policies and within institutional context. This research tries to understand the underlying meaning of the university's outward behaviours and responses, thus, it is a necessary communicative method with the individual members taking part in a dynamic interactive process. Qualitative methodology may support the validity of this research rather than quantitative methodology. In other words, the in-depth interview could be more helpful to ascertain of the causality between policy and the responding process accompanying dynamic interactions rather than a quantitative survey.

Based on the above methodological considerations, this section discusses the method used in this research by exploring the questions: in what processes are the universities selected? What is the time period of the research? How are interviewees selected and how are interviews carried out? What are the secondary sources of information and how are they dealt with? And how is the collected data analysed?

5.4.1 The Selection of Universities

In research, sampling and selection are viewed as principles and procedures used to identify, choose, and gain access to relevant units used for data generation. In most of the qualitative research, the principles and procedures are governed by alternative underlying logics, although the term 'sampling' and 'selection' are very often associated with a logic derived from the general laws of statistics and probability (Silverman, 2000). In this research, in order to establish a reasonable and logical principle, five factors are considered: the experience of policy engagement; the foundation year; the location; the number of students; and whether the institution is a national or private university.

■ **The experience of policy engagement**

The experience of universities' engagement in university-industry cooperation policy is the first consideration in the selection of universities for this research. This is because not all of the twenty-three universities may be interested in, and there may also be diversities in abilities for the process of knowledge transfer in regional innovative development. In order to identify the degree of universities' motivation and abilities for knowledge transfer, the policy experience of regional universities for the last ten years (1994-2003) is used as criteria to identify the extent of policy engagement. Eleven policy programmes for university-industry cooperation were considered, and are outlined in Table 6.1. These programmes have been viewed as a major policy for the cooperation since 1990. During from 1994 to 2003, the number that each university engaged in the eleven programmes was calculated. Seventeen universities out of twenty-three have participated in, at least, one programme, and six universities had no relation to these eleven programmes for those times, which is seen in the first column of Table 5.2. Universities with a different degree of policy engagement are considered in selection processes.

■ **The age of the universities**

The foundation year of the universities is considered to reflect the temporal dimensions of universities' histories. The age of the universities is considered an influence on their engagement in regional innovative development, because there is a relative difference between old and new universities in their strategies of the cooperation.

Table 5.2 Policy engagement of regional universities and other characteristics

No.	Universities	Founded	Location	Students	Remark
9	Kyungpook National University	1951	Daegu	27,137	National
8	Yeungnam University	1947	Gyeongsan	32,882	
6	Pohang University of Science and Technology	1986	Pohang	1,785	
5	KeiMyung University	1954	Daegu	30,539	
5	Daegu Catholic University	1953	Gyeongsan	18,873	
5	Daegu University	1956	Gyeongsan	26,414	
4	Gyungil University	1985	Gyeongsan	8,056	
4	The Kumoh National Institute of Technology	1979	Gumi	9,318	National
3	Andong National University	1979	Andong	10,107	National
3	Daegu Hoony University	1980	Gyeongsan	8,119	
3	Uiduk University	1995	Gyeongju	4,597	
2	Dongguk University	1978	Gyeongju	13,078	
2	Dongyang University	1993	Yeongju	5,762	
2	Handong Global University	1994	Pohang	4,543	
2	Kyungwoon University (Industrial Univ.)	1996	Gumi	7,130	
2	Sangju National University (Industrial Univ.)	1921	Sangju	7,994	National
1	Gyeongju University	1987	Gyeongju	8,663	
0	Asia University	2002	Gyeongsan	306	
0	Daegu Arts University	1996	Chilgok	1,678	
0	Daegu University of Foreign Studies	2002	Gyeongsan	219	
0	Kaya University	1992	Goryeong	2,936	
0	Taeshin Christian University	1996	Gyeongsan	916	
0	Youngnam Theological College & Seminary	1993	Gyeongsan	721	

* PE (Policy Engagement) refers to the extent of engagement in university-industry cooperation policy in each university during 1994-2003, and the number means that the number of the engaged policy among ten policies seen in Table 6.1.

Sources: Compiled by Author

■ The size of the universities

The next consideration was the size of university. Yet a major difficulty is what is the most important factor in deciding the size of a university: the number of faculties

or department, the number of academic staff, the number of current students, or the amount of its budget. This thesis considered the number of current students as the criteria of size, because in Korea, universities cannot freely decide the student quota. Therefore, the number of students can be seen as an indication of the result of the universities' capacities.

■ National or private university

As discussed in Chapter Three, in Korea there are differences between national and private universities in many aspects such as internal and external governances and the sources of the financial revenue. Therefore, the two different kinds of universities are an important consideration in the selection process.

■ Geographical location

It is generally assumed that the universities interactions with their societies have been influenced by their geographical locations, thus, in the selection of universities, the location of universities is considered in two aspects. One is the geographical distribution of studying universities in two administrative regions; at least one university should be selected from Daegu area. The second is the consideration of the specific areas which may be viewed as playing an important role in the economic and knowledge infrastructures of the regions, such as Gumi city where the total value of shipments in manufacturing of Gumi NIC amounts to 47.4% of the total for Gyeongbuk province, and Gyeongsan city where nine universities are situated. The second condition originates from the assumption that the regional universities may respond to specific local demands. Figure 3.5 outlined the location map of universities in two regions.

Taking into account the above factors, the last point is the number of universities to be selected for empirical work. If they are too many, it is difficult to study empirically owing to limited resources and time. But, if they are too small, it also hinder from drawing generalisation and comparing between them. Moreover, as mentioned earlier, this research uses qualitative method, and examines interactive relationships between universities and other institutions. Thus, it is critical to decide proper number of universities for empirical work, with reflection on not only the diversities of universities and but also the objective and method of this thesis. As

seen in Table 5.2, four universities amongst twenty-three regional universities were selected, considering the diversities in the five factors and the practical and methodological consideration for empirical study. They are: *Kyungpook National University (KNU)*, *Yeungnam University (YU)*, *The Kumho National Institute of Technology (the KNIT)* and *Handong Global University (HGU)*.

5.4.2 The Time Period

In an innovation system with in-built feedback mechanisms, the configuration of interaction is constantly changing. A snapshot of the interaction at a particular point in time may be substantially different from another snapshot of the same relations at a different time. Therefore, the time period of the research in a certain innovation system is an important consideration and should be exactly defined.

The beginning of this research is dated from 2003, which was chosen as it is based on the implementation of new university-industry cooperation policy to promote RIS development. 2003 is an important year regarding the universities' role in Korea. The new Korean government, the 'Participatory Government', formed in February 2003 suggests balanced national development as a main national agenda, and RIS building was selected as a strategy to overcome national disparities. Moreover, it put regional universities at the centre of RIS building. As this government emphasises the knowledge-based economy and the shift of Korean economic constitution from factor-driven to innovation-driven development, it is considered that regional universities should play a central role in RIS building. Many cooperation policies were separately implemented by some ministries of central government before 2003. However, this new government approaches were comprehensive, for instance: PCONBD (The Presidential Committee on National Balanced Development) was placed under the immediate control of President, and assumed the comprehensive propulsion of RIS policy at the national level, and it coordinates RIS policy among ministries: The main ministry to promote university-industry cooperation also changed from MOST (the Ministry of Science & Technology) and MOCIE (the Ministry of Commerce, Industry and Energy) to MEHRD (the Ministry of Education and Human Resources Development).

However, it is impossible to separate the situation of 2003 from that of previous years. Even though the new government started in 2003, there would be a continuance of institutions and governance structure from the previous time. Therefore, this research considers pre-2003 as a background context; for instance, in the case of the higher education system, it is dealt from the end of 19th century; the experience of cooperative policy in regional universities have been looked at from 1994.

5.4.3 Interviews

With respect to qualitative interviews, five discursive issues were found in doing this research such as: the selection process of interviewees; the order of interviews; the repeat interviews; arranging and doing interviews. Each is discussed in turn.

■ The selection process of interviewees

Table 5.3 Interviewees: groups and numbers

Groups		Interviewees	No. of Interviewees
Universities	KNU	The leader of the Planning Offices, the NURI Project, the CUCI Project, the IACF, the Business Incubators, etc.	9
	YU		6
	KNIT		5
	HGU		5
	Others		3
Firms		CEO or Managers	11
Government Authorities		National, Regional and Local Authorities	10
Technology Parks and Others		The Director of Technology Parks, Gumi National Industrial Complex, and the regional branch of SMBA	6
Total			55

Source: Author

A key purpose of research method in this study was to generate as rich a description of the interviewee's subjective experience of the interaction as possible. Semi-structured in depth interviews were selected as the principle method. In order to cover the universities' responses and their interactions with governments and firms as much as detail as possible, interviewees were sought from the four categories: university staff; firm managers; government authorities; and staff of Technology

Parks and others. The interviewees within each group were selected in two ways; one is pre-selection, before fieldwork started, depending on the position of interviewees; the other is a heuristic approach that suitable interviewees were found through interviews and secondary data. Table 5.3 shows the number of interviewees and groups. These interviews were carried out between April and August 2005 in Gyeongbuk, Daegu and Seoul of South Korea.

The selection process and characteristics of interviewees in each group are as follows:

• *universities' staff*: the Dean of the Planning Office, the leaders of the NURI and CUCI Projects, the leaders of the IACF and the Business Incubator in each university, were pre-selected before fieldwork started. The reasons for their selection are as follows:

- The Dean of the Planning Office was selected to examine the university's overall strategy in response to the policy and to identify its general mission.
- The leaders of the NURI and CUCI Projects and the IACF were selected to investigate their responses and interactions with inside and outside institutions. There was also a plan to examine the organisation of the IACF and the qualification of its members.
- The leader of the Business Incubator was selected to examine the relationship between the Business Incubator as one of the knowledge transfer institutions inside university and the IACF, and how their relationships has been changed after the policy programmes were implemented.

Not all the four universities had positions in all five. Only KNU (Kyungpook National University) takes part in the CUCI programme, and HGU (Handong Global University) has not joined the NURI programme. In HGU and YU (Yeungnam University), the Planning Office and the IACF were integrated, and operated under one leader.

During the interviewing process, the number of interviewees was extended through a heuristic way to meet more proper interviewees and to reconfirm some contested points. The first case of extension is related to the role and function, and the

organisational characteristics of the IACF, which cannot be fully examined by the interview of one person, its leader. Therefore, five directors of the IACFs in KNU (3), YU (1) and HGU (1) were interviewed additionally. Secondly, HGU was not fully engaged in the policies, so the number of interviewees was too small to understand the characteristics of this university. One more professor with a great deal of experience in cooperation projects with firms and governments, was introduced by both the Dean of the Planning Office and the head of the Computer Science & Electronic Engineering Faculty, and was interviewed. Thirdly, in order to capture the opinion of department/faculty level with relation to university's recent behaviours, the head of the engineering faculty/department in each university was interviewed. These interviews also helped to understand their interactions in the CCIs (Contracted Courses with Industries). Fourthly, to investigate in detail the collaboration among universities, three professors from non-selected universities were interviewed. They were selected by the references in the unpublished document produced by Gyeongbuk and Daegu Regional Government, which contains information about the managing and complementary universities in the NURI programme.

● *firms*: firms were divided into two groups as follows;

- firms directly involved in the policy: these firms were selected to examine their interactions with universities and governments with relation to the policy programmes;
- firms indirectly involved in the policy, and placed in universities' Business Incubators or regional Technology Parks: they were selected to examine the relationships between these firms and the IACF of universities and to investigate how their relationships with universities and government have changed since the policy was implemented.

The firms directly involved in the policy of the NURI and CUCI programmes, and the CCIs (Contracted Courses with Industry) were firstly considered as a group to be interviewed. The firms indirectly involved in the policy were regarded as a second group interviewed, in order to capture the changing interactions between them and the universities or their IACFs.

Business Incubators within each university and the Technology Parks closely located in each university were selected as the sub-groups of firms indirectly involved in the policy. There were three main reasons to select Business Incubators and Technology Parks as the sub-groups to be interviewed. Firstly, all four universities had in-house Business Incubators, and three Technology Parks were geographically close to the three universities, except for the KNIT (The Kumoh National Institute of Technology). This characteristic makes it easy to construct the research design that can examine the four universities together in this issue. Secondly, the purpose of the interview with these firms was to capture the changing behaviours of universities in response to the policy in terms of interactions with the firms; thus firms with experience in relations with universities could be suitable interviewees. The firms in Business Incubators and Technology Parks would have more possibilities in contact with universities than any other groups of firms. Thirdly, the research of firms located in Business Incubators and Technology Parks would help to identify the extent of the university's interactions in terms of the triple helix relations. Through examining the relationships between Business Incubators/Technology Parks and the university, their possibilities as hybrid-organisations may be investigated.

Even though the above groups and sub-groups of firms were decided on interview, the selection of individual firms within the group was one of the most difficult processes in the fieldwork design. Thus, it remained to be decided by doing fieldwork. During the fieldwork, five firms engaged in the government programmes were selected using information given by the interviewees in each university and regional government. The number of interviewees was five, which was less than the expected, ten. This was because a small number of firms were directly engaged in the policies, and some of them cooperated with two or three universities at the same in different programmes, for instance: Samsung Electronics cooperated with all three universities in the NURI programme and the CCIs (Contracted Courses with Industry); Maxan Co. was engaged in the CUCI programme with KNU and the NURI programme with YU; LG Electronics collaborated in the NURI programme with KNIT and the CCIs with HGU. This overlap and the small number of firms helped in the selection of firms for interview and to compare different responses from universities.

Firms for interview in Business Incubators and Technology Parks were selected by the recommendation of the head or director of the institutions. The chosen firms were required to meet the following conditions;

- the firm has been involved in Business Incubators and Technology Parks for more than two years, because this term is essential to identify the changes of universities' interactions when comparing before and after the policies were implemented.
- the firm has currently relations with one of the four universities such as a technology consultancy or using equipment or facilities of the university, otherwise it has previous experience with this type of relationships.

Using these processes of selection, total six firms (three from Business Incubators and three from Technology Parks) were interviewed. One firm (Sense & Sense Co.) from KNU's Business Incubator is also based in Taegu Technology Park, thus the number of firm in Business Incubators is not four but three.

Amongst a total of eleven firms, only two (Samsung and LG Electronics) are large firms, and the others can be viewed as SMEs. A specific interviewee in all these firms was selected by information given by the leader of the NURI and CUCI Project, and the head or director of Business Incubators and Technology Parks.

- *government authorities*: the eleven government authorities who were responsible for university-industry cooperation or regional innovation system building were interviewed. An important consideration when accessing the government authorities was the level of interviewee in the hierarchy, which was related to which rank has the appropriate knowledge that the researcher wants. This research selected a middle rank government officer working as the director of the division or team, because the purpose of the interview was to examine the interactions between different institutions rather than the policy decision process. But, in the PCONBD (The Presidential Committee on National Balanced Development), a comparably high-ranking officer was interviewed, because it played a role in decision-making and coordinating process at the top of the administrative process of the policy

Two regional and three national authorities were pre-selected before fieldwork, which was based on their positions shown on an organisation chart. However, during

the interviews, the number of interviewees was extended for mainly two reasons; firstly, owing to the personnel changes during the last one and half years, the predecessor should be interviewed; secondly, in particular, at regional level, there were some anecdotal evidence concerning the interacting process between regional universities and regional government. Some of this information needed to be confirmed by the other officers, and some needed more detailed facts from their colleagues.

In South Korea and research regions, the university-industry cooperative policy mainly relates to regional level (upper-level local government) rather than local level, thus the local authority (lower-level local government) was excluded in the interview design. However, a local government officer in Gumi City was interviewed, because, during interviews, it was found that Gumi City had somewhat different relationships with universities than the others.

- *technology parks and others*: Technology Parks, SMBA (Small & Medium Business Administration) and Gumi NIC (National Industrial Complex) were indirectly involved in the policy programmes, but they were closely related to the university-industry cooperation in the regions. Departmental directors of three Technology Parks were interviewed to investigate their changing relations with universities, to examine the shift of their roles near to hybrid organisations and to ask for their opinions in recent universities' responses and interactions. The regional office of SMBA, and the office of Gumi NIC were selected in order to examine their opinions and perspective looking into the current relationships between universities, governments and firms.

■ The order of interviews

In order to approach to the interviewees suitably and effectively, the order of interview among the above four groups and within each group was considered, which could minimise repeat interview and help to quickly make sense of the precise meaning and context of the interviewees' narratives. The interviews for this research proceeded in the following the order: firstly, regional government officers; secondly, the member of the universities, firms and Technology Parks; and lastly national government officers. This sequence was constructed in order to identify as early as

possible the overall structure of the responses and interactions and to acquire the secondary data from suitable person in proper time schedule.

Regional government officers were firstly interviewed. It was assumed that, among the three regional stakeholders, they would have more comprehensive information concerning the policy implementation and reaction to it, rather than the other two. This is mainly because the secondary data (such as the list of applicants, budgets, and matching fund) collected from them would be useful to the overall performance happening in these regions compared to the other institutions.

The next groups of interviewees were the four universities, firms, Technology Parks and others. There was no sequential order among the four universities, and it was not processed as university by university; however, at each university, the Dean of the Planning Office was interviewed firstly in order to identify the university's overall strategy in response to the policies, before research at each university was carried out. Interviews of firms and Technology Parks were processed without any sequential order, but, interviews of firms were possible after the related interviewees (introducers) were interviewed.

The national government officers were interviewed lastly. This is because of the possibility that some new issues or arguments with respect to the gap between the purpose of the policies and the actual reality, might be generated after interviews with regional stakeholders.

■ Repeat interviews

Repeat interviews were used to more deeply examine the emerging issues that had been touched upon in the first interview. As mentioned earlier, some anecdotal evidence was found in the responding process between regional universities, and between regional universities and governments. This information was not collected fully in the first interviews, and was confirmed by the subsequent interviewees. Three interviewees were re-interviewed, which are seen in Appendix C.

■ Interview questions

Most interviews covered the similar topic of universities' responses and interactions with a specific focus on the role and position played by each interviewee. In order to identify the degree and nature of universities' interactions between government and firms, these subject areas were as follows:

- the interviewees' experience with relation to each specific government programme in terms of interactions with government, industry and other universities.
- the interviewees' perception (including changed perceptions) the policy programmes implementation.

A further issue about regional boundaries was identified as:

- the interviewees' identification of their regional boundaries regarding RIS building
- This is used to understand regional boundaries between the prescribed boundaries by the policy programmes and the real identification of the actors.

A sample of interview questions is attached in Appendix D.

■ Arranging and conducting interviews

Interviews were arranged by electronic mail and telephone. My position as a government officer in Gyeongbuk Provincial Office, my current study for a PhD in England, and the purpose of the interview, were explained to all interviewees at this point. This helped me access the interviewees, yet had the disadvantage of potentially generating a bias in that the interviewees may be inclined to portray a government-friendly attitude. However, the alternative, hiding researcher's occupation can create an ethical issue. The reasons for this method will be discussed further later.

On arrival at the place of interview, the purpose and methods of the research was explained in some more detail to the interviewee. Most interviews were tape-recorded with their permission. During some interviews, the interviewees wanted to turn the recorder off, and sometimes, the researcher intentionally turned off the recorder in order to encourage the interviewees to talk more frankly and comfortably. Notes were also made whether the recorder was on or not, so as to capture non-verbal aspects such as body language which would help to understand the nature of interviewees' responses.

5.4.4 Secondary Sources

The second source of data was documents, which was extensively used in undertaking research design, empirical research and in the data analysis. In the research design, data available from official websites in the related institutions was mainly used, partly because of the difficulties of accessibility of offline data due to the distance between the research area and the study location. The official website of the institutions had enough data needed for research design. During fieldwork, offline data was widely collected from interviewees and their institutions. In the analysing process, these online and offline data were used extensively to understand and identify the policies themselves, the universities' responses to them, and the interactions between the three helices.

These online and offline data can be classified into four groups depending on their institutional sources, and their collection and usage are as follows;

- *Government documents*: these were collected from national government bodies such as the PCONBD, the MEHRD, the MOCIE, and the MOST, and from the two regional governments. The PCONBD had produced two substantial publicity documents related to RIS building and university-industry cooperation, which became a benchmark for the ministries and regional governments in those policies - the National Agenda for Balanced National Development (2004) and The Evaluation Report of the Performance in National Balanced Development Project (2005). These were used to understand the basic policy direction and implication for the RIS and university-industry cooperation, and its perspective of the current performance of the policies. The MEHRD, the MOCIE and the MOST had posted some documents directly and indirectly related to the four policies in their official internet website, such as the Annual Year Book, policy brochures, policy plan and announcement. These helped to identify the history of university-industry cooperation, and to more deeply understand the conditions and objectives of each policy. However, regional governments had not formally published their documents, either on the website or on paper, concerning the four policies, so documents were informally collected from interviewees, such as:

- The Budget and Performance of the NURI Programme and its Matching Fund, August/2004, Daegu and Gyeongbuk
- The list of Applicants in the NURI programme (Classified by universities and Project Size), August/2004, Gyeongbuk
- The information of the IACF and NURI programme in regional universities, 2005, Gyeongbuk

These government documents were used in order to analyse the universities' responses to the policy programmes and to identify overall features of the policy in the research regions.

- *Secondary data from universities*: two kinds of secondary data were collected from four universities. The first is the general information of each university such as the university's mission and statistic data from the Annual Year Book, the university's official website and brochures. The second is the specific information concerning the four policies, for instance, the memorandum and organisational map of the IACFs, and the regulation of intellectual property, which were collected from interviews and the website of each university and project team. These data were critically used in the process of the empirical data analysis.

- *Secondary data from firms*: basic information such as the year of foundation, the type of industry and annual sales figure in each firm was collected from its website. These data were analysed to investigate relationships between the characteristics of firms and their interactions with universities.

- *Secondary data from Technology Parks and others*: the Planning Papers (2003, 2004 and 2005) in each Technology Park containing all the projects of those years were collected in the interviews. This paper was used to identify the changing role of Technology Parks with relation to the new policies.

In order to capture new events related to the policy programmes, newspapers were also searched, for example, the national papers, *Chosun Ilbo* and *Hankyereh Shinmun*, and the regional papers, *Maeil Shinmun* and *Yeongnam Ilbo*. The list of secondary data is in Appendix E.

5.4.5 Analysis

As noted in the above section, the majority of the interviews were tape-recorded with the intention of transcribing them. The verbal data from the interviews was transcribed from the tapes, which basically involved typing the conversation as it proceeded. After finishing the transcription, every sentence and paragraph of the descriptions was labelled with a tag identifying the interviewees at the end, and then, these descriptions were organised through specific themes, such as each university, policies, and stages in the four developmental processes of the Triple Helix Model. Microsoft Word Programme was used for these processes. Once the data was organised, they were reviewed from the viewpoint of each theme or question.

'Mapping' was used as the main method for analysis. Each of the themes for analysis, such as the four universities, the four policies and the four developmental stages, was looked at separately at first and then in relation to each other. Links were then made between related stories, events, topics, contacts, etc., which were largely drawn from the various sources developed from the literature review, the qualitative and secondary data. This facilitated the understanding of the complex reality concerning responses and interactions and the identification of the characteristics of them. An example of 'mapping' is attached in Appendix F. The final step of the analysis brought together the issues outlined in the research questions and literature review, with empirical findings, in order to provide a practical and theoretical contribution to the concept of RIS and the role of universities in it.

The language used in the fieldwork (Korean) and the thesis (English) was different. This language gap was inevitable. A difficult issue was in keeping the original meaning when the fieldwork data was translated into English. It seems that there was no easy answer of the question of when is the optimal time for translation. In this research, a large amount of data from the fieldwork was produced. If all these descriptions were translated into English, there would be more risk of distortion from the original meaning than from a small amount. Therefore, in this research, the translation was conducted at the final step of analysis, so as to minimise mistakes in

translation and to decrease the amount of time that was spent in the translation process.

5.5 Ethics and the Research Framework

5.5.1 Ethical Issues

There can never be any absolute guidelines as to the ethical validity of a particular research strategy (Mauthner et al., 2002). However, the nature of the research required a profound and ongoing recognition of research ethics and politics mainly during data collection and analysis. This awareness encompassed the need to reflect on how the social characteristics of the researcher may shape the processes. In particular, as this thesis deals with government policy, the occupation of the researcher as a regional government officer may influence the processes of data collection and analysis.

With regard to data collection, this ethical issue is related to power relations between the researcher as a policy maker and the interviewees from universities and firms as a policy user. This relationship is not prominent because central government initiates the policy, rather than regional government where the researcher works. However, they are enough to be aware of the ethical implications. In the line of thinking, the following issues are mainly considered in the process of accessing and interviewing.

When contacting in interviewees to make an appointment for interview, the information about the researcher (including my official grade as a regional government officer and currently studying in the UK) and the research objectives was briefly outlined to them. This made easier to attain their consent for interview, mainly because of the occupation and official grade of the researcher. However, it was expected, in interviewing, that the interviewees may be temperate in answering the interview questions because of the formal position of the researcher. Therefore, before asking questions, the motivations and objectives of the research and details of my current PhD course in a UK university were fully explained to the interviewees.

In addition, with respect to the identification of individual interviewees, it was promised that in the thesis their positions including their institutions, with exception

for their personal names, are used. However, in the case that the research results are later published, the interviewees' anonymity would be protected. This agreement made them more feel comfortable about speaking on the topics.

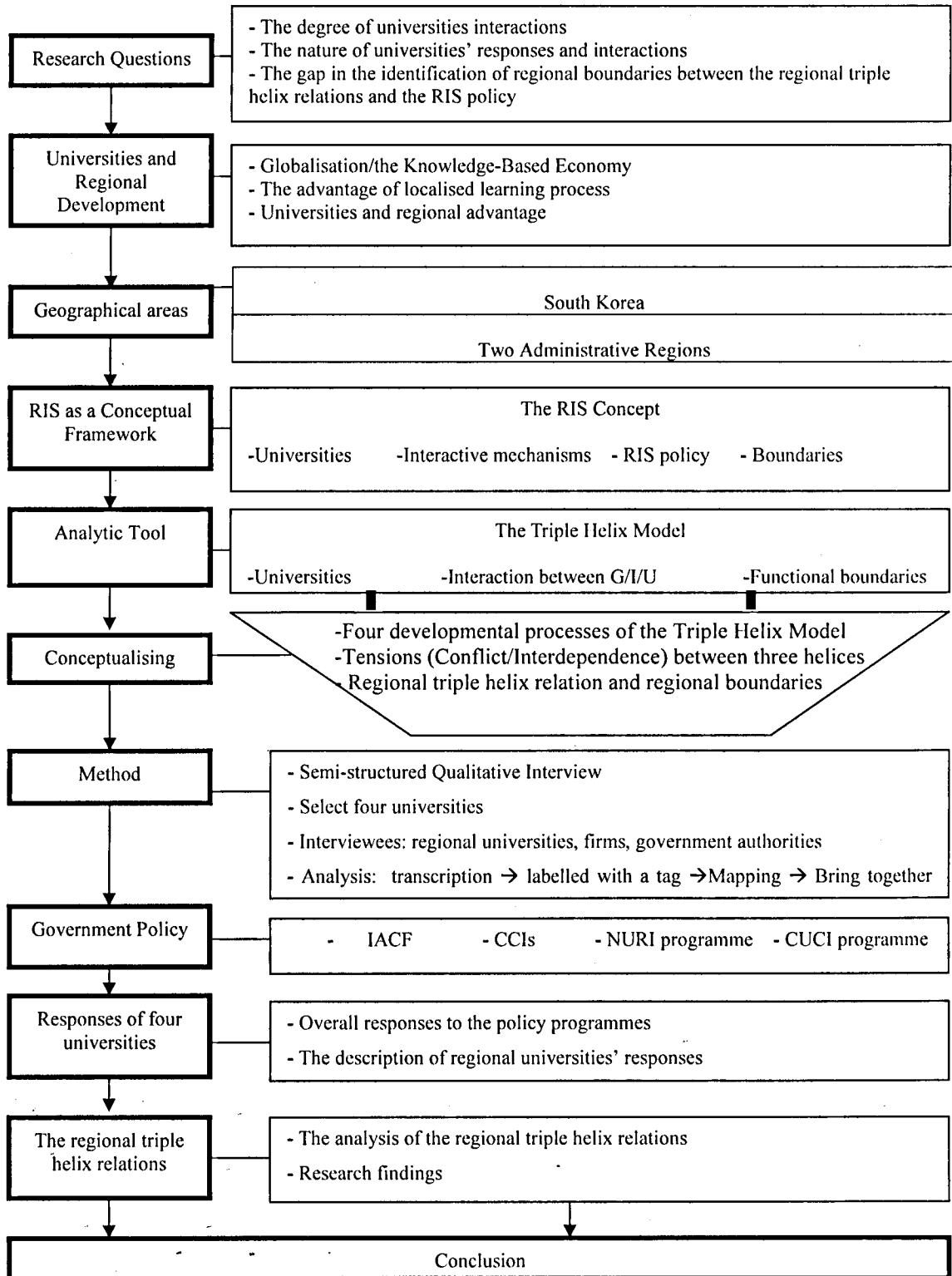
Furthermore, it is noted that face-to-face data generating methods such as qualitative interviewing can encourage the development of interpersonal relationships between the researcher and the interviewees. A high degree of trust and confidence between the two may prevent the interviews from ending up 'chatting around the edges' of the structured questions (Mason, 1996, p. 166-7). In interviewing, the researcher tried to give more freedom to the interviewees, and some gossip helped to arouse sympathy and to recognise the common interests between the researcher and the interviewees on the issue of regional innovative development. In addition, it seems that my emphasis on the aim of the interviews as the field work for PhD thesis made the interviewees feel that they can speak 'honestly' and 'truthfully'.

During the analysis of the collected data, the autonomy of the researcher becomes an ethical issue, in particular in this thesis because of the occupation of the researcher. Even though a researcher has a responsibility to report interviewees as accurately as possible and to generate an analysis which does not misrepresent the process, it seems that within a non-positivistic paradigm there is no clear boundary between interviewees' reports and the researcher's interpretations (Mason, 1996; Mauthner et al., 2002). In this thesis, the qualitative data was carefully interpreted independently from the perspective of defending or backing up regional government policy of where the researcher works. The data was analysed critically and objectively to answer the research questions rather than the considerations of political questions about whose interests are served or damaged by the overall analysis.

5.5.2 Research Framework and Process

The research framework seen in Figure 5.5 explains the order and context of the thesis. Based on the methodological considerations in Chapter Six, the policy programmes will be analysed by using mainly secondary data. Chapter Seven will describe universities' responses to the programmes, and Chapter Eight will analyse the regional triple helix relations between university, industry and government.

Figure 5.5 Research framework and process



Chapter 6 RIS Building Through University-Industry Cooperation Policy

6.1 Introduction

This research sets out to examine the role of universities in RIS (Regional Innovation System) development, in particular, with relation to the issues arising from their interactions with industry and government in response to national policy. The previous chapters discussed the literature relating to the theoretical concept of this thesis, and explored analytical frameworks to investigate it empirically.

Taking into account the theoretical and analytical frameworks, the purpose of this chapter is to explain and analyse government policy which prompted the interactions of regional universities which this thesis later examines. This chapter links the literature and the empirical research by providing a specific policy context grounded in South Korea.

Traditionally industrial and regional economic policies have been thought of as having a single aim to accelerate economic growth by providing the physical infrastructure for industrial development or attracting investors to the region (Cooke et al., 2000; Lundvall, 1999). However, as innovation has come to be understood as an interactive and socially embedded process, it is widely accepted that innovation policy should be designed to be more broad than has previously been the case, since the societal framework is imperative for the effects of the policy (Lundvall, 1999). From this point of view, this chapter will explore the historical characteristics of Korean UIC policy since the 1960s, and this investigation will help to identify the specific features of UIC in Korea and to throw light on the current UIC policy.

A critical policy change occurred in 2003; the new Korean government prompted RIS building to tackle the imbalance in national development between the Capital area and other regions. Its policy strongly emphasised UIC as a way to RIS building,

and it put regional universities at the centre of the policy. There are four main programmes to stimulate UIC: the establishment of IACF (Industry-Academy Cooperation Foundation), CCIs (Contracted Courses with Industry), NURI (New University for Regional Innovation) and CUCI (Central University for Cooperation with Industry) programmes. These new programmes attempt to change the role of universities and their engagement in UIC and regional innovative development by providing new regulatory framework and funding.

The first part of this chapter attempts to identify the characteristics of UIC and its policy in South Korea before 2003. The second part explores the rationale of policy change in 2003, and it analyses the main context of regional innovation policy. The third part examines UIC programmes suggested by central government as a policy tool for the construction of a regional system of innovation, and it also analyses the new UIC programmes compared to the previous programmes and from the theoretical viewpoint of a regional innovation system.

6.2 The Historical Overview of University-Industry Cooperation (UIC) in South Korea

Whether innovation is understood as radical or incremental, innovation cannot be totally divorced from its background and rationale. Cooke and Morgan (1998) highlight the evolutionary characteristics of the innovation system in that;

most innovations, either process or product, are small in systems impact and contribute to the slow evolution of the system within the framework of shared understandings, institutions, and culture. (p. 73)

This section will try to explore the historical processes of the development of UIC and its policy in Korea, which may explain the specific contexts of Korean UIC relationships and to identify the characteristics of the current policy compared to the previous one. The first part briefly sketches out the evolution of UIC and its policy from the 1960s to the 1990s. The second part introduces UIC policy implemented in the 1990s, and the final section provides a deeper analysis of these points.

6.2.1 The Evolution of University-Industry Cooperation in Korea

Korea witnessed several phases of industrialization between the 1960s and 2000, during which the importance and characteristics of UIC varied. In the 1960s, labour-intensive industry grew fast, and textiles, shoes and wigs topped the export rankings. In the 1970s, heavy and chemical industries such as petrochemicals, shipbuilding, automobile, and consumer electronics expanded their exports. In the 1980s and 1990s, technology-intensive industries such as semiconductors became the most important product in terms of their share of GDP (Park & Bae, 1996). In particular, following the foreign exchange crisis in 1997, the Korean economy has focused many of its efforts on promoting the development of knowledge intensive industries in order to cope with the changing world economic environment (Park S-O, 2001).

University-industry cooperation during the 1960s focused on the training of university students to equip them with the skills and management know-how that industry desired. University graduates were expected to assume a managerial position upon being hired and to supervise large numbers of manual workers. Industry was not capable of exploiting new ideas and knowledge; instead, it wanted graduates who could run factories. Most of the firms were more interested in technology transfer from the industrialized countries than promoting domestic R&D activities. Even in 1963, when the Industrial Education Promotion Act was passed, which became the basis of the PAIEIUC (the Promotion Act for Industrial Education and Industry-University Cooperation) which was revised in 2003, its support was limited to field-training for a practical education. An outstanding event in this period was the establishment of the Korea Institute of Science and Technology (KIST) by the government in 1966. It opened in 1969 when it played a central role in enhancing national technological ability, though its aim was the importation and domestication of foreign technologies, which would then be supplied to firms.

In the 1970s, the government and industry recognized the limitations of imported technology and the importance of domestic R&D activities to achieve a higher level of industrialization (Kim et al., 2000). However, firms did not have the resources to support in-house R&D investment because of the lack of accumulated capital. Thus, government supported research institutes took a lead role in improving industrial

technologies during this period (Park S-O 2001), and the role of the KIST also changed from a supplier of imported technology to firms, to a supporter of the creation of new technology through R&D activities. The government established five new research institutes through the Specified Research Institute Promotion Act. Furthermore, the master plan for the Daeduk Science Town was approved in 1974 to promote national R&D facilities. Most of the government supported research institutes were to move into this town, which became the centre of national R&D activities with about 8,000 doctoral scientists in 2004.

The changed role of the KIST and the government established research institutes shows the general forms of R&D activities in the 1970s. Private firms depended on these public institutions for their new technology rather than universities. In this period, the number of university students increased in the technical and engineering fields alongside the promotion of heavy and chemical industries (Park S-O, 2001). Even though UIC was not active in this period, university-industry cooperation had begun to develop (Kim et al., 2000). The Technology Development Promotion Act was passed in 1972, and it brought in new regulations such as the rule that a reserve fund for technology development could be allocated to university staff for cooperative research. The Korea Science and Engineering Foundation was founded in 1977, which aimed to promote university research through providing funds. Lastly, in this period, the government made co-operation between university, research institutes and industry mandatory, when large research projects were funded by the government (Kim H-K, 2002).

The industrialization policy during the 1980s and 1990s focused on the transition from heavy and chemical industries to highly technology-oriented industries. The transition implied that the main source of wealth was no longer machines and equipment, and new ideas and creative capacity became the key ingredient. Since the early 1980s, firms increasingly pursued technology development to cope with fierce competition in the international market (Park S-O, 2001). This led firms to invest heavily in their research and development. Many firms established their own R&D centres and significantly increased R&D expenditures. In 1980, only 54 firms, most of which belonged to a *chaebol* (i.e. Korea's business conglomerates owned and managed by founders and their families) had their own R&D centres. This figure

increased to 2,226 by 1995 as SMEs also began to establish R&D centres (Park S-O, 2001). As firms developed in-house R&D facilities, they did not need the university as their partner for technology transfer. In this period, UIC policy was limited to the government research projects that increased in line with 20 years of national economic growth and the increasing importance given to technological development. Large research projects by the government, such as the Specified Research and Development Project (1982) and the Technology Development Project for Industrial Infrastructure (1987), gave priority to the project team having the cooperation between university, research institutes and firms (Kim H-K, 2002, p. 41).

In the 1990s, the government emphasized UIC more than the previous period, as it became increasingly interested in the construction of a national system to enhance innovative economic capacities by way of technological development, and UIC was viewed as a crucial way to foster the national science and technology abilities. After the 1990s, the government produced various programmes for UIC, which are seen in Table 6.1.

In this period, UIC policy was extended to foster a physical infrastructure to provide combined supports for cooperation. In the early 1990s, the government programmes focused on cooperative research between universities and firms, such as SRCs (Science Research Centres), ERCs (Engineering Research Centres), and UICPs (University-Industry Consortium Programmes). However, from the late 1990s, the policy supported infrastructure for UIC, such as Technology Parks, Business Incubators, TICs (Technology Innovation Centres) and TTCs (Technology Transfer Centres).

To sum up, the following characteristics can be found in the evolution of UIC policy in Korea. Firstly, in Korea, the government played an initiative role in promoting UIC rather than universities and industry. In addition, the government's perspective concerning UIC has changed over the last four decades. Before the 1990s, it seems that the government supported UIC as a way to enhance the research abilities of the university through public funding. Since the 1990s, the government has increasingly recognized UIC policy as an important tool to enhance national innovative capacities by way of accelerating knowledge transfer. Secondly, it can be said that in Korea, the

real activities for UIC started in the 1990s. In the 1970s, the government supported research institutes, which came to account for most of the national R&D activities, and in the 1980s in-house R&D of firms dominated. In these periods, the university was not considered as a partner to firms. Since the 1990s, the university has been emphasized as a useful centre for R&D and knowledge transfer, not only for producing graduates.

6.2.2 UIC Programmes in the 1990s

This part examines the UIC programmes implemented during the 1990s, shown in Table 6.1. This investigation may help to explain the rationale and characteristics of the current policy. Each programme is explained in turn following the start year.

■ The Centres of Excellence: SRCs (Science Research Centres) and ERCs (Engineering Research Centres)

The Centres of Excellence programmes have been implemented by MOST (the Ministry of Science & Technology) since 1990, and aimed to encourage multidisciplinary collaborations between academics and industry to enhance universities' capabilities for basic scientific research up to the international level. SRCs focused on basic scientific research, and ERCs pursued engineering research on basic and advanced technologies linked to national priorities and industrial development. The MOST provides nine-year support to each centre in principle, but the support may be terminated by mid-term evaluations every three years. Compared to the other programmes which followed, these programmes were characterised by their focus on enhancing university research abilities for basic science and technology rather than cooperative research and applicable technologies.

■ UICPs (University-Industry Consortium Programmes)

UICPs have been carried out by SMBA (Small & Medium Business Administration) since 1994. The purpose of this programme was to tackle regional SMEs' practical bottlenecks by utilising the research resources of regional universities and research institutes. To apply for this programme, the university or research institution had to form a consortium with more than seven SMEs located within their regions. This programme stressed tackling the practical bottlenecks of SMEs rather than R&D

cooperation or continuous interactions between firms and universities; thus, the duration for this programme was limited to one year.

Table 6.1 Policy programmes for university-industry cooperation in from 1990 to 2000

Policy Programmes	Start year (Ministry)	Activity Supports	Targeted Development
Science Research Centres (SRC)	1990 (MOST)	UIC in basic research	To enhance research abilities of research centres within universities
Engineering Research Centres (ERC)	1990 (MOST)	UIC in engineering research on basic and advanced technologies	
University-Industry Consortium Programmes (UICP)	1994 (SMBA)	To tackle regional SMEs' practical bottlenecks	The development of UIC in applicable knowledge
Regional Research Centres (RRC)	1995 (MOST)	To promote UIC at regional level	To support regionalised science and technology
Technology Innovation Centres (TIC)	1995 (MOCIE)	To supply expensive research equipment in universities' research centres	The joint use of research facilities and equipment
Technology Business Incubators (TBI)	1995 (MOCIE)		
Information Technology Business Incubators (ITBI)	1998 (MOIC)	To provide combined supports such as business spaces and management skill	Nurturing venture companies or starts-up businesses
Business Incubators	1998 (SMBA)		
Technology Parks	1998 (MOCIE)	To provide infrastructure for UIC	To facilitate collaboration between university and industry
Technology Transfer Centres (TTC)	2000 (SMBA)	To construct basic facilities for technology transfer and to build technology database	To promote technology transfer from universities to firms
Information Technology Research Centres (ITRC)	2000 (MOIC)	To support R&D in information technology	To develop UIC in information technology

Source: compiled by author

■ RRCs (Regional Research Centres)

After 1995, in line with the emergence of the local autonomous system in Korea, the RRC Programme was implemented to support regionalized science and technology. The Centres of Excellence programme resulted in the selection of highly reputed universities in the capital area, and focused on R&D meeting national needs. However, the RRCs provided an opportunity for universities located in the non-capital area. A supported centre performed research related to basic or applied science and technology viewed as the nucleus of specialised regional industry. In order to apply this programme, the university had to submit an application reference from regional government. This programme made it a rule to evaluate each centre for three years and to extend up to nine years based on the results of interim performance evaluations. As the title 'Regional Research Centre' indicates, this programme supported regional R&D and UIC for regional industries; however, the MOST controlled all the processes for this programme. It can be said that this programme was the first support for regional R&D with the formation of UIC by the central government.

■ TICs (Technology Innovation Centres)

The Technological Innovation Centre Programme was designed to promote cooperation between regional universities and firms through the joint use of 'research facilities and equipment'. This programme aimed to supply expensive research equipment in university' research centres, and to help firms to share equipment. The condition of the programme was that only universities located in the non-capital area could apply, in order to support regional SMEs. TICs are similar to RRCs in that they are established in the university to foster the regional industrial competitiveness by utilising regional research resources. However, RRCs focus on R&D activities, and TICs on establishing research equipment and facilities.

■ TBIs (Technology Business Incubators), ITBIs (Information Technology Business Incubators), Business Incubators

These three programmes commonly aimed at nurturing venture companies or start-ups by providing combined supports such as business spaces and management skill in order to overcome obstacles at an initial stage of business development. The firms within business incubators located in university territory had the opportunity to utilise and access the technology and management skills of academic researchers.

The three programmes had slightly different titles, and were carried by different Ministries; TBI by MOCIE (the Ministry of Commerce, Industry and Energy) 1995; ITBI by MOIC (the Ministry of Information & Communication) 1998; Business Incubators by SMBA 1998. TBI and ITBI supported only start-ups based on new technology and information technology respectively, but Business Incubators supported any new firms if they were start-ups. If a university were designated as any kind of business incubator programme out of the three, the government provided the funds for building a centre and operating it. Some universities had more than one programme out of the three.

■ Technology Parks

Technology Parks were established as technological innovation complexes which accumulated R&D resources from regional industry, universities, and research institutes. Technology Parks aimed to build a specific space and infrastructure in order to aggregate R&D capacities and facilitate networking activities and collaboration. Their main functions are to provide R&D, a business incubator, training and education, an information centre, a management and support service, and a test laboratory for the commercialisation of the research results. Technology Parks started in 1998 designating six regions as a model, i.e. Goangju & Jeonnam, Daegu, Gyungbuk, Songdo, and Ansan. These six Technology Parks were funded by national government, regional/local government, and universities. In 2000, two Technology Parks (Pusan, Pohang) were founded by private sectors and regional governments. An outstanding feature of Technology Parks in Korea is that they were built on a university-oriented plan. They were established with the basic idea that the university had R&D capacities and technology to be used for firms. Their locations were near to the university or within its territory.

■ TTCs (Technology Transfer Centres)

TTCs were established within the university with the purpose of technology transfer from the university to firms, and commercialization of applicable technologies. TTCs constructed technology database concerning Intellectual Property and applicable technology in its university, and tried to transfer them to firms. SMBA has supported the fund for the construction of basic facilities and operational expenses. TTCs are

different from the other programmes, because they directly intended to support technology transfer and commercialization from the university to firms.

■ ITRCs (Information Technology Research Centres)

The objective of this programme was to support R&D for IT (Information Technology) in the university and to develop the core technology for IT. Each centre could receive financial support from MOIC for eight or six years, and renewal evaluation was carried out biannually. This programme specialised in IT, and it did not need the participation of the regional/local government.

6.2.3 The Characteristics of UIC in the 1990s

Some characteristics are found from the UIC programmes in the 1990s, and these help to identify the characteristics of the following new programmes launched in 2003. Above all, the process of the above programmes may be seen as top-down following this procedure: planning and announcement by central government, application by universities, selection by central government, performance by universities and firms, and evaluation by central government. Central government had the power to plan, implement and evaluate the result. Therefore, the role of regional government was limited to deciding whether it paid the match funds for the programme or not. However, regional government could not easily refuse university requests for the match funding, because of political and financial considerations to increase the amount of financial support by central government in the region. Moreover, a vicious circle occurred in spending the budget in regional government. That is to say, the more regional government spent on providing the match funds, the more financial restriction there was on its own projects.

Secondly, even though the local autonomous system was launched in 1995, it seems that the process and content of UIC policy were dominated by NIS (National Innovation System). Some programmes (RRCs, Technology Parks and TICs) emphasized the regional dimension of UIC; however, regional UIC was considered as a sub-system of NIS to enhance national competitiveness rather than regional innovative development.

Thirdly, the above programmes were implemented on the basis of administrative geographical boundaries; for instance, in RRCs, TICs and Technology Parks, a university located within the territorial area of a regional government could cooperate with the regional government, and in UICPs, the firms of consortium partners should be located within the same administrative region as the university.

Fourthly, there were overlapping objectives and contents between programmes; for instance, Business Incubators, TBI and ITBI have different titles, but their aims and operational contents focusing on the role of business incubators were similar. This is mainly because three Ministries and one Association were engaged in the above programmes, but coordination among ministries was lacking.

Lastly, central government used funding as a main policy instrument to foster UIC. Although it supported the construction of physical infrastructures such as Business Incubators and Technology Parks, funding was a main policy tool. Moreover, at those times, UIC policy programmes were created with a specific form to meet a specific need at that time rather than a comprehensive approach in changing the regulatory framework of universities.

6.3 Rationale of Changes In 2003

The evolution of Korean UIC (University-Industry Cooperation) discussed above underwent a new change, as the so-called 'participatory government' of President Roh Moo-Hyun took power in February 2003. This government emphasised UIC policy as a tool for the construction of RIS (Regional Innovation System) to tackle emerging socio-political and economic demands.

6.3.1 New Socio-Political Demand

The new government diagnosed that the unbalanced development of the nation not only caused socio-political problems with regional disparities, but also hindered national competitiveness. For the last half century, Korea has experienced

remarkable economic growth. In terms of spatial development, this has been achieved as a result of the Government's strong commitment to aggregate economic growth centring on the Seoul capital area or the so-called capital area (Seoul, Incheon, and Gyeonggi-do Province). The concentration of population and economic activities in the capital area has been one of the most dominant spatial patterns in the process of rapid industrialization and economic development. The dominance of the capital area is attributed to the concentration of R&D expenditures and the over-concentration of large enterprises principally caused by government-led economic development. The capital area contains 11.8% of Korea's total area, accounting for about 45% of the total population and about 55% of manufacturing firms. 95 of the 100 largest firms have headquarters in the same area (Lim, 2000). The corresponding influx of population and industries into the capital area has greatly increased land costs, and caused housing shortages, traffic congestion, environmental degradation, and other social difficulties.

Other parts of the country outside of the capital area, however, have suffered from decreases in population, stagnant economies, and a lack of economic opportunities. Therefore, the conflicts caused by unbalanced development between the two regions have intensified, and this inter-regional conflict has become a critical socio-political problem. After the 1997 financial crisis, the gap has become bigger, because almost all of the regional economies outside of the Capital area have experienced long-term stagnation, while the Capital's economy has recovered from the crisis quickly (Kim H-K, 2005).

From an international perspective, international competition is growing with 'globalisation', and 'the knowledge-based economy' is becoming increasingly important. However, even though the Korean economy has developed rapidly during the past four decades, it used to rely on the input-driven growth model, which was considered successful in terms of the quantitative growth of national economy at that time. In the knowledge-based economy, the total factor productivity mainly focusing on innovation is considered a critical element for economic development, rather than the input-production factor. Knowledge is viewed as an important element to attain innovation. Therefore, the Korean government put emphasis on the change of its economic pattern toward supporting R&D and the innovation-driven economy (Kim

S-B, 2004). In particular, on the one hand, the Korean manufacturing sector since the late 1990s has faced severe competition with neighbouring countries such as China, which has abundant cheap labour; on the other hand, Korea has to compete with its neighbour Japan and the Western Countries, which have advanced in both science and technology.

Therefore, it seems that this new government recognized that it was time to change to an innovation-driven economy. In addition, the new government asserts that the innovation-driven economic paradigm is more useful at the regional level rather than national level, because it argues that a region has much more flexibility to cope with the knowledge-based economy than a nation (PCONBD, 2003). It considers that a region has become the unit of international competition, and also that regional competitiveness can be the basis of national competitiveness; hence, the lack of innovative capacities at the regional level, except for the capital area, has hindered national competitiveness.

6.3.2 The Construction of RIS

To solve the above problems, the new government proposed the construction of RIS as a primary policy in order to attain dynamic balanced development and promote national and regional competitiveness. It appears that the concept of RIS is well matched to the government intention to enhance regional endogenous and innovative development, which eventually may tackle disparities between regions.

This government first established PCONBD⁶ (The Presidential Committee on National Balanced Development) in April 2003 to implement the RIS policy. It published '*Vision and Agenda for Balanced National Development*', which explained operational strategies to build RIS. The government clearly shows in this paper that its policy is based on the concept of RIS with the National Innovation System as its origin and Phillip Cooke as its main advocate (PCONBD, 2003, p. 10). However, as

⁶ PCONBD was composed of the national government (12 Ministries) and civilian members. It was placed under the immediate control of the President, and assumed the comprehensive propulsion of RIS policy at the national level. Its main role is to support regional innovative development through setting up an RIS plan and to coordinate among ministries. The committee has actually led the current RIS policy since the new government started.

discussed in Chapter Four, the specific features of RIS building are different in every region, even though its theoretical concept is comparatively simple. It can be expected that RIS policy will be peculiar to the government that planned it; thus, it is necessary to examine what were the specific aims and methods of Korean RIS policy.

■ **Balanced national development through regional endogenous development**

This government suggested 'balanced national development' as a key national agenda. 'Balanced national development' means not only the integrative balanced development for all regions to meet National Minimum Standards, but also the dynamic balanced development which maximises regional innovative potential and capacity throughout the country (PCONBD, 2003). This government emphasises the latter, because, in the long run, it aims to make every region self-reliant, based on its endogenous development strategy (*ibid*; Kim H-K, 2005).

The government explained that, through the construction of the regional innovation system, regional endogenous development might be attained, which is viewed as a core element of dynamic balanced development (PCONBD, 2003; Kim H-K, 2005). It also suggested that regional endogenous development could be attained through highlighting interdependent relations and interactions between regional organisations and actors, and its main idea is to develop each region on the basis of its own growth potential (PCONBD, 2003; Kim H-K, 2005). Apart from how the concept of regional endogenous development is defined academically, it seems that this government used this concept in two ways: one is the opposite of exogenous strategies focusing on the acquisition of innovative potential or investments from other area; and the other is self-reliant development maximising the innovative capacities within the area without any support from outside (Isaksen, 2003; Kim H-K, 2005). Therefore, the government emphasized that each region should make an effort to build its own cooperative system, as denoted in the address of President Roh Moo-Hyun:

To realise the strategy of regionalisation, each region of its own accord should construct the network between industry-university-government. Regional university, industry, society and regional government should make an effort together to construct and organise a close cooperative system for regional development. (At the Policy Forum of Jeonju City in February 2003, quoted from PCONBD, 2003, p. 12)

However, there are some problematic issues in relation to the above objectives of the RIS policy. Firstly, the connection between the RIS policy and the achievement of balanced national development is questionable. As mentioned earlier, it may be more likely that RIS policy will result in widening the gap between regions with more innovative potential and those with less, which was described by Oughton and her colleagues as 'the regional innovation paradox' (Oughton et al., 2002). Despite the possibility of this paradoxical outcome, the Korea government has adopted RIS policy as a major strategy for balanced national development. This is similar to the case of the EU's regional policy, which was discussed in Chapter Four.

Secondly, the relationship between balanced national development and regional endogenous development is also questionable. It seems that the two policy objectives might be contradictory. The term 'balanced national development' implies that the intervention by national government may be imperative to strike an economic balance between regions or to keep up the balance. However, regional endogenous development emphasises the internal effort in any region for its economic development. It would appear that these two objectives might be generated for political reasons in order to cover everybody's interests in every region.

In addition, as discussed earlier, Korea has a centralised governance system (see Appendix A) not only in regional economic development (see Section 3.4) but also in the higher educational system (see Section 3.3); however, Amin (1999) argues that endogenous development strategies tend to favour bottom-up and region-specific based policy action. Therefore, the question is: to what extent can regional endogenous development or balanced national development be attained by central government under Korean system of governance? In what ways and to what extent does the policy tool for RIS reflect the region-specific context?

■ Interactions and cooperation between regional institutions

It seems that the government considers the construction of a cooperative system by each individual region as critical in successful RIS building, even though central government inevitably supports regions financially. This is well expressed in the

definition of RIS by the government in the SAOBND (the Special Act on Balanced National Development)⁷ enacted in December 2003 as follows:

Regional innovation is to create, use and diffuse the regional developmental capacities according to the given condition and specialisation of each region in the fields of human resource development, science and technology, industrial production and enterprise support. (Sub-Article 2 of Article 2)

The regional innovation system is a support system to attain regional innovation by enhancing cooperation and interaction among universities, firms, research institutions, regional governments and NGOs. (Sub-Article 3 of Article 2)

The government emphasises the terms ‘interdependent relations’, ‘cooperation’ and ‘interaction’ among regional organisations. It appears that this government intended to construct an internal dynamic of interaction in each region, which is viewed as a crucial arenas for localised learning and tacit-knowledge sharing (Howell, 1999).

However, interactive relationships between regional actors or organisations may be highly dependent on the region specific context such as ‘innovative milieu’, ‘trust’ and ‘untraded interdependency’. Further more, these intangible assets may be vary from region to region. Therefore, we should ask: in what way does RIS policy promote interactions between participants? What kind of interaction and cooperation does the policy intend? To what extent does national RIS policy reflect these regional differences to enhance interactions?

■ Regional universities as a central institution

One of the most interesting points of the new RIS policy is its emphasis on regional universities rather than firms, and this is different from the general focus of the RIS concept. The policy document explains that most of the regions lack basic innovative capacities and resources, thus, it is essential to enhance R&D abilities of regional universities related to regional specific industries (PCONBD, 2003). The government document in ‘*Vision and Agenda for Balanced National Development*’ by PCONBD (2003) clearly stated its intention to support regional universities to make a virtuous circle:

⁷ The main aim of this Act is to construct a legitimate base to implement RIS policy comprehensively. It regulates the definition of RIS, the selection of Regional Strategic Industries by each region, and the establishment of PCONBD (The Presidential Committee on National Balanced Development).

Enhancing the capacities of regional universities → Activating regional innovation → Regional industrial development → Minimising the gap between the capital area and the other region → Keeping regional human resources in the region → the development of regional universities. (p. 12)

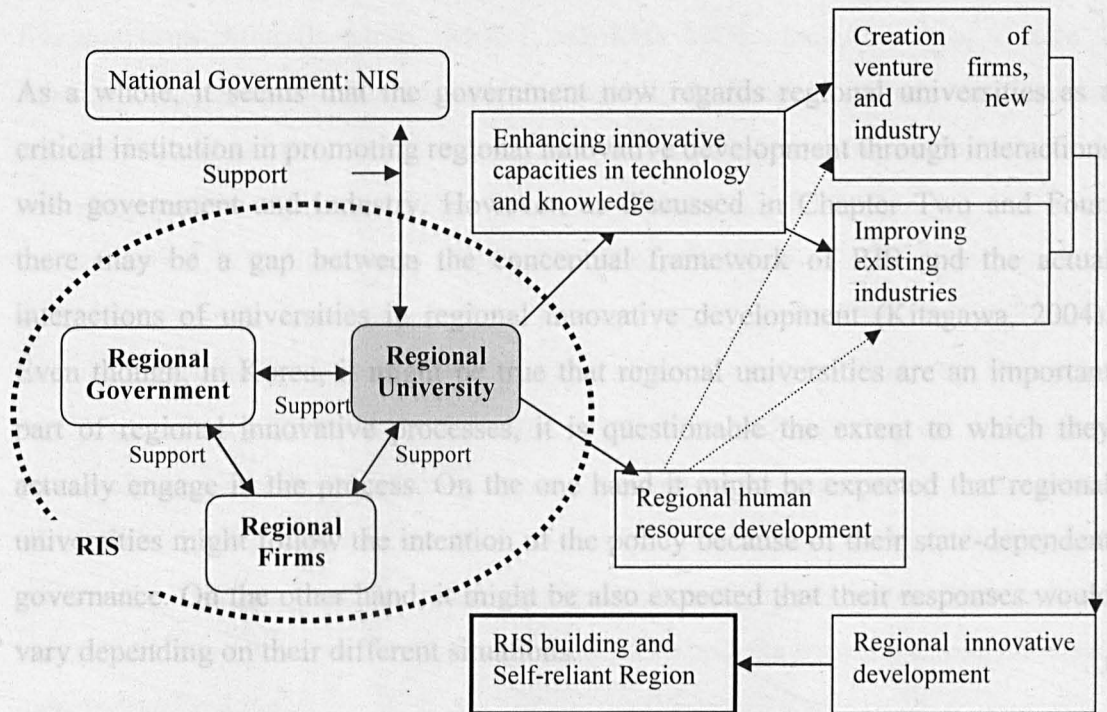
Many government documents concerning the policy also described the importance of regional universities as a knowledge stock and of the central institutions to enhance regional innovative capacities (PCONBD, 2004; 2004a; PCONBD & MOCIE, 2004). However, even though the RIS policy underlines the role and innovative capacities of regional universities in regional innovative development, it is still questionable: why does the policy focus on regional universities rather than firms or other institutions? What are the expected roles of regional universities by RIS policy?

There are some reasons why this government strongly emphasises the role of regional universities in RIS building. Firstly, the new government adopted the terms 'knowledge' and 'innovation' as part of its political rhetoric, and it also put an emphasis on the connection between 'knowledge' and 'innovation'. It regards the abilities of regional universities concerning the development of regional human resources and research, and the storage and creation of knowledge, as necessary to build a bridge between knowledge and innovation and to build RIS. It seems that it is similar to the general reason why the changing role of universities is increasingly stressed, which was discussed in Chapter Two.

Secondly, as explained in Chapter Three, in Korea regional universities are confronted with some critical problems: a quantitative expansion was not accompanied by a qualitative advance; the gap between universities' curricula and the needs of regional industrial have grown; the college-bound population has decreased. The government considered that these problems of regional universities aggravated the gap in economic development between the capital area and other regions. By enhancing the capacities of regional universities and changing their role, the government expected to attain regional innovative development, which made it possible to cover regional disparities.

Thirdly and practically, there were some limitations on supporting firms directly with government funding, because of the agreement of WTO (World Trade Organisation) which prohibits government subsidies for firms when these can distort the principle of international free trade. As a suitable institution for policy target to support RIS, the government thought that a supportive policy for regional universities is easier and safer than that for firms.

Figure 6.1 Regional universities and RIS building



Sources: Adapted and translated from PCONBD, 2003, p. 12: the shading and emphasis in original

The President also argued strongly for the importance of regional universities in this way:

To open the era of regionalisation and balanced national development, above all we must start with the intensive fostering of regional universities. There are many demands such as support for regional industry and the construction of regional infrastructure; however, we must start with the intensive fostering of regional universities. This is because the place to prepare for the knowledge-based society is the university. Therefore, universities centring on regional development are following the knowledge-based trend. Through fostering the abilities of regional universities, regional industry and culture can be developed. (President Roh Moo-Hyun at Policy Forum of Jeju Province in February 2003, quoted from PCONBD, 2003, p. 13)

In terms of the question of how regional universities play a central role in the construction of RIS, the government stresses interactive relations between universities, government and industry. Figure 6.1 adapted from the policy document shows the flow and framework of the policy focusing on regional universities and their interactions with government and industry. The next section addressing UIC policy programmes for RIS will give a more detailed analysis of the interactions the policy intended.

As a whole, it seems that the government now regards regional universities as a critical institution in promoting regional innovative development through interactions with government and industry. However, as discussed in Chapter Two and Four, there may be a gap between the conceptual framework of RIS and the actual interactions of universities in regional innovative development (Kitagawa, 2004). Even though, in Korea, it might be true that regional universities are an important part of regional innovative processes, it is questionable the extent to which they actually engage in the process. On the one hand it might be expected that regional universities might follow the intention of the policy because of their state-dependent governance. On the other hand, it might be also expected that their responses would vary depending on their different situations.

6.4 New UIC (University-Industry Cooperation) Programmes and Regional Innovation Strategies

Against such a background, the new government launched some major new initiatives to promote UIC (University-Industry Cooperation) at regional level. These programmes are aligned with new national policies such as 'Balanced National Development' and 'Regional Innovation System Building'. They commonly focus on reinforcing the capabilities of regional universities, linking this to promoting and facilitating the development of the regional economies.

This section introduces the contents of new UIC programmes, and analyses them to identify their characteristics compared to the previous programmes and to understand their specific strategies to promote regional innovative development.

6.4.1 New UIC Programmes

'A New Vision for University-Industry Cooperation' was announced in September 2003 by PCONBD (The Presidential Committee on National Balanced Development), five ministries (MOCIE, MOIC, MOST, MEHRD, MCT - the Ministry of Culture & Tourism) and SMBA. Its main contents were to promote the co-development of universities and industry and to eventually construct a regional innovation system. It also suggested new changes of UIC policy by pointing out the following problems of the previous UIC programmes (PCONBD, 2003; 2004). Firstly, the previous UIC lacked customer-oriented cooperation. In other words, universities as suppliers of knowledge and human resources did not fully reflect the needs of industry. Secondly, therefore, industry increasingly distrusted universities, and spent a great deal of money on re-training for graduates. Thirdly, these problems partly originated from the points of the UIC policy that concentrated on universities. In many cases, the projects selected by UIC programmes reflected the researcher's needs rather than those of industry. Lastly, an interactive and communicative process between universities and industry was lacking.

Therefore, it can be said that the new UIC programmes aimed at not only the construction of regional innovation system but also covered the problems of the previous UIC policy. However, we should ask: what are the specific characteristics of the new programmes compared to the previous policies? How can the new UIC programmes make up for the problems of the previous programmes? How do the new programmes promote regional innovative development?

There are four outstanding UIC programmes, which may be viewed as part of the major RIS policy of the new government: two are related to the regulatory framework concerning universities' role; and the other two are funding programmes to promote university-industry cooperation. This part examines the content of each initiative, and analyses them in relation to the above questions.

A) Revision of the PAIEIUC (Promotion Act for Industrial Education and Industry-University Cooperation)

The government's amendment of the PAIEIUC took effect in September 2003. The original Industrial Education Promotion Act was set up in 1963. The purpose of the amendment was to lay the institutional framework for effective UIC activities. Since 1990, the Korean government has launched several UIC programmes, and by doing so, it seems that it also recognized the need for a new approach, including the change of the regulatory framework. An understanding of the state-dependent nature of higher education governance (see Section 3.2) in South Korea may help to clarify the regulatory frameworks below. The main contents of the revised Act are classified into two new regulations: the establishment of IACFs (Industry-Academy Cooperative Foundations) and CCIs (Contracted Courses with Industry).

A-1) The establishment of the IACF (Industry-Academy Cooperation Foundation)

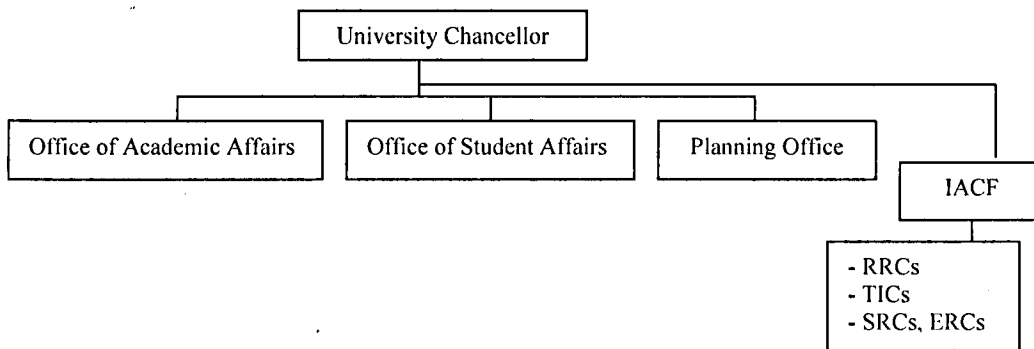
As universities have increasingly engaged in UIC since 1990, they needed a signpost organisation to help industry and government to find the most appropriate expertise within the university. Some universities tried to set up signpost organisations; for instance, Yeungnam University established YUCSC (the Yeungnam University Centre for SME Cooperation). The government also supported organisations such as the TTCs (Technology Transfer Centres) from 2000. However, the role of these centres did not expand to managing cooperative-related finance independently. This is because in South Korea, in any university, the establishment of a 'legal foundation' managing an independent financial system should be permitted by Act or Law, because traditionally national government controlled universities to prevent corruption. Thus, even though universities have gradually recognized the need of an independent 'legal foundation' in order to manage the cooperation-related finance collectively and possess intellectual property, they could not establish it by themselves.

As mentioned earlier (see Section 3.2.2), in South Korea, national/public universities are not a 'legal foundation' but an autonomous sub-organisation of national/regional government. Therefore, their accounts are included in the general accounts of the

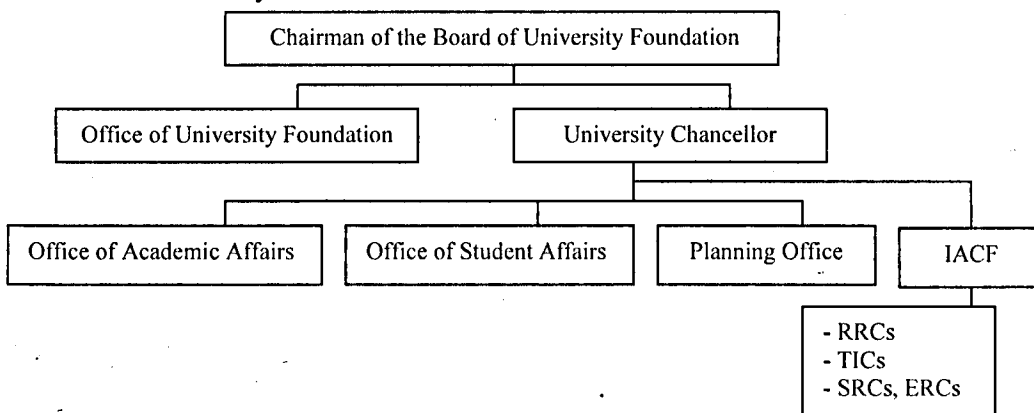
national/regional government, and the cooperation-related finance and intellectual property also automatically become a part of the general accounts of their government. On the other hand, a private university is a legally independent foundation following the Private School Act, thus it has the legal power for contracting and possession. Its cooperation-related finance is inserted into the accounts of the 'University Foundation' in each university. However, as the cooperation-related finance has been increased, not only national/public universities but also private universities want to manage cooperation-related finance independently.

Figure 6.2 The position of the IACFs in national/public and private universities

• National/public University



• Private University



Source: Adapted from unpublished government document - brochure, The IACF, February/2004, MEHRD

Against this above background, the government in the PAIEIUC permitted the establishment of the IACFs as a 'legal foundation', and they are placed within the university but are independent from the 'University Foundation' in terms of

acquiring intellectual property, undertaking the independent accounts for cooperation-related finance and becoming a party to industry-university cooperation contracts. The organisational position of the IACFs in the university is seen in Figure 6.2. In national /public universities, the IACFs are on the one hand controlled by the university Chancellor; on the other hand, they are viewed as organisations independent from the university and an autonomous sub-organisation of the related governments in matters of cooperation with industry and government. In a private university, an IACF is positioned not only as an autonomous sub-organisation of its 'University Foundation', but also as a legal foundation independent of the university.

The PAIEIUC regulations ensure that the IACFs play a role in being a party of a university in a cooperation contract, accounting for cooperation-related finance, acquirement and management of intellectual property, supporting the university cooperation financially by transferring its profits, fostering technology transfer and commercialising university research. The main purpose of the establishment of IACFs is to provide university-industry related services under one roof, not only managing all research centres within a university, but also working as a signpost to the outside partners of the university. It is also expected to promote technology transfers and projects, and commercialise university research.

It seems that the establishment of the IACFs provides a comprehensive approach to enhancing universities' engagement in cooperation compared to the previous programmes focusing on specific objectives emerging at those times. Therefore, the policy target of this regulatory programme is to encourage the cooperative role of universities to be changed at the university level rather than the level of each research centre or project team within the university.

A-2) CCIs: Contracted Courses with Industry

The other important regulation that government implemented under the PAIEIUC was the CCIs (Contracted Courses with Industry) with the purpose of providing practical education for university students as well as the retraining of industrial employees to match the firms' needs. A quality gap between the needs of industry and the abilities of university graduates has become a big issue in both universities and industry. Firms complained that the universities' education was far away from

their needs, and they pointed out the high-retraining cost for new employees (graduates). Universities also recognised that it was difficult for their graduates to be employed directly in firms because of their deficiency in applicable knowledge and skill. Thus, a consensus among universities and industry has already emerged on the need for educational programmes to reflect on the demands of industry.

Before the government implemented this regulation, similar courses had already been operating in universities; for instance, in the research areas, since March 2003, HIGU (Handong Global University) had operated an educational track for recruitment with a two year (the third and fourth year) course by contracting with LG Electronics. KNU (Kyungpook National University) and the KNIT (The Kumho National Institute of Technology) have held a retraining course for the employees in LG and Samsung Electronics as a part of their Master's Course since 1999 and 2001 respectively.

The MEHRD intended to expand these kinds of cooperative courses throughout universities by formalizing them. It encouraged universities to adopt the CCIs by pointing out that the student numbers of the CCIs could be considered as additional to the student quota by up to 3% of total student numbers. However, it also set the condition that students' tuition fees should be less than 50% of the whole operation cost, and university and firm should share the remaining 50%. It seems that this prescription intends to prevent the university from recklessly creating CCIs.

There are two kinds of CCIs according to the regulations. One is that university and firm can create a specific educational track. If the students finish the track, they are directly employed in the firm. Hereafter, this kind of educational track will be called '*an educational track for recruitment*'. In this case, by creating the course, a firm can ask the university to meet its specific needs through the educational track, and a university also has the advantage that the students can be directly employed in the firm. The other is the retraining course created by contracting with a firm for its employees. This course may be created for the purpose of retraining firms' employees or giving them a chance to attain higher degree.

A notable characteristic of the above two regulatory frameworks is that, before these programmes were implemented, there was some consensus in the needs of these regulations in not only universities but also firms. Thus, the regulations played a role in backing-up the needs of universities and firms.

B) The NURI (New University for Regional Innovation) Programme

The NURI is a government-funded programme to strengthen the capability of universities located outside the capital area. The essential purpose of the NURI Programme is to establish regional innovation systems, in which higher educational institutions, regional governments, research institutes, and firms build partnerships for mutual development and improvement (Lee H-J, 2005). The programme also aims to develop university curricula in terms of the specialized fields which are closely aligned to characteristics of the regional economy and industry. Another purpose of this programme is to promote regional development by training high quality manpower. Thus, it seems that the basic idea of the NURI programme seems to be that highly qualified graduates are expected to invigorate the regional economy (Duke et al, 2005).

This programme supported three scales of project, which were intended to support funding differently depending on the degree of importance in regional industry. It is mandatory that regional government and firms should not only take part in the project, but also pay the match fund. The government considers that the mandatory participation of regional government and firms should automatically construct the cooperation between them, and the payment of a match fund might result in positive cooperation. The three kinds of scale and the ratio of match fund are explained as follows;

- Large-scale Projects: they must be connected with *Regional Strategic Industries*⁸ regulated in SAOBND (the Special Act on Balanced National

⁸ Central government encouraged each region to select *Regional Strategic Industries* which can be leading industries to foster its innovative development in the future. The SAOBND stipulated, in December 2003, the condition covering how each region selects its strategic industries, all regional governments decided their strategic industries by the end of March 2004. In this short term, most of the regions just followed the guidelines suggested by central government (Kim R-H, 2006). Regional Strategic Industries selected by two selected regions are as follows:

- Daegu; Mechatronics Industry, Electronic and IT Industry, Textile Industry and Bio-Industry

Development). A match fund of a minimum 10% of the total programme costs should be funded by regional government. Total costs of each project team can be 3-5 billion KRW.

- Middle-scale and Small-scale Projects: These Projects must be matched with the purpose of regional human resources development based on regional industries and economy. Middle-scale programmes should be matched with funds from regional/local government or firms, accounting for a minimum of five percent of the total cost. The total costs of each project team can be 1-3 billion KRW and less than 1 billion KRW respectively.

The above conditions concerning compulsory collaboration and match funds by regional government and firms are similar to the previous programmes such as UICPs (University-Industry Consortium Programmes) and RRCs (Regional Research Centres). One of the outstanding differences from the previous programmes is that the large scale, projects should be connected with Regional Strategic Industries, because national government encourages a region and its universities together to concentrate on their specified industries.

Another characteristic of this programme was that the programme prescribed additional conditions related to the university's situations such as the ratio of new student's enrolment to total student quota, and the ratio of academic staff to the legally prescribed number of it, which are seen in Table 6.2. It is the first case in the UIC policy of South Korea, of not only the quality of the research team but also the university's situation being considered. The reason why the government took into account the current situation of the whole university was that this programme also took into consideration the restructuring and reform of higher education. In other words, the government wanted to support only those regional universities that could meet the quality it needed seen in Table 6.2, otherwise it excluded them from its supportive funding. This differs from previous programmes that aimed at the promotion of cooperative relations rather than paying attention to the larger context concerning universities abilities and changes toward cooperation.

- Gyeongbuk; Electronic and IT Industry, Advanced Materials Industry, Bio and Traditional Industry, Oriental Medicine Industry, and Culture and Tourism Industry (PCONBD & MOCIE, 2004)

Table 6.2 The conditions to apply for the NURI programme

Conditions	University level	Project team level
Ratio of new student enrolment (New student enrolled/Total student quota)	- Annually over 60%	- Annually over 60%
Ratio of academic staff (The current academic staff / the legally prescribed number of academic staff*)	- Over 50% -After selection: Chronologically up to 60%	- No limitation -After selection: Chronologically up to 80%
The establishment of the IACFs	- The IACF must be established under the Law, PAIEIUC.	

* The legally prescribed number of academic staff is regulated in 'the Rule of University Foundation and Operation'.

• Source: Adapted from government document - planning paper for the NURI programme, 2003/MEHRD

This programme emphasizes not only the relationships between the three regional institutions (university, industry and government), but also cooperation between regional universities. This programme in its planning and announcement paper divides the participant universities into a managing and complementary university, which is seen in Appendix G. The managing university plays a leading role, and the complementary university has a supportive role in the project. Even though the government did not suggest any incentive to the collaboration, it introduced a model of how two universities cooperate in the Planning Paper, which is also seen in Appendix G. The emphasis on collaboration between universities is one of the outstanding differences in this programme compared to the previous programmes such as ERCs, SRCs, TICs, TBIs and UICPs. It seems that the government considered collaboration and interaction between regional universities could result in enhanced knowledge transfer and learning from each other.

This programme basically views the administrative region as a unit for its implementation, which is the same as the previous programmes. However, it prescribed an incentive of 5% of the total amount regionally allocated by central government for this programme, in the case that two different administrative regions, in particular, '*a metropolitan city that had been separated from a province located around the city*' (Unpublished Document - Announcement for the NURI programme, p. 15) are integrated as a regional unit in this programme. This is a new trial attempt by central government to consider regions as having not administrative but economic

and historical boundaries. There are four possible cases of regions that could be reformed in this way in South Korea including Gyeongbuk province and Daegu City.

The MEHRD decided to distribute the available financial resources to regions excluding the Capital area. It planned to spend 1,420 billion KRW on the NURI programme through to 2008. The selected project teams will be supported with a five-year supply of personnel expenses, management costs, money for materials and machines in laboratories, scholarships and so on.

C) The CUCI (Central University for Cooperation with Industry) Programme

The CUCI programme is another government-funded programme to support the cooperation between regional universities and industry, and it is jointly implemented by PCONBD, MEHRD and MOCIE. The national government needs a leading university as an exemplar in the construction of university-industry cooperative relationships in each region, and this university is expected to play a critical role in the expansion of university-industry cooperation into the other universities within its region.

The roles of the CUCI programme can be summarized as follows: 1) the construction of the hub universities supported by the government plays a central role in customized regional R&D centres for regional firms and industrial complexes; 2) they lay the groundwork to provide technology and management consultancy to the firms; 3) they build and operate an equipment support centre to be shared by firms; 4) they support the infrastructure to facilitate university-industry networking; 5) they nurture and provide human resources that meet the demand of regional industries. Accordingly, the CUCI programme intends to build the hub universities not only to support R&D function for regional firms, but also to play a central role in the cooperative relationships between universities and industries in the regions. The total amount of funding for a hub university will be 3-7 billion KRW over five years, and regional/local governments and industry are each required to make over 5% cash contribution to the total funding.

Some characteristics of this programme are: firstly, that this programme did not intend to support a specific project or research for UIC, but it aimed to enhance the

total services that a hub university could supply in cooperative processes. The previous programmes in the 1990s and the NURI programme have a fixed aim such as R&D or cultivating human resources, but this programme aims to promote universities playing a central role in all kind of knowledge transfer processes in a region. Thus, this programme implies the government intention to change the university's role towards becoming cooperation-friendly.

Secondly, the geographical boundaries in this programme are different from the administrative region; in the case that a metropolitan city is separate from the province located around the city, the city and province are viewed as a region. It seems that national government intentionally considers historical boundaries as the unit for this programme rather than administrative boundaries. This case and the 5% incentive of the NURI programme can be viewed as a clue that these UIC programmes intend to enhance regional innovative capacities in a larger context compared to the previous programmes, which aimed at the promotion of cooperative relationships only between university and industry.

Thirdly, this programme followed a top-down process. Central government has all the initiatives in the decisive process of this programme, such as Planning (PCONBD, MEHRD and MOCIE), Selection and Evaluation (The Evaluation and Operation Committees), Annual and Interim Evaluation (The Evaluation Committee, MEHRD and MOCIE). As seen in Appendix G, all these processes are closely related to the two ministries; MOCIE and MEHRD. The Operation and Evaluation Committees are organized by the recommended members from MEHRD, MOCIE and partly PCONBD. KITF (Korea Industrial Technology Foundation) is an agency of central government to support the operational process of industrial technology policy. There is no process in which the regional government and university have the chance to provide their opinions and to play a decisive role. This top-down process is similar to that of the NURI programme.

Lastly, the same as the NURI programme, the government also encouraged the collaboration between regional universities in this programme. It suggested how two universities might manage their cooperation in a Planning Paper, which is seen in Appendix G.

Table 6.3 The characteristics of the new UIC Programmes

	PAIEIUC		NURI	CUCI
	IACF	CCI		
Aim	-To lay the institutional framework for effective UIC activities to construct RIS		-To support RIS building by way of linking the capacity-building of regional universities to promoting and facilitating the development of the regional economies	-To create a hub university supplying total services related UIC for regional firms
	-To provide UIC services under one roof	- To support the practical education for universities' students as well as the retraining of industrial employees		
Function/ Role	-Being a party of university to cooperation contract -Accounting for the cooperation-related finance -Acquirement and management of IP -Supporting university operation financially by transferring its profits -Fostering technology transfer and commercializing university research.	-University and firm can create a specific educational track and retraining course for student and employees respectively.	-Cultivating university graduates through various educational programmes reflecting the demands of regional industries. -Developing university curricula closely aligned to the regional industries - Improving interactive relationship between university and firms	-Customized regional R&D centres for regional firms and industrial complexes -Building and operating an equipment support centre to be shared by regional firms -Supporting the infrastructure to facilitate UIC -Nurturing and providing human resources that meet the demand of regional industries
Policy Means	Act (PAIEIUC)		Funding (1,420 billion KRW for four years)	Funding (40 billion KRW for five years)
Time	Since September 2003		July 2004 – June 2008	August 2004 – July 2009
Geograph- ic unit			-Administrative region, but an incentive of 5% of the total regionally allocated fund when two administrative regions (a metropolitan city and a province around the city) are integrated.	- If a metropolitan city is separate from the province located around the city, the city and province are viewed as a region.
Gov.	MEHRD	MEHRD	PCONBD and MEHRD	PCONBD, MEHRD and MOCIE

Source: Author

6.4.2 Regional Innovation Strategies

In contrast to the previous UIC programmes, it is prudent to recognize that the new programmes aimed at constructing a regional innovation system in the larger context of universities' cooperative relationships. The new UIC programmes may be viewed as a tool to enhance regional endogenous development, thus, it should be analysed by reflecting on the strategies of regional innovation rather than the cooperation between university and industry. By exploring the regional innovation strategies that the new programmes imply, this section attempts to find the differences from the previous policy and identify the characteristics of the new policy with reference to the theoretical viewpoint of regional innovation policy. In this sense, the new policy can be categorized by five elements; the policy process; central institutions of the policy; the view of innovation in the policy; collaboration and competition between universities; and regional boundaries of the policy.

■ The policy process

In the analysis of regional innovation policy, two different kinds of policy process are widely discussed (see Section 4.3.2), and these are the top-down and the bottom-up processes (Howell, 1999). However, it seems that there is little or no rational agreement as to what is the appropriate balance between state and region, or top-down and bottom-up process in regional innovation policy (Cooke & Morgan, 1998). In the literature of regional innovation policy, the central issues in the identification of the policy are from which perspective (national or regional) the policy is implemented, and to what extent the policy reflects the regionally embedded innovation processes or characteristics. The discussion of the issues may help to understand the distribution of power between region and nation, and eventually to identify the framework for regional innovation policy in a certain country.

Above all, central government changed its governance structure in the new programmes compared to the previous programmes. In the 1990s, any coordination process among ministries was lacking as pointed out earlier, but, in the new programmes, the PCONBD intervened in all the programmes as an arbitrator. The purpose of the intervention was to harmonise between ministries with relation to UIC programmes, and to continuously encourage UIC policy as a way of RIS building. In

addition, the MEHRD, being at the top of the higher educational governance, is in charge of a main role in the new programmes rather than the MOCIE supporting industry. The PCONBD and MEHRD played a main role in planning and implementing the policy. With this changed agency structures, the new policy was created through the larger context to construct regional innovation and balanced national development. Therefore, it can be said that the perspective of the new policy was from the integrated ministry level, and this characteristic may be related to the consideration of the larger context rather than focusing on the cooperation in itself.

In terms of the power relations between region and nation, there was no process in the policy to reflect the perspectives and characteristics of regional governments and universities. First of all, in the four programmes, the diversities of regions and universities are not reflected in the policy process. The regulatory framework and funding are implemented equally in all the regions and universities, and the regional government also does not have discretion over these matters. This may be viewed as one of the most problematic issues in the new policy, because regions and universities cannot be seen as homogenous entities.

In addition, in the funding programmes, amongst the three important policy processes of planning, implementation and evaluation, all the processes were controlled by central government. Moreover, the planning paper for these programmes prescribed in detail not only the conditions and processes but also the evaluation indicators, thus most of the important factors for the programmes have already been decided by central government at the planning stage. Furthermore, as seen in Appendix G, the role of regional government in the process is limited to transferring funds from national government to regional universities and to paying a match fund.

Consequently, the policy process of the new programmes can be viewed as initiated by national government, and followed by regional universities and government. Therefore, the policy process between nation and region was not changed in the new programmes, even though the government insisted that the new programmes should be based on the bottom-up process in its document (MEHRD, 2003). The only change of the policy process is that the PCONBD mediates the policy from the

perspective of a larger context to enhance regional innovative capacities, unlike to the previous programmes.

However, it cannot be said that this top-down process in South Korea is not suitable for constructing a regional system of innovation. This is because the specific needs and process for policy implementation can vary from country to country and from region to region. Accordingly, it is questionable how this top-down process really effects the construction of the regional innovation system in the research areas, thus some questions to be examined in the next chapters are raised: how do the characteristics of the top-down process influence the response of regional universities and the interactions between university, industry and government? Does the top-down policy give a stimulus to dynamic construction of regional innovation system or intensify the lock-in effects through institutional inertia?

■ **Placing regional universities as central institutions for UIC and RIS Building**

The key challenges for policy towards the promotion of innovation involve assisting firms to change and to deal with change by enhancing their learning capabilities.... (Cooke et al., 2000, p. 18)

As the above quotation denotes, in the RIS literature and policy, the firm is generally viewed as the key institution to promote regional innovative development (Cooke & Morgan, 1998).

However, in South Korea, the new government focuses on regional universities as central institutions to building the RIS, which was discussed in the previous section. This part will explore the question; 'in what ways have the new programmes made regional universities into central institutions in the construction of the RIS'?

There are some points to consider with relation to this question. First of all, the new programmes aim not only to promote university-industry cooperative relationships, but also to fundamentally change the role of regional universities towards more engagement in regional innovative development. For instance; the IACF and CCI programmes try to construct a new institutional framework to sustain the cooperative relationships through the setting-up new offices and courses; the NURI programme prescribes some conditions which each university should meet in applying for the

programme, which are seen in Table 6.2; a hub university in the CUCI programme aimed to construct 'a cooperation-oriented university' changing its role and structure toward cooperation.

Secondly, the funding for the NURI and CUCI programmes was eventually managed by the managing university rather than regional government and firms. The total funding from national and regional government and the participating firms comes into the accounts of the IACF of the managing university, and the IACF was also in charge of the total financial management. Therefore, the financial management was to be considered as the most important element in cooperation; the managing university has the power rather than regional government and participant firms.

Thirdly, it can be said that the first and direct beneficiary of the funding programmes are regional universities, and other participants (firms and regional government) may be the next. In the NURI programme, the expenditure items of the national funding are listed in the planning paper:

- a) developmental and operational charges for new educational programme
 - to change curriculum and its operation
 - various kinds of student education for field-based study
 - cooperative activities
- b) labour cost
 - newly employed lectures to support this project
 - temporary employment such as laboratory assistance
- c) research expenses
- d) maintenance and repair for the existing building
- e) lease for research equipment
- f) overhead charges for IACF

Most of the expenditure items are related to helping the university to enhance its research and educational qualities. Even though it may be expected that in the long run the region and firms can benefit from the cooperation, in the short term, the university is the direct beneficiary of the programme.

The previous programmes in the 1990s had also put their policy focus on universities rather than firms, and they had an emphasis only on the cooperation between university and industry. However, the new programmes aim to support not all universities but regional universities located in outside of the Capital area. They are

also interested in the larger context including the changing role of regional universities and the construction of regional innovation system.

At this point, some questions are raised with relation to the universities' response to the policy in the specific regions; how do the regional universities respond to the new programmes? Are the policy objectives in terms of the change of universities' role realised?

■ Interactive relationships as a main mechanism

The view of the innovation process has changed considerably in the past years. For a long time innovation was regarded as a process driven by individual entrepreneurs or by dominant firms. It was seen as a linear process starting with R&D and ending on the market. More recently, it has been argued that, on the contrary, it is a highly interactive process in which many functions, firms as well as organisations are involved. (Cooke et al., 2000, p.74)

As quoted above, in the RIS literature, interactive mechanisms are viewed as a decisive factor in constructing a successful RIS (Doloreux, 2002; Howells, 1999).

In South Korea, as mentioned earlier, the new UIC programmes should be understood within the larger context of the construction of regional innovation systems and endogenous development. As discussed in previous section, the new government regarded interactions between regional institutions as a key mechanism that makes it possible to build a regional innovation system. Therefore, it seems that the new UIC programmes which may be seen as a main policy tool to build RIS may intend to improve interactions between regional institutions. This part will examine the question: 'what kinds of interactions are expected in the new programmes'?

Above all, it can be said that the main actors or institutions of the interaction in the new programmes may be viewed as regional universities, firms and regional government. As mentioned above, the policy firstly focuses on regional universities as a main institution to build RIS, and it expects that the universities can help in the development of regional industries by way of cooperative relationships with firms. It also expects regional governments by meeting up the needs of regional universities and firms to play an intermediate role in promoting the interactive mechanisms. For

instance, the NURI and CUCI programmes set the condition that firms and regional government should be involved in the programmes.

In particular, it appears that the key feature of the interactions which the policy intended may be viewed as *'the active engagement of the three institutions with interactive relationships in the construction of RIS'* (PCONBD, 2003, p. 6; 2004, p.14). It seems that the government expects the three institutions to share a consensus on regional innovative development, and they positively engage in the process of interactive learning. In addition, in order to prevent the inertia in the institutions and to encourage the participants to positively engage in the policy, the NURI and CUCI programmes prescribed the compulsory payment of funds from participant universities, firms and government.

Furthermore, it seems that the interactions the policy expected are not one-way, from research to application, focusing on R&D activities or basic research, but are interactive relationships having an emphasis on continuous relationships and trilateral interactions between universities, government and industry. Some evidence explaining 'interactive relationships' is found: the new regulations for IACF and CCIs aim to construct a new framework for continuous relationships and interactions; the NURI programme and CCIs strongly emphasize the importance of competent regional graduates who are viewed as an important input for innovation and sharing tacit knowledge between universities and firms.

On the whole, it can be said that the optimal outcomes of the new programmes are to construct the interactive relationships in which regional universities, government and firms become main actors, and they positively engage in the innovation processes (PCONBD, 2004). However, in reality, the interactive process is complex, and it is related to not only regional economic environment but also regional cultural and institutional characteristics which are regionally embedded. Therefore, the question in the specific regions is: how do regional universities and industry and government interact in response to the policy? Are the policy objectives to promote interactive relationships between universities-industry-government achieved?

■ Collaboration and competition between regional universities

Michael Porter (1990) emphasises the importance of domestic rivalry and competition as the key determinant for global competitive advantage. In the regional innovation literature, the issue has been discussed of how firms can increase their competitive advantage through collaboration and competition between them, rather than between universities (Park, S-O. 2001). Therefore, it seems that the issue of collaboration and competition among universities is neglected in both the concept of RIS and the Triple Helix Model. Universities have different aims, norms, and governance structure from firms, and their behaviours for collaboration and competition may denote their specific characteristics. As universities have been increasingly identified as the powerful driver of innovation in the knowledge-based economy, their collaboration and competition should be re-evaluated with relation to their territorial development. Boucher and his colleagues (Boucher et al., 2003) found hierarchy effects between universities in some European regions as a result of competition, and they suggested that academics and policy makers should be more aware of universities' characteristics in competition and collaboration.

A notable point in the NURI and CUCI programmes is that they emphasise collaboration and competition between regional universities, as central government announced collaboration and competition as one of the importance principles in the policy document of the programmes (PCONBD 2003 & 2004). In its policy document, collaboration emerges when two different universities jointly take part in a project, and competition is inevitable because the funding is allocated at a regional level.

Some rationales are found with relation to collaboration and competition in the new programmes. The competition is underpinned by the principle of 'selection and concentration' (PCONBD, 2003; 2004; 2004a). The national government wanted to support only some regional universities to be competent in promoting regional innovative development. This is partly because the resources of national funding were limited to cover all regional universities. More importantly, it is partly because the government intended to stop financial support for incompetent universities, which may gradually help to weed them out. Coping with the deficiency of new student owing to the decrease in the college-bound population, it seems that the government wanted to follow the law of 'the survival of the fittest'. Eventually, the

government also expected that competition should make regional universities pay more attention to the programmes to be selected. On the other hand, the purpose of collaboration in the programmes is to enable the sharing of knowledge and the reduction of costs to create and develop a new educational programme. Moreover, the collaboration may help to construct a new relationship in related academic fields between regional universities.

In brief, the policy highlights the fact that collaboration and competition between regional universities may be an important driving force for regional innovative development. However, collaboration and competition are not always a driving force for innovation, and sometimes they may hinder innovation. For instance, too strong and localised collaboration can become obstacles to firms' ability to change technological trajectories, which may intensify the lock-in effects (Park S-O. 2001). At this point, some questions are raised; in what ways and to what extent, do competition and collaboration happen in the research areas in response to the new programmes? Are the policy objectives promoting competition and collaboration realised?

■ **Changed boundary for RIS building**

Academic staff involved in regional research pointed to the changing meaning of 'region'. For some, this meant the city within which the university was located, while, for others, the regional space of the university covered a wider area that was part of a designated regional boundary designated by government. (Gunasekara, 2006, p. 174)

As read in the above quotation, geographical boundary in regional innovation is problematic issue to both policy maker and researcher.

In the 1990s, all UIC policies had regarded an administrative region as a territorial boundary for policy implementation. However, since 2003, in the new policy, the national government has changed the territorial boundary to implement UIC programmes, which was explained in the above section with relation to the NURI and CUCI programmes. The rationale of the change may be inferred from the consideration of the larger context, such as historical and cultural consensus and industrial and economical convergence, to develop the regional system of innovation.

However, there may be an emerging conflict between an administrative boundary where the policy will be actually implemented and the new boundary which the new policy prescribed in order to promote RIS. This is because even though the historical or economic boundary may be more suitable for RIS building than an administrative boundary, in reality the policy should be implemented through an administrative process naturally following the formal boundary. In particular, in South Korea, there is no national government agency in regional areas such as the Regional Development Agencies in the UK. Accordingly, it is interesting to examine how the policy programmes are actually implemented with relation to the matter of regional boundaries, and some specific questions are raised; how do regional universities respond to the new boundaries of the UIC programmes? Is there any emerging conflict between the boundaries for RIS building and the actual interactions of the three institutions? Are the policy objectives to construct new boundaries for RIS building realised?

6.5 Conclusion

The Korean UIC policy has developed in line with the several phases of industrialization. After 2003, the new government introduced the new UIC programmes aiming at the construction of regional innovation systems such as the establishment of the IACFs, the creation of CCIs and the NURI and CUCI programmes. In contrast to the previous programmes in the 1990s, this new policy put an emphasis on the larger context of universities' cooperative relationships in order to solve socio-political problems of the country. The regional innovation strategies of the new programmes can be summarized a top-down policy process, putting regional universities as a central institution for RIS building, interaction as main mechanism, the emphasis of competition and collaboration between regional universities, and the suggestion of changed boundaries for RIS building.

However, one of the significant questions in RIS policy is the extent to which the policy reflects the characteristics of any regionally embedded innovation process, and how the policy intention penetrates through regional institutions and their behaviours. Therefore, the implementation process of the policy is highly dependent

on the diversities of the regional socio-economic situation (Archibugi et al., 1999; Cooke et al., 2000). In some cases, policy can stimulate dynamism in the regional economic structure, but in other cases, it can intensify the lock-in effects through institutional inertia.

Moreover, the above UIC policy is a national policy, and follows a top-down process. Thus it is interesting to note that how regional stakeholders respond to the national initiatives in each regional level. The next chapter explores this questionable point in the specific research regions; thus any gap between the policy intention and the responses of regional universities to it would be found.

Chapter 7 Universities' Responses to the Government Initiatives

7.1 Introduction

This chapter explores the dynamic responses of the regional universities to the government initiatives, and the key question to be investigated is: what has been happening to the regional universities in response to each of the specific policy initiatives? Methodologically, this chapter attempts to describe some stories happening in each university since September 2003 rather than to discuss the nature and characteristics of the interactions. The way and perspective to looking into the responses are based on the triple helix relations which are used as an analytic concept in the research. The understanding of the universities' responses underpins the analysis of their interactions with industry and governments using the analytic frameworks conceptualised from the Triple-Helix Model, which will be presented in the next chapter.

Since 2003, the South Korean government has implemented new UIC policy programmes such as: the establishment of the IACF; the encouragement of the CCIs; the NURI programme; and the CUCI programme. In this research, four regional universities out of twenty-three were selected by considering their history, size, location, whether they are public or private, comprehensive or specific, and their experience of engagement in government projects (see Section 5.4.1). It is interesting to identify the relationships between the new policy programmes and the dynamic responses of the four universities.

It might be expected that one particular policy might produce various responses depending on different situations and the objectives in accepting it. It might be assumed that there might be some unexpected responses or outcomes of the policy in the universities. In particular, as the new UIC policy encourages the universities not only to cooperate and interact with the other universities, firms and regional governments, but also to compete with each other, their responding processes may be

complicated. In addition, the policy was implemented through the top-down process; thus it is interesting to identify how the top-down policy is implemented at a regional level, and how the characteristics of the top-down process influence the response of regional universities. Lastly, with relation to the geographical boundary within which the regional universities interact, the policy (the NURI and CUCI programme) encourages the two studied regions to be integrated. Thus, the question of how regional universities respond to the encouraged boundaries by the policy will be examined.

The description in this chapter is based on the analysis of the collected data from interviews and secondary resources. This chapter falls into three parts. The first part provides the overall feature of the four universities' responses, and the second part answers the question of how each university has responded to the policy. The last part contains a number of reflections on the four universities' responses in order to review and discuss major findings from this chapter.

7.2 The Overall Response to the UIC Programmes in the Two Regions

This section examines the overall features of the universities' responses to the new government policies by using published and unpublished government documents. The snapshot of the overall response helps to identify the outward features of regional universities in two research regions. In addition, the outward features may raise some questions to be investigated further in order to understand that what has really been happening within them.

7.2.1 The IACFs (Industry-Academic Cooperation Foundations)

In revising on the PAIEIUC (The Promotion Act for Industrial Education and Industry-University Cooperation), central government (the MEHRD) encouraged universities to establish the IACF as a central organisation for cooperation. On the first of May 2005, all regional universities in the two regions established IACFs,

even though their role and organisational position are different in each university. Some universities established IACFs as an independent organisation, but in some universities they belonged to the Planning Office or the Research Office. For instance; the Pohang University of S&T set up its IACF as a new independent organisation from the existing office, but Uiduk University and Dongyang University established their IACFs within the Planning Office and the Research Office respectively. All of these IACFs follow the requirements of the PAIEIUC at least legally and formally whether they really play their expected roles or not.

In terms of the outward formation in setting up of the IACFs, it seems that all regional universities positively responded to the government policy. However, it is questionable: to what extent the organisational formation and role of the IACF are different between regional universities. Do the IACFs play their expected roles? In the process of the IACF set-up and operation, what kinds of conflict and interdependence have happened?

7.2.2 The CCIs (Contracted Courses with Industry)

With respect to the CCIs, as mentioned earlier, similar courses had already been operated in the regional universities before the PAIEIUC was implemented. Eight more contracted courses have been created since September 2003 in the regions, which are seen in Table 7.1. Incidentally, all the universities with the courses are the selected universities for this research. It can be said that the contracted courses have steeply increased since the revised PAIEIUC was implemented. However, not all the eight courses were created under the Act, for instance; the three new contacted courses of the KNU in 2004 and 2005, did not follow the PAIEIUC, even though most of the contract agreement and programme are similar to the regulation of the PAIEIUC, which will be discussed in detail later.

Table 7.1 denotes only the quantitative information of the contracted courses, from which questions are raised: how and by what process are these new courses created? Why do some courses not follow the new government regulation, the PAIEIUC? What are the differences between regional universities in terms of the creation of

contracted courses? What kinds of tensions have emerged between university-industry-government in the creation of the contracted courses?

Table 7.1 The contracted courses in the four studied universities

Univ.	Company (Objectives, Student Number)	Courses	Start Year
HGU	• LG Electronics (Educational track for recruitment, 20)	• Electronic Engineering	Mar. 2003
	• LG Electronics (Retraining, 15)	• Master Course of Material Engineering	2001
KNIT	• LG Electronics (Retraining, 40)	• Material Engineering (Credit Banking)	2001
	• Samsung Electronics (Retraining, 45)	• Mobile Engineering • Industrial Management	Feb. 2005
	• Samsung Electronics (Retraining, 20) • LG Electronics (Retraining, 20)	• Techno-MBA (Master of Business Management)	1999
KNU	• Mando Company (Educational track for recruitment, 20)	• Electronic Engineering • Material Engineering	Feb. 2004
	• Samsung Electronics (Educational track for recruitment, 20)	• Electronic Engineering	July 2005
YU	• Samsung Electronics (Retraining, 120)	• English • Chinese • Japanese	Aug. 2004

* The shadings are the CCIs under the PAIEIUC

Source: Compiled by Author

7.2.3 The NURI and CUCI programmes

In the NURI programme, among twenty-three regional universities, eighteen universities applied with a total of sixty-nine projects (8 large; 24 medium; 37 small scale) in the research regions. Only five universities did not apply such as Asia University, Daegu Arts University, Daegu University of Foreign Studies, Kaya University, and Taeshin Christian University. As a result of this fierce competition between regional universities, twelve universities were selected as managing universities in twenty-one projects (5 large; 4 medium; 12 small), which are presented in Table 7.3. All of the selected projects cooperate with firms, and all of the large and medium scale projects collaborate with other universities and regional governments.

In the CUCI programme, two collaborative groups applied: one group is YU (managing university) and the KNIT (complementary university); and the other includes KNU (managing university), and the Pohang University of Science & Technology and Yeongjin College (these are complementary universities). These two groups competed, and the latter group was selected. Table 7.2 shows the selected universities in the CUCI programme.

Strategic field	Managing Univ.	Complementary Univ.	Total Funding (for 5 years)		
			Nation	Region	Local
-Electronic Engineering					
-Mechanical engineering	-KNU	-the Pohang Univ. of S&T	20,000	200	200
-Motor Industry		-Youngjin College		(Daegu)	(Pohang)

Source: Modified from the unpublished government document of MEHRD and Gyeongbuk Provincial Government

These outward features may be viewed as a natural result of a necessary condition of the policy that the university must cooperate with firms and regional government, and selectively with other universities in application for the two funding programmes. In order to identify and understand the internal relationships between not only the three helixes but also regional universities, it is necessary to examine the questions: what has been happening in the cooperation and competition process between regional universities, and between universities, industry and government? What kinds of tensions have emerged in the process of cooperation and competition? What are the different responses to the funding programmes between regional universities?

Table 7.3 Selected projects of the NURI programme in two research regions

KRW: Million

Scale of project	Project Name	Universities		Government Funding (per a year)		
		Managing Univ.	Complementing Univ.	Central	Regional	Local
Total	21 Projects	12 Univ.	19 Univ.	41,192	2,575	666
Large (5)	Training PoP-iT engineers for the regional strategic industry	KNIT	-Daegu Univ. -DongYang Univ. - Sangju National Univ. -AnDong National Univ.	4,000	-Gyeongbuk: 400	-GuMi: 30 -Andong:30 -Sangju: 20
	Training embedded engineers for the new growth IT industry	YU	-Catholic Univ. of DaeGu, - DaeGu Univ. -Pohang Univ. of S& T	4,000	-Gyeongbuk: 400	-Gumi: 50
	Training experts for the top class mobile-display industry	KNU	-YoungJin College -GyungIl Univ.	4,000	-Gyeongbuk: 200 -Daegu: 200	
	Nurturing expert manpower in the material and element industry for the next generation	Pohang Univ. of S& T	-YU	4,000	-Gyeongbuk: 400	
	Nurturing experts in cultural contents	Keimyung Univ.	-Daegu Hooney Univ. -Keimyung Cultural College	4,000	-Gyeongbuk: 200 -Daegu: 200	
Medium (4)	Human resource development for NANO and precision technology	KNIT	- DongYang Uni. - SangJu National Univ.	2,470	-Gyeongbuk: 50	-Andong: 20 -Gumi: 100 -Sangju: 15
	The nurture of expert for digital mechatronics united technology	KNU	-YoungJin College -Pohang Univ. of S&T	3,000	-Gyeongbuk: 75 -Daegu: 75	
	The nurture of technicians for bio-health and agrobiolgy	KNU	-Sangju National Univ. -Andong National Univ.	3,000	-Gyeongbuk: 150	-Andong: 60 -Gunwi: 200 -Sangju:30
	Nurturing experts for the design industry	Daegu Univ.		2,500	-Gyeongbuk: 41 -Daegu: 41	

Small (12)	Nurturing expert for moulding technology	Daegu Univ		1,000	Yeongchun:30
	E-learning education for handicapped infants and children	Daegu Univ.		1,000	
	Nurturing experts in culture and tourism	Gyeongju Univ.	-YoungJin College	1,000	-Gyeongju: 50
	Human resource development for disaster prevention	KNIT	-Andong National Univ.	1,000	-Andong: 3 -Gumi: 5
	Human Resource Development for Car equipment through RDI with regional SMEs	Gyungil Univ.	-Youngnam College of S&T	800	
	Nurturing care manager for old people	Daegu Hoony Univ.	-Daegu College of Industrial and Information	500	
	Nurturing experts in optical technology	Kyungwoon Univ.	-Daegu College of Industrial and Information	1,000	
	Nurturing experts in the commercialisation of oriental medicine	Daegu Hoony Univ.		360	
	The nurture of experts in display technology combined with purifying technology.	YU		1,000	
	Nurturing expert for the industry of S/W digital contents	Dongguk Univ.		860	Gyeongju:22
	Nurturing experts in bio-information machinery	Andong National Univ.	-YoungJin College	900	
	Nurturing teachers for infants and children	Keimyung Univ.	-KNU	793	

Source: Adapted from unpublished government document: The list of Support in the NURI programme 2004, November/2004, MEHRD, available online at; <http://www.moe.go.kr/index.html> (accessed 20 February 2005).

7.3 The Responses of Regional Universities to the UIC Policy

This section attempts to describe how the selected four universities respond to the UIC policies, and also tries to address the specific characteristics and situation of as the background of its responses. By doing so, it identifies the differences between the universities and the collective characteristics of the regions in responding to the policies. This part tries to describe what has been happening in each university since September 2003 rather than discuss the specific trilateral relations and emerging tension. This is because the aim of this section is to explore the responses of the regional universities to government policies rather than to analyse the interactive and tensional relations between the engaged institutions.

The description in this section is based on the analysis of the collected data from interviews and secondary sources. The response of each university is explored through the policy programmes such as the IACFs, the CCI, the NURI and CUCI programme.

7.3.1 KNU (Kyungpook National University)

KNU was founded in 1946 under the name of National College, and it became a national university in 1951 during the Korean War, which was based on the government policy that higher education should be dispersed throughout the country rather than concentrated in Seoul. It is located in the north-eastern section of Daegu City. The university had 15 colleges with 27,137 students and 896 professors and lecturers in April 2004. It has engaged in 9 government projects out of a total of 10 previous UIC programmes since 1994 (see Table 5.2 & 6.1), and this is the largest number in universities within the two research regions. In terms of the number of academic staff, KNU is the largest university in the two regions. Moreover, it is widely accepted in the two areas that KNU is the most highly reputed comprehensive university in terms of the abilities of research and graduates. The Faculty of Electrical Engineering & Computer Science has 86 academic staff, 3,992 undergraduate and 836 postgraduate students which is about 14% of the total numbers of the university. This faculty was designated as a specialized academic

area by central government in 1973 to provide graduates needed in national and regional industries.

As central government encouraged universities to establish IACF as a centre for cooperation with firms, KNU set up its IACF in October 2003. The IACF was organised with four teams as follow:

- Two existing teams from the Planning Office:
 - Research Supporting Team: managing internal funds
 - University-Industry Supporting Team: managing external funds

- Two newly formed teams:
 - Science & Technology Team: patent management
 - University-Industry Cooperation Team: accounting for the NURI programme, and being the contracting party for cooperation with government and industry

The existing teams were transferred from the Planning Office to the IACF but kept their roles, and newly built teams managed the emerging new roles.

When it comes to the characteristics of the members in the IACF, its current leader (a professor at the Department of Management) and ex-leader (a professor at the Department of Material Engineering), had been appointed because of their abilities of people skills and experience in cooperative work. However, the other members were assigned to their positions without any considerations of their special abilities or experiences in working at the IACF. The members are under the IACF's leader; however, they can move to any other offices within the university because of the principle of the circulating assignment which is generally accepted in both public and private universities.

Before the IACF was set up, the patents produced by academic staff were just registered at the Planning Office but there was no university regulation to manage them. A number of academic staff hid their patents as if they were the result of personal research having no relation with their job. Patent management of KNU was started in October 2003 when 'Regulation for Patent Management at KNU' was enacted, at the same time as the setting-up of the IACF. The regulation had prescribed the distribution of royalty income from patents produced in relation to the work of the academic staff for the university; academic staff - 50%, university - 30%, and others (department or research centre) to whom the staff wants to give the profit

- 20%. It was changed in August 2004; academic staff - 70%, university - 30%, in order to encourage the scientists to be open and transfer their hidden patents to the university.

With relation to the cooperation with firms over education and training since 1999, KNU has retrained 20 employees of Samsung Electronics and 20 employees of LG Electronics, which is seen in Table 7.1. Soon after the PAIEIUC had been implemented, this university contracted with ManDo Corporation, one of the Korea's biggest automotive part makers, for 'an educational track for recruitment' with two-years courses of 20 students. This company gave the students scholarships covering tuition fees and some stipend as well, and after graduation the students must go to the company. At that time, it was a revolutionary case in UIC for education and training in South Korea. This is partly because the firm paid for a large number of scholarships in order to recruit highly qualified students, and partly because it was the first case reflecting the government intention of the CCIs programme. This case was chosen by the PCONBD as a successful example to be diffused into the other universities. In this contract between KNU and ManDo Company, the leader of the Planning Office played a critical role in the whole process, because his elder brother is the Chief Executive Officer of the company. The leader of the Planning Office emphasised that his personal relationship made it possible. In July 2005, KNU also contracted with Samsung Electronics for a similar educational track of 20 students. It seems that, passing through these processes, both academic staff of KNU and the related firms had chances for exchanging their opinions about the curriculum.

In the NURI programme, KNU applied for 7 projects which are the maximum each university is able to apply for, with 23 applicant teams competition within the university. The leader of the Planning Office pointed out that 23 applicant teams was the biggest number in any university of the two regions. He explained that this originated from a strong desire of its academic staff to join the NURI Programme, and he said the reasons for the staff's motivation were:

... our university had many government projects, it has become a kind of group culture and trend to join as many government projects as possible and for lectures compare with each other how many projects they were involved in, particularly in the case of the Department of Science,

Engineering and Agriculture. The more projects a lecturer has, the more postgraduate students are attracted. (The leader of the Planning Office at KNU)

In terms of the geographical boundaries of the NURI programme, this university initially argued that the two regions (Gyeongbuk and Daegu) should be integrated. It seems that the university was eager to keep its leading role in the two regions in those changing circumstance through a large amount of government funding. Moreover, KNU could not easily cooperate with the firms located in the Gumi NIC (National Industrial Complex) located in the Gyeongbuk Province because of the different administrative region. Most of the large or electronic firms in the two regions are in the Gumi NIC. The university recognized the importance of cooperation in the NURI Programme, and tried to find ways to collaborate with the firms in Gumi NIC. The Chancellor of KNU suggested to the governors of Gyeongbuk province and Daegu City that the two regions should be integrated in the NURI Programme for these reasons; the MEHRD promised that if any two regions closely related are unified in this Programme, it gives an incentive of 5% of the total funding for the regions; the main purpose of this programme is to produce well-educated students to be employed in the two regions, thus it is impossible to deal the graduates from the two regions differently. In spite of the strong opposition of some universities that their advantages could be lost if the regions were integrated in the programme, the two regions became an integrated unit for competition and implementation in the NURI programme, which will be discussed later in detail.

Like other universities, KNU was interested how to create a better alliance with other universities in order to be selected for as many the NURI and CUCI programmes as possible. In the NURI Programme, each team of 23 applicants decided its partner universities. However, in the case of CUCI programme, only one university can be selected in two regions, thus KNU's UAOs (the University Administrative Offices) including the Chancellor, the leader of the Planning Offices and the IACF and the Dean of Academic Affairs, intervened deeply in the cooperative process with other universities. They approached the Pohang University of Science & Technology, which had a great reputation for fundamental research, and Youngjin College, known for its practical cooperation in South Korea, to suggest a strategic alliance in order to increase its bidding power in the competition for the programme.

The university also negotiated with the cooperating universities concerning which would become a managing university. The leader of the Planning Department and the leader of KNU's CUCI Programme (at that time the leader of the IACF) admitted that they tried to make alliance with universities considering the merit of the partners to win the competition.

At KNU, a champion to play a key leadership role in advocating strong university-industry linkages was found. A number of studies have highlighted the importance of champions in shaping the role that a university has in engaging in regional innovative development (Santoro & Chakrabarti, 2002; Gunasekara, 2004; Etzkowitz, 2002). The person who could take care of the application process of the NURI and CUCI programme, was the leader of the IACF at that time and is at present the leader of the CUCI Project, Lee Sang-Ryong, a professor at the department of Material Engineering. He worked as the leader of KNU Technology Park, and was the first leader of the IACF from October 2003 to August 2004. He has a great deal of experience in government projects. One of his outstanding characteristics is his extensive personal relationships in the region and with national government formed by his career and educational background (Gyeongbuk High School and Seoul National University). As the leader of the IACF, he played a leading role in responding to the government funding programmes. He gave advice to each project team for the NURI Programme, and he presented all 7 projects which KNU produced to the RIC (Regional Innovation Committee). His good presentation as a result of being completely familiar with project contents was one of the reasons that KNU successfully attained 3 projects in the NURI Programme. For the CUCI Programme, he also played an important role in creating cooperative universities, and he contacted the regional (Daegu) and local government (Pohang City) for a match fund. After the CUCI Project of KNU was selected, he became its leader. He was awarded the title of 'Glorious Person of KNU' in 2004 as a reward for his services.

As a Chief Director of Samsung Electronic Company said; "*KNU has a better quality of infrastructure and human resources in both lecturers and students than any other regional universities*". This university tried to keep its leading role in the two regions in the changing circumstances of the emphasis on UIC and the large

amount of government funding. It seems that the characteristics of its leading role and the accumulated know-how in UIC influences its responses to the policies, not only when it prepares for the proposals but also when it tries to find cooperative universities and firms.

7.3.2 YU (Yeungnam University)

The name of Yeungnam University has been used since 1967 following the merger of Daegu College and Chunggu College, which were founded in 1947 and 1950 respectively. Yeungnam University is located in Gyeongsan City where nine universities out of twenty-three in two regions are situated, and the city shares a border with Daegu City. In April 2004, the university had 14 colleges with 32,882 students and 645 academic staff, and it has the largest number of students in two regions. It has experience of eight government projects out of a total of 10 previous major government projects related to university-industry cooperation (see Table 5.2 & 6.1), therefore, it can be said that this university is the second ranked comprehensive university in two regions in terms of the cooperative research.

In March 2004, YU established its IACF within the Research Office, and the leader of the Research Office is at the same time in charge of the IACF. The IACF was organised into two teams: the Research Supporting Team undertook new tasks such as cooperative contracts to government and accounting support of NURI Projects; the Supporting Team for Specialization supported research centres and scientists applying for new government projects.

An interesting point to note in the IACF of the university is that it does not operate the patent management, which is managed by YU Centre for SME Cooperation (YUCSC). The YUCSC has been in charge of the UICP (University-Industry Consortium Programme) since September 1993, Business Incubators since March 2000 and the TTC (Technology Transfer Centre) since October 2001. It has played a main role in the technology transfer and cooperation with SMEs for the last ten years. However; after the IACF was established, it has tried to take on the role of the YUCSC. The leader of YUCSC expressed his discontent with the fact that the IACF tried to control the funding for his centre and to assume certain roles.

The IACF is struggling to find its way in terms of organisation and mission. Organisationally, it is included in the Research Office, even though legally it is an independent foundation. Its role is also not fixed, for example, the YUCSC undertakes patent management, and the Registration Office manages the CCI. In addition, the relationships between the IACF and the research centres or academic department are limited to the formal administrative process. When it comes to specialization of the members, except for its leader, its members were not considered in regard to their special abilities or experience required for working in the IACF, which is the same as in the other studied universities.

In August 2004, YU made an agreement for the CCI with Samsung Electronics Company, which provided an opportunity to study for a bachelor's degree for employees by entering into the third undergraduate level in one of three language subjects English, Chinese and Japanese. In each subject, there were forty new students, and this university ran these courses only for this company's employees. This is the first case of the CCI under the PAIEIUC law in South Korea. A notable point is that personal relationships became a useful tool in this contract between YU and Samsung Electronics Company. The chief factory manager in the Gumi plant of Samsung Electronics Company, who graduated from the university and has kept in touch with the leader of Planning Office and Registration Office, was heavily involved in this contract.

With respect to the NURI Programme, the interviewees of the university explained that they attempted to keep its position as the second ranked comprehensive university in the two regions through obtaining as many projects as possible. The university applied for 7 projects, the maximum each university is able to apply for, which were selected from 13 competing teams within the university, as the result of which two projects were selected. This is seen in Table 7.3, and the number of two selected projects is fewer than that of KNU, the KNIT and Daegu University. In the CUCI Programme, this university collaborated with the KNIT, but they were beaten by KNU and its collaborators.

There were different opinions between university members about the processes of application and selection in the two programmes. The leader of the Research Office evaluated those processes as a success; even though the number of selected projects was not many, the preparation processes were effective because they coped well with the changed programmes on the basis of extensive experience in UIC. However, a scientist, the head of Electrical Engineering & Computer Science Faculty assessed these as not successful, for the following reasons; firstly, the university did not play any important role in the political process of regional universities discussing the integration of the two regions and other matters concerning the programmes, thus the university failed to capture useful information in regional competition between universities. Secondly, even though YU had some experience of government projects, some of the teams did not fully understand the objectives of these changed programmes. Thirdly, the qualities of the applied teams are questionable. This is because when the UAOs (the University Administrative Offices) evaluated seven project teams out of thirteen, a number of UAOs unfairly assisted some teams from their academic departments.

These two different viewpoints imply the gap between the UAOs and the scientists in viewing the UAOs' responses to government policy. It seems that this distrust of the UAO's accomplishment is somewhat related to the university's leadership situation. Even though it is a private university, there is no person who has acted as an owner since 1988. The owner who worked as the Chairman to 'the Board of the Yeungnam Educational Foundation' had been expelled in 1988 because of corruption, thus the lack of leadership. The leader of the Research Office recognized that the absence of strong leadership as a reason why this characteristic made the university responded less positively compared to other private universities.

A point to note is that both the UAOs and academic staff were very conscious, on the one hand, of the university's position as second to KNU, and on the other hand, of the leading role of KNU in the area as competitor to YU. As the head of Electrical Engineering & Computer Science Faculty said:

...in these regions, we ranked next to KNU. We thought that this position should not be overtaken by other universities, which stimulated our motivation in preparation for the government programmes. (The head of the Faculty of Electronic Engineering & Computer Science at YU)

Interviewed university members felt proud to be at the second university in these regions, and they appeared to worry about being overtaken by others in the changing financial environment which emphasised.

The issue of the relationship and competition between YU and KNU in UIC may be understood by the investigation of the specialized academic fields in the two universities. In 1994, the MEHRD selected specialized engineering faculties/departments in 8 universities all over the country including KNU and YU for the National Support for University Programme (NSUP) which aimed to assist excellent engineering faculties/departments to enhance national competitiveness and develop the skills of engineers. At that time, KNU and YU specialised in Electronic and Mechanical Engineering respectively through the support of central government. However, electronic and information industries were highly developed in the regions, whereas the mechanical industries were not, mainly owing to the decline of the textile industry. Thus, during the last decade, YU has tried to specialize not only Mechanical Engineering but also Electronic Engineering, and the biggest engineering faculty/department of this university became the Electronic Engineering Faculty, which is similar to that of KNU. This kind of overlap of the specialized academic fields in two universities led to an inevitable conflict and competition between them, which has emerged through recent government programmes. For instance, in the NURI programme, these two universities did not cooperate in any project; moreover, in the CUCI programme, YU allied with the KNIT without any contact with KNU.

In terms of geographical boundaries in responding to the policies, the members of the university agreed with the fact that the two regions should be considered as an integrated region for cooperation with industry, mainly because the integrated area shares a cultural, historical and economical consensus. However, in practice, it seemed that they were afraid that their current advantage as a leading university in Gyeongbuk region could be damaged in case that they should compete with the universities in Daegu city mainly because of KNU which has better ability than the university.

On the whole, from the above stories, it can be said that in responding to the government policy: YU tried to defend its position as the second, and to keep KNU's

unopposed position in check; new organisation and interaction were found such as the establishment of the IACF, the new course for CCI, and joining in new projects of the NURI programme; in addition, tensions between the university's members or organisations, and between the university and other institutions, have emerged.

7.3.3 The KNIT (The Kumho National Institute of Technology)

The Kumho National Institute of Technology was established in 1980. The university has seven engineering and scientific faculties with 9,318 students and 180 professors and lecturers in April 2004, and it had experience of four government projects out of a total of ten previous major government projects related to cooperation (see Table 5.2 & 6.1). It is located in Gumi City in the western part of Gyeongbuk Province. As a result of the export drive policy in the early 1970s, Gumi City has become the centre of high-tech industry leading national exports since the establishment of the Gumi NIC (National Industrial Complex) in 1971. The city produced 11% of national exports in 2004, 28.8% of Gyeongbuk's GRDP in 2002. Major products are mainly high-tech electronics such as LCD, CRT, and Telecommunication Equipment, which accounted to 82.4% of the total manufacturing output in 2004. Accordingly, it can be said that the location of the university may be an advantage for increasing cooperation with industry compared to other regional universities.

This university set up its IACF inside the Planning Office in January 2004, and the members of the Planning Office served in the role of the IACF. It seems that this IACF was established nominally to apply for the NURI Programme. In February 2005, the IACF became independent of the Planning Office, and changed to a new form with two newly-formed teams: the Cooperative Management Team managing research funds including NURI Projects and cooperative contracts for the government; and the University-Industry Cooperative Team supporting each research centre related to cooperation, and operating Patent Management.

The members of the University-Industry Cooperative Team are distributed in several research centres such as the Business Incubator and RRC (Regional Research Centre). They also hold two positions simultaneously as members of both the IACF and of the research centres. The noticeable point is, despite working in the other research

centres, the leader of the IACF has the right to evaluate the working performance of the members, which is related to the personnel management system of the IACF. When a local research centre employs new members whose task is related to the IACF, the centre should discuss its relevance with the IACF's leader. Moreover, the leader of the IACF can allocate work amongst the members whose task is related to the IACF, in research centres.

The leader of the IACF explained this characteristic as the centralized system, and this system could operate with the agreement of each research centre accepting not only the IACF's role, but also its leadership. In this university, a consensus was found between university members that the IACF and each research centre should cooperate to increase its UIC. However; the method of construction of their relationships is still not clear, and the interrelationships between them are limited to basic needs such as research support, cooperative contract to governments and firms, accounting support and Patent Management.

The university has operated two retraining and educational courses for the employees of LG Electronics Company since 2001; an undergraduate and a master course of Material Engineering. These programmes appear in some government documents as successful case of cooperation with industry. In February 2005, the university set up the CCI (Contracted Course with Industry) in collaboration with Samsung Electronics Company for retraining and education through two courses, Mobile Engineering and Industrial Management. This is the second case of the CCI under the PAIEIUC law in the country. These two cases are 'retraining programmes' giving more opportunities for current employees to be educated, and these are in striking contrast with the case of KNU that operated 'educational track for recruitment' with Samsung Electronics. The company selected the KNIT for retraining its employees because of its proximity, and it contracted with KNU for recruitment because of its better abilities of graduates compared to other regional universities. The Chief Director of VTC & HRDP of Samsung Electronics clearly expressed why his company chose KNU for recruitment; *"we like the university having competitiveness in terms of abilities of research and graduates"*. From the above comparison, it can be said that a geographical advantage of the KNIT has an influence on the

construction of CCI, but the degree of cooperation is limited to the retraining programme rather than the extension to the recruitment programme.

For the NURI Programme, the university applied for six projects, which are less than the seven it can apply for, and three projects were selected. The members of the KNIT, other universities, and the regional government officers interviewed, estimated that the KNIT's outcomes in the competition of the NURI Programme were successful compared to the previous engagement of this university in government projects. The following characteristics were found in this university related to the process of preparing, applying, and being selected for this programme.

Firstly, in preparation for the programme, the UAOs, including the Chancellor, the leader of the Planning Office and the Dean of Academic Affairs, who played a critical role in arbitration between two big academic faculties; Mechanical Engineering and Electronics Engineering. When these two together intended to apply for a large-sized project limited to one project in one university, the UAOs persuaded the Mechanical Engineering Faculty to concede to the Electronics Engineering Faculty in applying for the project. This is partly because the UAOs prevented the faculties from engaging fierce competition, which them to concentrate more on competition with other universities. The other reason is UAOs thought that Electronics Engineering comes close to the requirement of regional and local industrial needs.

Secondly, 'special teams' were organized spontaneously in each project team preparing the written proposal for the NURI programme. These special teams consisted of some experienced specialists with good reputations in writing government project proposals. The members of these teams were lodged together in a hotel for three or four days to prepare proposals. The leader of Planning Office said that;

Our ability to write proposals was one of the critical factors in the selection of three projects out of a total of six proposed projects in the NURI Programme. We wrote the proposals very well, because we organized the special teams to prepare them. ...Our proposals, particularly of large and medium sized projects, were evaluated by the Regional Innovation Committee as the best among all those of the regional universities. The MEHRD was also very surprised when they looked into our proposals, and

they used one of them as a sample. (The leader of Planning Office at KNIT)

The leader maintained that the ability to write proposals had been developed in his university through experience of government projects, and he judged that these special teams produced the necessary qualities for success. Some of interviewees outside the university admitted that the KNIT tended to produce good quality proposals in the programme.

The third point observed in the KNIT was the consensus among the members that it was a chance to upgrade this university's status and role in its local and regional area. On the one hand, the homogeneity of the academic staff emerging from university's specialization in technology strengthened the unity of the group. On the other hand, the members' various backgrounds, being from different hometowns and universities, reinforced their unity, and this diversity prevented one or two large informal organisations from holding real power. This unity can also be due to the characteristics of a small-sized university. Many interviewees said that when they responded to recent government policies, this members' unity helped them to cooperate with each other.

The last point considered as a characteristic of the KNIT in the NURI Programme is that this university had a natural advantage due to its geographical location: i.e., next to the National Industrial Complex. This is because the NURI programme demanded that universities should collaborate with firms from the initial stages of presenting proposals. The project teams easily found cooperative partners among the university's neighbours, and they could receive advice and quick feedback about the curriculum from firms nearby. For example, when conducting interviews with the leader of the NURI project and the leader of the IACF, they were asked for the telephone numbers of the related firms, and they had memorized the numbers and reconfirmed them through their mobile phones. This was different from the other three universities where most all interviewees had to ask their secretaries and checked it through their computer or telephone directory.

On the other hand, the university's members mentioned that their weak point was a lack of personal relationships. This was mainly caused by the result of the relatively

short history compared to KNU and YU and the absence of the academic field in social sciences. They insisted that they would be politically defeated by KNU and its collaborators in the CUCI Programme, even though they had been preparing the programme for a long time.

This university had close relationships with YU in the NURI and CUCI programme, in particular, in the academic field of electronics and computing engineering. It seems that their connection naturally emerged with the intention to prevent KNU's exclusive benefits in this field. These two universities expected that their collaborations could achieve the best outcome, because of the various merits of the two universities: YU is considered to be in the second position in both general terms and in the field of electronics and computing engineering; and the KNIT has the best geographical advantage. However, in the NURI programme (large-scale project), they did not come to an agreement regarding the assignment between the managing and complementary university. The leader of the NURI project at the KNIT argued that, at that time, they were more interested in how to ally with a certain university in order to win the competition rather than in organizing the collaboration in order to do the project well. He added most of the universities selected their collaborative university with this consideration in mind.

With relation to interaction with industry, members of this university had more actual points of view, as the leader of the large-sized NURI Project and the head of the Faculty of Electronics Engineering said;

...to be honest, the relationships with firms in the NURI Programme are conventional ways, but the intention of government is to construct a strong regional innovative network. There are some difficult and complicated problems about these relationships. Big companies consider our approaches for cooperation as being troublesome, because they are doing well without our help. And another thing is, in Gumi, Samsung and LG Electronics Company concentrate on R&D which is applicable to production, and more fundamental and basic technology were dealt in the head research centre located in the capital area. The problem is that it is really difficult for the university's staff to engage and support firms for not basic but applicable technology which should be applied directly to the product process. Therefore, the cooperation with industry is not easy in our area. (The leader of the large-sized NURI Programme at KNIT)

There are some gaps between the viewpoints of firms and universities, so I feel keenly the necessity of more communication with firms. The firms' managers do not talk with us openly, perhaps to protect their secrets, which is more evident with the big firms. If they question us vaguely, we answer vaguely. (The head of the Faculty of Electronics Engineering at KNIT)

These two professors' expressions about difficulties in cooperation with firms imply that they take a more objective view of university-industry cooperation than other universities' interviewees who revealed only the bright side of the cooperation. It seems that these objective and critical views came from their real experiences of interaction with firms.

In terms of geographical boundaries in responding to the policies, the university's researchers give high priority to the Gumi area as the place to supply their knowledge and services to firms. The interviewees of the university defined the region related to university-industry cooperation as only the Gumi area. They pointed out that the regional boundary could be both the Gyeongbuk and Daegu area when under the so-called 'regional innovation system', however, they can not react to needs from outside of Gumi because the Gumi area itself is too large for them. They also insisted that the university had a locally embedded characteristic in that 45 per cent of its graduates have been employed in the Gumi area.

To sum up, the KNIT positively responded to the government policies with the following characteristics; being a small and specified university; the creation of 'special teams'; the consensus among the members; and the proximity to firms; and the identification of its boundary as the Gumi area.

7.3.4 HGU (Handong Global University)

HGU opened with Christian Spirit in 1995 at Pohang City located in the north-eastern section of Gyeongbuk Province. Pohang City is famous for the steel industry, where POSCO which is one of the largest steel firms in the world is located. However, this university has no contacted with local industries, and it is not well known to the people of the region. This university has shown itself to be strongly Christian on all occasions, and it is well known to Christians all over the country. Accordingly, most of the new students were recruited through the Christian network

from all over the country and overseas where they are evenly distributed, thus only 5.8% of the new students were from the Gyeongbuk and Daegu regions in 2004. The university's documents emphasize that it specialises in teaching rather than research, in order to produce well-qualified graduates with Christian Spirit. In April 2004, the university had 11 academic departments with 4,543 students and 82 academic staff. Since it was founded, it has engaged only one government project, a Business Incubator supported by the SMBA (Small & Medium Business Administration), out of a total of 10 previous major government projects related to cooperation (see Table 5.2 & 6.1).

The university set up its IACF on 1st April 2004, because until 23rd of April the university had to submit its proposals for the NURI programme under the official title of the IACF. The IACF only added its official title to the current Planning Office, even though in the 'University Regulation of HGU' it is an independent legal foundation. Thus, the leader of the Planning Office holds two official titles at the same time. The leader of Planning Office frankly described the situation of its IACF;

...we set up the IACF. However, we do not need the IACF, because we do not have any work related to cooperative projects with governments at present. Therefore, in our IACF, we just have its title but no members. If we employ members for the IACF, it just wastes our budget. (The leader of Planning Office at the HGU)

The leader looked on the IACF as a tool to apply for and manage government projects.

However, the two professors (a professor at the Department of Bioscience & Food Technology, and a professor working as the Head of the Business Incubator) interviewed in this university recognized the need for the IACF to play an intermediary role and encourage cooperation with governments and firms. They expected that this university would approach cooperation more positively, and pointed out some in fostering knowledge transfer. A Professor at the Department of Bioscience & Food Technology who manages a venture company placed within the Business Incubator of the university criticises the university's neglect of the cooperation in this example;

Our university asked us to pay personally the cost of applying for an international patent, because of the high cost. ... In cases where we use the university's title for firms' products as a part of a brand name, our

university wants us to pay 10 % of the total sales. How can we do knowledge transfer and cooperation with industry? (The Professor at the Department of Bioscience & Food Technology at the HGU)

Since March of 2003, this university has operated an 'educational track for recruitment' with a two years course by reflecting of the needs of LG Electronics Company located in Gumi. This course was well known as the first case of cooperation over an educational track in order to recruit in South Korea, so in some government documents, this case was shown as successful. However, after the PAIEIUC was launched, the university did not operate any new contracted course with industry.

After the announcement of the NURI Programme by the MEHRD, the preparation processes were assumed by the strong leadership of the Chancellor. He had the confidence that the proposed projects of the university would be selected. This is because the MEHRD and the PCONBD already acknowledged the fact that the education programme of the university was a successful model expected in the NURI programme, and this university specialised in teaching-oriented to nurture qualified graduates, which also matched with the objective of the programme.

The university members followed the Chancellor's guidance in preparation for the government programme, and the Chancellor deeply intervened all the preparing process. The Professor at the Department of Bioscience & Food Technology described the situation in this manner:

Most of lecturer had no idea how to prepare their proposal. Therefore we totally accepted the Chancellor's idea, because we believed that our Chancellor had a great deal of information from central government and the Presidential Committee concerning this NURI programme. (A Professor at the Department of Bioscience & Food Technology at the HGU)

The Professor mentioned that, at that time, they could not help following the Chancellor's ideas, because this university had not accumulated knowledge in preparing and managing government projects. The Chancellor, Kim Yeong-Gil, with a great reputation as a scientist who worked at NASA in the U.S.A. has constructed a strong leadership through the recovery of the deficit which was a crucial problem of the university. The Chancellor has built up a personal relationship with the higher authorities of central government and the Presidential Office on the basis of his high

reputation as a famous scientist; however, he did not make close links with regional authorities.

The Chancellor organised a special team in order to prepare the NURI programme as soon as this programme was announced, and the main role of this team was to organize a project team and to support the preparation process for the programme. This new special team was in charge of the whole preparing process for applying for the NURI programme directly under the Chancellor. However, this team did not know how to prepare and what was the main intentions of the government programme. At the beginning of the establishment of this special team, the professor in the Department of English Language, who had no experience related to government projects became its leader. The Professor at the Department of Bioscience & Food Technology criticized this case as an example of the university's ignorance of government projects. Later, this leader was changed but the special team did not operate well because of a lack of knowledge and experience.

In the NURI Programme, this university has continued to concentrate on teaching and education which were viewed as its primary activities, and it did not fully follow the other objective of the programme, namely cooperation with industry and other universities. Even though it tried to ally with other universities, it had difficulty in finding collaborators. This is partly because the university did not have a good reputation of doing government projects in its region, which led the other universities to exclude it as a cooperative partner. This is also partly because the university's strong reputation as a Christian institution did not match that of other universities. In its proposals, it highlighted its first educational mission, Christian spirits. The university proposed a medium and a small-scale project; the former is '*education to produce global leaders needed in the 21century company*', and the latter is the '*construction of media city Pohang*'. Neither of them was selected.

An interesting point to note is that the university attributed the failure of the NURI programme to the problem of the regional context, even though the university admitted that it lacked experience and know-how in applying for government projects. Firstly, in the two regions, interviewees of the university mentioned that personal networks are very important in business and political processes, but none of

the university's graduates could intervene in the regional competition processes because of its short history. Secondly, the university asserted that the Gyeongbuk regional government intentionally estranged the university from the government project, because most of the applied regional universities were selected for at least one project in the NURI programme, but HGU was not. Lastly, they also claimed that the region discriminated the university in the NURI program because of the Christian style expressions like 'an attitude of devotion'.

At this point it is necessary to look into the relationships between this university and the local context. The steel firm POSCO has led the development of this city since the 1960s, and it established the Pohang University of Science and Technology in 1987. This university, with 1,785 students and 214 academic staff, is reputed to be one of the best research-oriented universities in South Korea. POSCO and its university invested 53% of the total funds to build the Pohang Technology Park (PTP). They have had initiatives in the operation of the PTP. Even though HGU and the PTP are located in the same city, there was no relationship between them. The leader of the Promotion Department in the PTP describes the HGU in this manner:

In the case of HGU, the ability to support start-ups in the Business Incubator is very weak. There was no case of start-up firms moving from the HGU's Business Incubator to our Business Incubator, because they will fail before coming here. ... The HGU is like a island in terms of interaction with others in this region. (The Leader of the Promotion Department in Pohang Techno-Park)

He also raised this question; why did the teaching-oriented university apply for the NURI programme by emphasising cooperation with firms?

With relation to the geographical boundary where the university interacts, most of the interviewees of this university defined their regional boundary as the whole country or the world, for the following reasons: firstly, not only the new students but also the graduates were from and distributed evenly across the country and overseas. Secondly, the HGU constructed a Christian network with many countries. It educated the students from under-developed countries, and received funds from a Christians church in the U.S.A. for whom this is a way of saving money rather than educating

directly. The Head of the Computer Science & Electronic Engineering Faculty summed it up in this way:

The region of Gyeongbuk has no meaning to us. We are interested in the whole country and Southeast and Central Asia. ... We are a new university which started only 10 years ago, so we need a new strategy to keep us alive in this competition. This is our strategy. ... We try to find funds all over the world with the Christian Belief. (The Head of the Computer Science & Electronic Engineering Faculty at the HGU)

The leader of Planning Office expressed how the university considers its region and geographical boundary:

We are really disappointed with the selection results in the NURI Programme. If this regional government deals with us this way, we can leave this region. ... We accept our mistake that our Chancellor did not take part in the Chancellor's meeting of regional universities to discuss the NURI Programme. ... however, this region disregards us too much. We can earn money by selling this estate, and move to another region. (The leader of the Planning Office at the HGU)

It seems that in this university, the extension of its regional boundary is viewed as a strategic consideration to construct a better university in the competitive environment.

In brief, it seems that the university has kept its specialised characteristic as a teaching-oriented university and a Christian institution, but has somewhat neglected cooperation with firms and government. However, in the NURI programme which was matched with its teaching-oriented characteristic, the university positively responded in order to overcome their financial difficulties. In responding to the government policies, tensions were found between engaged actors or organisations, in particular between the UAOs and academic staff, and between the university and its region.

7.4 Reflections on Universities' Responses

This section will explore the question; to what extent do the above descriptions provide the answer to the questions generated in the previous chapters? The above illustration helps to extend the knowledge of how the regional universities have

responded overall, and it also provides the specific features of each university. In reflecting on the above description, this part will discuss the new findings and questionable points which need further analysis.

7.4.1 Diversities and Similarities in the Universities' Responses

From the above responses of all four universities to government policies, not only similarities but also differences between them were found. The differences can be summarized as follows: with respect to the establishment of IACFs, specific roles and organisational formations are different; in the CCIs, except for HGU, the three universities have opened contracted courses since September 2003; KNU operates an 'educational track for recruitment', but the KNIT and YU have a 'retraining programme'; in the NURI programme, the number of applying teams and the preparation process were different such as organizing special teams (the KNIT and HGU) and the degree of engagement in regional political issue for the programme; in the CUCI programme, cooperation happened between regional major universities.

In fact, in the literature review (Chapter Two and Four) of this thesis, the importance of universities' diversities was slightly neglected, even though methodologically the diversities of the four selected universities were taken into account. This is mainly because it initially attempts to find the collective characteristics of the responses and interactions of regional universities rather than exploring the differences between them. As the evolutionary innovation theory considers the institutions in their heterogeneous rather than homogeneous (Boschma & Lambooy, 1999; Dosi & Nelson, 1994; Fagerberg, 2002), the diversities between regional universities should be taken into consideration in the analysis of universities' responses to government policies (Gunasekara, 2004a; Boucher et al., 2003). The university is not separate from its social environment, and it may be socially constructed by various different factors such as its organisational culture and mission, and the characteristics of geographical location and community. Accordingly, even though to some extent universities are influenced by the regulatory framework of the state, they are heterogeneous institutions, and responds in different ways to the government policies (Granovetter, 1985; Charles, 2003). Boucher and his colleagues (2003) underscored the importance of the different engagement of universities in this quote:

Not all universities are equally involved in their region's development and particular types of universities are more engaged than others. ... these results suggest that researchers, university administrators and policy makers should be more aware of the range and levels of regional engagement by universities. (p. 891)

Accordingly, the above finding of the diversities between regional universities gives two meaningful interpretations to this thesis. Firstly, in terms of the policy process, the different characteristics of regional universities were not contextualised in the top-down policy programmes. As mentioned earlier, there was no normative way in regional innovation policy between a top-down and bottom-up process, but the important point is that the policy should reflect the specific context of the region and its institutions. The Director General of the Regional Innovation Bureau at the PCONBD agreed that the policy programmes did not reflect the characteristics of regional universities;

It was really difficult for us to divide the universities into categories such as leading university, research-oriented university, and teaching-oriented university, because all of the universities together wanted as much funding as possible. And we worried about their objections if we distinguished between the specified groups in terms of the amount of funding (The Director General of the Regional Innovation Bureau at the PCONBD).

His comment denotes the political expediency of the top-down policy. It also implies that the policy will inevitably generate conflicts when it is implemented because of the diversities of regional universities.

Secondly, the above finding of the diversities between regional universities may underpin the understanding of the universities' nature in the engagement of regional innovative development. This is partly because the diversities can become a factor to explain the characteristics of regional universities, and partly because the identification of the universities' diversities provides a perspective to understand the universities' nature and engagement in their regional development.

With respect to the similarities between the four universities in response to the policy, all four universities established their IACF, and except for the HGU, the other three universities opened the new contracted course. All four universities positively applied for the NURI programme to be selected, and in the CUCI programme, the universities showed their strategic collaboration. Accordingly, it seems that the

outward appearance of their similarities can be summarized as active application for the government programmes by the four universities.

However, the above descriptions did not provide the analysis of the interactions and tensions happening in the responding processes of the universities; thus it is necessary to examine the interactive relationships between universities, industry and government in order to further understand their characteristics and background meaning of their responses.

7.4.2 Collaboration and Competition

Competition between regional universities in the funding programmes was inevitable, because the policy intended to select the project teams through such competition between regional universities. Cooperation was found in three directions; between universities and firms; between universities and regional government; and between regional universities. The former two forms of cooperation were actually enforced by the government as a requirement in applying for the policy, and the last form of cooperation occurred, by universities themselves, to increase the bidding power in the competition process. It can be said that competition and cooperation coexisted in the four universities in responding to the policy programmes, and this feature is matched with the policy objectives at least in outward appearance.

In RIS literature, cooperation is encouraged in order to increase interactive learning between institutions, and competition is emphasized as the key determinant for global competitiveness (Porter, 1990). Park S-O (2001) emphasises the importance of both of them:

In considering policy implications of RIS, the importance of the balance between competition and cooperation should be carefully considered. ... Competition provided incentives to innovate, but cooperation at local, national, and international levels are also important in enhancing capabilities to innovate. (p. 31)

However, in reality, it is difficult to distinguish between simple contacts and cooperation based on interactive learning, and between a simple competition and the competition concerning competitive advantages.

Even though, in responding to government policy, regional universities cooperated with other institutions (other universities, firms and governments), the degree of interaction is still not clear. Thus, the background meaning of their cooperation and competition, which underpins the identification of the nature of dynamic interactions happening between universities and other institutions should be examined. In the next chapter, using the Triple Helix Model, the degree and nature of cooperation and competition will be investigated.

7.4.3 The Boundaries of the Universities' Engagement

With respect to the regional boundaries of the universities, an interesting point is that each university defined its boundary differently where it interacts in relation to regional innovation system building, for instance: KNU and YU view the integrated regions of Gyeongbuk and Daegu as their boundaries; the KNIT concentrates on a much smaller area, Gumi City; but HGU expands its territorial boundary to the whole country and all over the world. It can be viewed that these differences mainly originated from strategic considerations in constructing a better university in the competitive environment.

The varied viewpoints from university to university may influence the type and extent of their interactions with regional government, industry and other regional universities. This is because regional authorities simply look at administrative borders as their region, whereas the universities and firms tend to regard regions as the territories to be changed depending on their strategic considerations (Gulbrandsen, 1997).

Accordingly, it is interesting point to explore how the universities actually interact with other institutions in terms of their regional boundaries. Moreover, it can be assumed that each regional university might denote its reaction according to the new boundaries encouraged by central government. The next chapter will try to examine the possible gap between the triple helix relations and the territorial boundaries regulated by the policy.

Chapter 8 The Degree and Nature of Universities' Interactions

8.1 Introduction

This chapter explores the degree and nature of universities' interactions with industry and governments in response to the university-industry cooperation policy programmes. It is analysed using the Triple Helix Model. In Chapter Five, the Triple Helix Model was conceptualised into two frameworks (Analytic Framework One and Two), and the issue of the possible gap between the boundaries of RIS building and the actual interactions of the regional triple helix relations is generated. The Analytic Framework One was based on the four developmental processes of the triple helix relations, and it will be used to investigate in which stage of the four developmental processes the four regional universities are positioned. The Analytic Framework Two was based upon the considerations of tensions occurring in the dynamic relations between the three helixes, and it will examine the nature and characteristics of the dynamic interactions through focusing on the analysis of interdependence and conflict emerging in the process of the interactions. The examination of regional boundaries originates from the epistemological gap between the concept of RIS based on spatial issue and the Triple Helix Model focusing on functional relations. Therefore, through investigating the functional boundaries in triple helix relations, the regional boundaries of RIS building will be identified.

In the previous chapter, the description of four universities' responses underpinned an overall understanding of realities in the regional universities and the similarities and diversities between them. It also highlighted the fact that the four universities responded somewhat positively to the university-industry cooperation programmes. However, it did not provide the dynamic aspect of the interactions and the rationale of the responses. This chapter attempts to find the dynamic interactions between university, government and industry, which are not discussed in the descriptive analysis.

It should be noted that the analytic concept of this chapter, the Triple Helix Model, is not a stable but dynamic model. The positioning of regional universities in terms of the four developmental processes is not static, but a process of ongoing transition from a certain stage to other. Even though the time period for this research of the triple helix relations is from September 2003 to 2006, the features of the relations at that time may be viewed as the symptoms of future developments and interactions. On the other hand, it is nearly impossible to capture all of the features in the dynamic interactions between universities, government and industry, and therefore, the analysis has inevitably been done by limited data collected through qualitative interviews and secondary sources through focusing on the responding processes to the government policy.

The first part of this chapter analyses the dynamic interactions of regional universities in five dimensions; within the universities; between universities; between universities and governments; between universities and firms; and universities in regions. The second part discusses the results of the analysis against the analytic frameworks.

8.2 The Dynamic Interactions of the Regional Universities

The triple helix relations between universities, government and industry can be classified into trilateral relationships such as; between universities and government; between government and industry; and between industry and universities. However, as mentioned earlier, this research explores the interactions with specific relation to universities. Rather than dealing with the relationships between government and industry, it investigates the universities' interactions by studying the changes within universities and the interactions between universities. Additionally, the relationships between the localised triple helix relations and regional boundaries for RIS building are examined at the end of the chapter.

The questions of the Analytic Framework One (see in Figure 5.2 and Table 5.1) and the tensions driven by the conflict and interdependence in the Analytic Framework

Two (see in Figure 5.3) were based on the analysis of the universities' interactions in each part of this section.

8.2.1 Dynamic Interactions Within Universities

One of the driving forces in the triple helix relations is that each helix assumes the role of the others creating interdependent relations between the three spheres within the changing socio-economic environments. Therefore the changes within the universities in response to the new university-industry cooperation programmes may be considered as an important factor in identifying and understanding the triple helix relations. As the new policy programmes encourage regional universities to interact with government and industry to construct RIS, it can be expected that regional universities take on some new roles that contrast with their previous behaviours as they respond to the policy programmes. The changes of the regional universities will be discussed in three different directions: the establishment of new organisations; the change of patent management; and the changing perspectives of the universities and their members. These were found through analysing the dynamic processes of their changes in response to the policy programmes.

■ The establishment of new organisations, the IACFs

As described in the previous chapter, central government (the MEHRD) actually enforced regional universities to establish their IACFs as a signpost organisation, and it played a major role in cooperation and knowledge transfer. All four universities established the IACFs in the period of October 2003 to April 2004. In general the four universities together agree with the fact that it is necessary to build up a central organisation for cooperation with industry and government, otherwise the cooperative management might be separately operated.

However, even though the four universities have superficially followed the policy, the actual roles of the IACFs have been limited to being a party of a university to a cooperation contract and the fund management of the government project. In addition, each IACF of the four universities has been struggling to find its way in terms of organisational independence, specialisation of the members and

relationships with other research centres within universities and with outside institutions.

In the evolutionary perspective of the universities' role in knowledge transfer, the establishment of the IACF within a university may be viewed as a turning point, bringing the university closer to industry and seeking to commercialise the university-based technology (Agrawel, 2001; Santoro, 2000; Siegel, 2003; Friedman and Silberman, 2003). Friedman and Silberman (2003) suggest that the age of the TTOs (Technology Transfer Offices) may be a factor to decide the university's knowledge transfer outputs in this way:

Cultural barriers exist between the TTO, the university scientists and industry. Personal relationships and networking are important in the transfer of university technology. Building personal relationships and reducing cultural barriers will occur with time and experience. The TTO will learn from accumulating experience and specialized know-how. (p. 20)

At the initial stage of the IACFs, as Friedman and Silberman mentioned in the above quotation, there might be a possibility to emerge tensions between the IACF and other research centres within universities and between universities and central government with relation to the implementation of the regulatory policy.

The interdependence between the IACF and other research centres within the university is automatically constructed, as the MEHRD authorized the IACF as the sole responsible partner of a university for contact and fund management in government funding programmes. In other words, if a research centre tries to apply to any government funding programme, it must first pass through the IACF for the process of contract writing and the final approval of the financial expenditure. Therefore, it can be said that they have a connection with each other on paper, however; the actual relationship is limited to the formal and necessary connection in case they need a contract or fund management concerning a government project.

Interviewees of research centres such as Business Incubators and the NURI and CUCI programmes, recognised that the need of the IACF's role as a signpost organisation, yet on the other hand, they did not accept the IACF's leadership. A

professor working as the leader of a NURI Project stated his opinion about the IACF in this manner:

...to be honest, the best thing is that the IACF doesn't exist, since it is natural to be inconvenient if the public makes one more organisation. However, in terms of fund management and contract with outside institutions, we need the IACF. (The leader of a NURI Project at KNU)

As the above quotation implies, some discontents were found between the IACFs and the research centres or departments within the universities, but the conflicts were different between the universities depending on the situation. In the case of KNU and YU, each research centre of the universities has accumulated the abilities for managing the UIC (University-Industry Cooperation) programmes since 1990. They were, therefore, inclined to underestimate the newly built IACF as an unnecessary organisation that was trying to control them. In cases where a certain organisation had already played a similar role to the IACF, such as in patent management and cooperation, a conflict arose strongly between the existing organisation and the newly built IACF. As mentioned in the previous chapter, at YU the YUCSC (the Yeungnam University Centre for SME Cooperation) had already played a similar role to the IACF, however; as the university established the IACF in line with government policy, a conflict arose between the new IACF and the YUCSC. The leader of the YUCSC expressed his dissatisfaction with not only the government initiative enforcing to set up the IACF, but also the IACF itself saying:

I can't understand why central government forces the universities to establish a new organisation, the IACF. In our university the YU Centre for SME Cooperation has operated well, so why should we create the IACF? ... the creation of the IACF is the same as building a roof over the roof. (The leader of the YUCSC at YU)

Even though the four universities established their IACFs, they were discontented with the policy, which emanates differently depending on the universities' characteristics such as whether it is a private or public university or its size. At YU, the private university, the leader of Research Office expressed his displeasure with the establishment of the IACF in some detail:

The IACF is only needed for the national university, because in the national university, the benefits gained from the result of knowledge transfer and cooperation should shift to the National Treasury. ... in fact, a private university like ours does not need the IACF. However, we set up it because

the MEHRD forced as to set up the IACF. (The leader of Research Office at YU)

The small private university, HGU, also reveals discontent with the policy in that it demands the same structure for the IACF with no consideration of the differences between universities. This university does not have any government fund project currently, but it established its IACF nominally to apply for government funding projects. The leader of the Computer Science and Electronic Engineering at HGU suggested the idea that *“the government should consider the flexibility which permits and encourages some small universities to establish the knowledge transfer office with collaboration between them”*. In the case of the national university, KNU had difficulty in changing the organisational position of its IACF. It asked the MEHRD to put its IACF at a higher rank in order to foster knowledge transfer positively. However, the MEHRD did not accept because of the government regulations concerning ‘the organisation of the national university’.

Consequently, it seems that the establishment of the IACFs may be regarded as a new form of an internal transformation, although the current IACFs have not played the expected roles. In addition, there were tensions between related institutions and actors, which were partly based on the gap between the diversities of universities’ situations and the uniformity of the policy programme.

■ **The new rule for patent management at national universities**

Private universities have possessed the patent property on their ‘University Foundation’ since 1973 when ‘the Patent Management of the Private University’ was regulated. However, in the case of national/public universities, they could not possess any property themselves, because all of their properties must directly belong to the financial account of national or regional government (in the case of public university).

As shown in Table 8.1, the new policy programme of the amended PAIEIUC made it possible that national/public universities could possess the patent property on their IACFs which were built as an independent ‘Legal Foundation’ within the universities. Thus, both KNU and the KNIT established ‘the University Rule for Patent

Management' in October 2003 (revised in August 2004) and September 2005 respectively in order to manage their patent property through their newly built IACFs. The main content of these rules (see Section 7.3.1 KNU as an example) is the distribution of royalty income between the researcher and the university, and it stipulates the IACFs as the main organisation to manage the patent rights. After setting up the new rules, the universities encouraged the researchers to open and transfer patent rights privately possessed by them into the universities, because most of the rights were created by not personal research but by occupational research as a university employed researcher.

Table 8.1 The evolution of the regulation for universities' patent management in South Korea

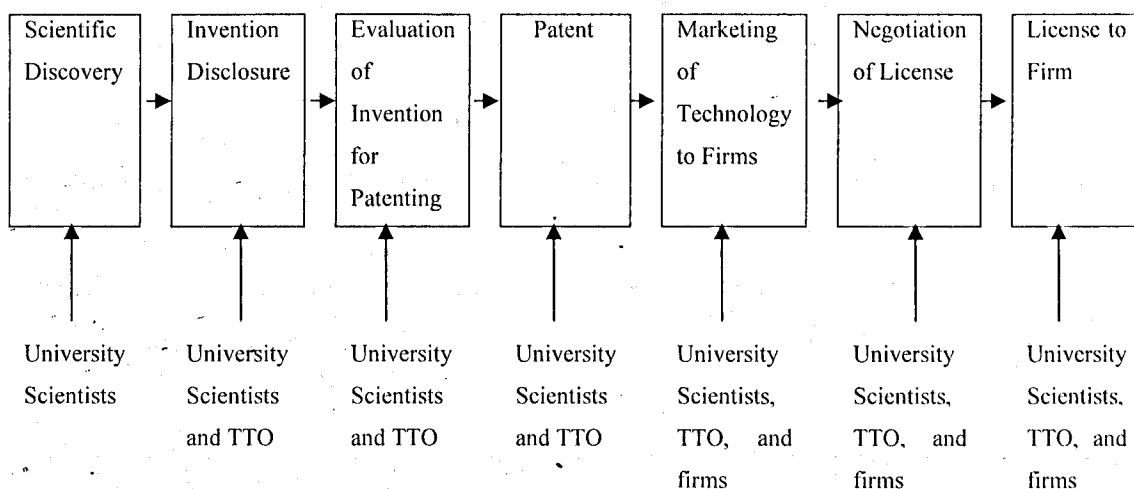
Year	Regulations	Contents	The way of patent management of Universities	
			Private	National/Public
1973	'Patent Management of the Private University' by the Decree of the Prime Minister	Private universities could possess the patent property	The Patent Property belongs to the 'University Foundation' .	The Patent Property belongs to the financial account of the national and regional government.
1999	Promotion Act for Technology Transfer (PATT)	Both private and public/national universities can possess patents that arise from government research grants, influenced by the Bayh-Dole Act of U.S.A made in 1980.	The same as above	The same as above
2001	Revision of the PATT	The organisation for technology transfer (such as TTOs) within a university (private and national/public) can possess the patent property	The patent property belongs to TTOs . For instance, at YU the YUCSC retained the property.	The same as the above, because there was no regulation that national universities can build TTOs as a legal foundation.
2003	PAIEIUC (Promotion Act for Industrial Education and Industry-University Cooperation)	Both national/public and private universities can build the IACF as a legal foundation	The IACFs or TTOs	The IACF

Source: Compiled by the Author

Theoretically, a general flow model of technology transfer from university to industry and stakeholder involvement is shown in Figure 8.2. It begins with a discovery by a university scientist in a laboratory, and then the scientist files an invention disclosure with the TTO (Technology Transfer Office) (Siegel et al., 2003). The scientist and TTO cooperate in the commercialisation process. However, in South Korea, and in particular at national universities, the scientists do not have any chance to cooperate with TTO, and they personally retain the patent rights. Moreover, it seems that national universities had not paid much attention to the technology transfer to industry with relation to the patent management.

Accordingly, it seems that the new rule in the national universities may be viewed as a turning point to them paying more attention to manage and protect their intellectual property. This change may encourage the universities and their members to accelerate the commercialisation of new technologies and promote entrepreneurial activities (Bercovitz & Feldmann, 2006; Gorman, 2002; Jones-Evans et al., 1999). The new rules may help an overcoming of critical barriers to effective technology transfer from university to industry, and it can be said that the legislation of new rules for national universities can be regarded as a form of the internal transformation.

Figure 8.2 Technology transfer from a university to a firm according to a theoretical viewpoint



Source: Adapted from Siegel et al., 2003, p.114, Fig. 1.

Two interesting points were found with relation to the universities' patent management. Firstly, as seen Table 8.1, the government regulation has become a critical influence on the change of patent management in both national and private universities. It can be said that in South Korea the patent management of universities has been developed with the state-dependent regulatory framework. Thus, not only the universities' endeavours for knowledge transfer but also the government regulation to support and encouragement for it should be regarded as critical factors to improve the cooperation with firms in terms of patent management. Secondly a gap was found between the changed regulation of the universities and the members' perspective with relation to the rule of patent management. For instance, a team leader at KNU's IACF explained the difficulties in transferring the patents possessed by the scientists into the IACF in this manner:

...at present, our university tries to transfer all patents personally owned by academic staff to university's property, but they hide their patents. They think of the patents as their property. We need to make them open their patents. (The leader of Science & Technology Team of the IACF at KNU)

The team leader pointed out that the scientists should understand that the patent produced by their occupational research belongs to their university. It seems that scientists are hesitant to open and shift their patent rights into the university's property, because for a long time they have conventionally regarded the patent as their personal property. Accordingly, the changed regulation generates tensions based on the gap of the unbalanced changes between the regulation and the perspective of the universities' members. The following part will expand the discussion about unbalanced change concerning the cooperation between them and their members.

■ Ongoing change of the perspective of the universities and their members in the cooperation

In order to look into the internal transformation of the universities, this part examines the tensions between the universities and their members, which may be seen as a symptom or ongoing feature of the internal transformation. This is because the tensions might be based on the gap from different perspectives concerning the cooperation between the related organisations and actors in response to the current policy. The perspective of universities and their members in knowledge transfer is

an important factor in how universities can cope with the changing environment of the knowledge-based economic situations (Friedman & Silberman, 2003; Siegel et al., 2003). Thus, in responding to government policy, the changes of the perception of the universities and their employees toward the cooperation and knowledge transfer may be viewed as an important point in identifying their actual interactions. Moreover, the recent literature of university-industry cooperation argues that the new expectation for benefits may be seen as the driving force to change the motives and perspectives of the universities and their members (Etzkowitz & Leydesdorff, 2000; Siegel, 2003).

However, there are some limitations to discuss the issue of the changing perspective in this research, with some reasons: firstly and methodologically this research focuses on the interactions between institutions rather than the values of universities' members. Secondly, it is too early to discuss any outcome as a result of the changed perspective, because the field research was done less than two years later after the policy had been implemented. Thirdly, the issue of the causality is closely related to discovering the changes of the perspective in responding to the specific government policies, because the other variables can effect on. Therefore, in this section, the perspective both of the universities and their members, how to look at the current cooperation policy and responding process to it, were caught through the analysis of the interviewees' talking and secondary documents. In additions, the matter of the perspective is narrowly analysed with relation to the tensions happening between a university and its members.

Above all, in responding to the government policies, the UAOs (University Administrative Offices) or the Chancellor have gradually stressed the importance of cooperation. For instance:

- in the NURI programme, the UAOs of the four universities intervened in the preparation process, and they encouraged the scientists to be selected and take part in the programme;
- the three universities except for HGU suggested a new rule that the degree of cooperation with industry will be considered as a factor for the assessment of the staff's performance;

- in the case of HGU, the Chancellor initiated the preparation process of the NURI programme;
- in KNU, the ten staff having contributed the most to the cooperation were awarded bonus payment in 2004, for the first time;
- and as discussed in the earlier section, all four universities established their IACFs under the auspices of the UAOs.

It seems that the UAOs expected several benefits from the positive responses to the policy programmes. The first may be financial gains from the funding programmes. Secondly, the engagement of the government programmes may enhance the reputation of the universities, helping to attract new students and improving employment prospects of graduates. Thirdly, by showing positive responses, the universities might expect to have preferential treatment from the national government in the ensuing policies. Fourthly, there may be in-kind benefits such as employment of their graduates.

In line with the positive responses of the UAOs and the universities' changing toward cooperation, it seems that the members have also gradually recognised that the benefits of cooperation are larger than adhering to the typical values of the 'ivory tower'. For instance; academic departments or project teams engaged in programmes can afford to spend funds on scholarships for students, buying laboratory equipment and creating new curricular programmes, but the unselected departments may feel neglected by comparison. The leader of the IACF at the KNIT summed up the changes of the staff's perspective of cooperation in this way;

our university's staff had not sincerely tried to cooperate with firms, because they are government employees and receive enough salaries. However; they have changed their mind recently. Some staff who had disliked the cooperation recently approached industry. Maybe this is because they have realised something has changed since the government strongly encouraged the cooperation. (The leader of the IACF at the KNIT)

A point to note is that the changes have happened with disparities between a university and its members, which leads to the tensions between them. In the studied universities, the disparities were found in responding to the government policy, and here are two examples. Firstly, an individual staff member provokes an antipathy that

the university and many of its staff strongly emphasize the cooperation. A professor at KNU expressed his discontent;

The professors and lecturers should concentrate on their research rather than cooperation. Why are they interested in cooperation? The current government policies bring down the research abilities of the lecturers. ... The main tasks of professors and lecturers are to teach students and then to research, however, now they are possessed by the irrelevant illusion. The university must assess them by published academic articles. (The leader of the faculty of Electronic Engineering & Computer Science at KNU)

The professor stressed that his expression was not from the formal position of the leader of faculty but his personal opinion. He also said that he was very careful to say this discontent because his opinion became more and more minority.

The second example opposes the fist. In HGU, some staff is discontented with their university's policy emphasising teaching only and its response to the government policies with which it did not well cope. The leader of the Business Incubator and a professor at the department of Bioscience & Food Technology at HGU expressed their discontent in these ways:

Recently, with particular reference to the NURI programme, many of regional universities were selected, and received lots of grants from government. However, we have no one. It is disgraceful. ... I think that my university has discouraged research. (The leader of Business Incubator at HGU)

Our university hopes to be a teaching-oriented university, but I think it is a disadvantage. One day the Chancellor said "research is only a personal interest of academic staff who should be formally and mainly concentrated on teaching". I think it is really incorrect. Research, teaching and cooperation with industry are closely connected. (The professor at the department of Bioscience & Food Technology at HGU)

HGU has stressed its characteristic as a teaching-oriented university, but some staff suggests the flexible approach in that teaching, research and cooperation as more or less compatible. However, it cannot be said that HGU is only concentrated on teaching, because its Business Incubator was established through the government funding programme in order to enhance spin-off and venture firms. Moreover, as mentioned earlier, the Chancellor who emphasised teaching-oriented university strongly encouraged the university to be selected the NURI programme focusing on the cooperation with firms. The financial benefits from the government funding can

be viewed as one of the main reasons that this university applied to the programme. It seems that HGU has struggled to find its own way between remaining with its specific characteristic and taking part in the cooperation, appearing as a tension between the university and its members.

Consequently, the above tensions between a university and its members explain: firstly, the perspective of the universities and their members in cooperation have been changed in response to the government policies, however; secondly there are disparities between the changes.

8.2.2 Universities to Universities

This section investigates the collaborative relationships between regional universities. It attempts to identify the nature of collaborative mechanisms of the universities within the regions in terms of interdependencies and conflicts. It further examines the pathways in constructing regional innovation systems through collaboration between universities.

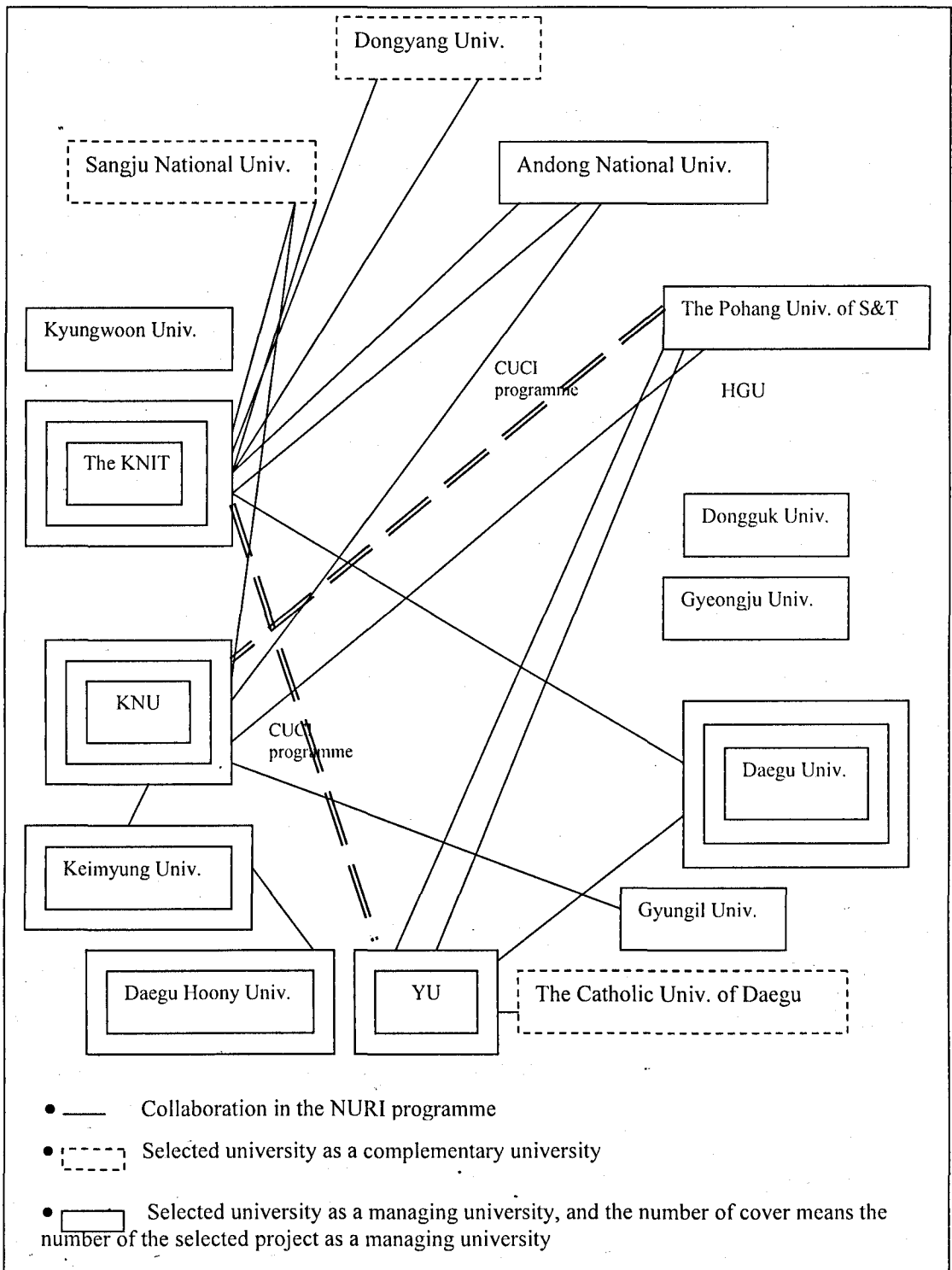
As discussed earlier, the Triple Helix Model neglects the importance of the cooperative process within each helix, such as partnerships between universities or firms. This is basically because this model starts with the considerations of institutional differences in three different institutions, and it emphasises the interface between them (Etzkowitz & Klofsten, 2005; Leydesdorff, 2006). However, as important as the interactive and recursive processes between the three institutions, the cooperative mechanisms within a helix are an important factor enhancing knowledge transfer within a region. Regional partnerships of universities, providing different expertise, resources and experiences can be an effective way of accelerating progress in regional cooperation in knowledge transfer and regional innovation. Accordingly, the collaborative mechanism between regional universities may be viewed as part of internal transformation in the triple helix relations, because this is an ongoing changing process within a helix promoting innovative capacities under the pressure of changing environments.

In the two funding programmes, the government announced that universities must apply for these programmes with an alliance of regional government and firms, but the alliance between universities is not a compulsory condition. In reality, all selected projects of large and medium scale in studied regions were organised with the collaboration of more than two universities, which is seen in Table 7.3. This is mainly because the collaborated proposals may produce better qualities and more possibilities to be selected than those of solitary university. Moreover, it seems that partnerships among regional universities are motivated by the desire to strengthen the bidding power of participating universities and project teams, for the following reasons: firstly, universities might be thought that the government regarded collaboration itself as an expected outcome of the policy that intended to promote interactions between regional institutions. Secondly and practically, the collaboration makes it possible that funding can make a direct effect on more than two universities. Thirdly and in terms of interactions, it seems that collaboration in itself encompasses the interactions with other universities in the localised interactive processes. Fourthly and psychologically, the collaboration looks like having more endeavours and advantages for the programmes and better chances of success than a single application, even though it does not guarantee a high quality result.

In terms of how each project team or university tried to find its collaborators, some of these characteristics were found, and they underpin the identification of the nature of the cooperation between universities.

The first finding is that the shape of the competition determined the shape of the collaboration between regional universities. This is because the universities selected their collaborators after the consideration of their competitors. For instance, YU, KNU and the KNIT regarded each other as a main competitor in the field of Electronics and Computing Engineering, so they did not cooperate each other in the NURI programme. In addition, in the CUCI programme, the formation of the collaboration is reflected by the identification of the competitor with whom it cooperates; the KNIT and YU organised a team, and KNU became the competition. Figure 8.3 shows the collaboration between regional universities in the two funding programmes, and it denotes that there was no collaboration between KNU, YU and the KNIT in the NURI programme.

Figure 8.3 Collaboration between regional universities in the NURI and CUCI programme.



Source: Author

Secondly, when the project teams or universities tried to cooperate with other universities, they discussed the assignment between the managing role and complementary role in operating the project. This is because the managing university

has an initiative of the project and the more allocated fund than complements. If a project team wish to be a managing university in a project, it should try to find some teams or departments, which have less qualified or less reputed teams than itself. In the case that the assignment is undecided until collaborators start to write a proposal together, they have serious conflict. For instance, in the large-scale NURI programme, the KNIT and YU failed to come to an agreement on the assignment between the managing and complementary universities, both of whom wanted to play the role of the managing university.

Thirdly, as Putnam (1993) points out 'trust' between institutions facilitates cooperation for mutual benefits, the cooperative experiences and personal relationships between collaborators may be viewed as a factor that constructs cooperation. It seems that the project teams (both the managing and complementary teams) needed trust between partners, because they would cooperate together for the next four years. A professor at Gyungil University, working as a Cooperative Leader of NURI Project with KNU, explained why his team cooperated with KNU: "*at my university, 50% of scientists in IT technology graduated from KNU. Thus, we know each other very well*". In Addition, as seen in Figure 8.3, the national universities, KNU and the KNIT had a preference for cooperation with the other national universities such as Sangju and Andong National University. It seems that it shows a kind of trust-building relationships between national universities sharing some consensus such as, similarities of personal positions as government officers and similar relations to the government. Some of interviewees said that the constructed trust between the managing and complementary teams or universities resulted in a decrease of the conflicts between them when they negotiate the assigning proportion of the funding and project work together.

The above characteristics of the cooperative process between regional universities imply that each university selects its partner based on the expected benefits emerging from cooperation and the degree of trust-building. These cooperative relationships were constructed through the specific features of the research regions emerging between universities such as interdependencies, competitiveness, the level of research capacities and trust. Accordingly, in the NURI and CUCI programme, it can be said that the alliance among regional universities can be viewed as a strategic

alliance in order to be selected, to win competitors and to operate the project together without difficulties rather than to produce the best outcome for the regions.

Lots of interviewees associated with the NURI Programme mentioned that in the operational process of the programmes, they met a problem of the strategic alliance because of the ability gap between the students of the cooperative universities. As mentioned earlier, the NURI programme mainly aims to cultivate university students through various educational programmes by the reflection of the regional industrial needs, so the cooperative universities have together tried to create new educational programmes and exchange programmes and students with each other. Sometimes, the cooperative universities co-use remote educational systems. However, when a university created some special lectures intended to share between collaborated universities over the internet, it did not accept to the other partner universities because of a big gap in the student abilities between collaborated universities. For instance, in the large-scale NURI project named the 'Training Embedded Engineer for New IT Industry', between the Pohang University of Science and Technology and the other three universities (YU, the Catholic University of Daegu and Daegu University), the ability gap of students is too substantial to co-educate. It seems that this problem is originated from the strategic alliance without consideration of the real possibilities in cooperation.

On the other hand, conflicts between cooperative universities are less than expected, for several reasons. Firstly, as mentioned above, trust-based relationships between universities were based on cooperation. Secondly, the fund apportioned between allied universities is clearly allocated at an early stage of the proposal development, which was asked by the policy. Fund apportioned is a delicate matter, which may be the main factor creating conflicts between them. Last and most importantly, the cooperative relationships in the operational process between universities are inactive. For example, in the NURI programme, each project team has a meeting with other complementary teams, normally every two weeks, to discuss the management and progress of the projects. The discussion is limited to routine and general processes following the written project proposal.

The above analysis of the alliance among regional universities denotes the fact that regional universities might become aware of the needs of the cooperation with other universities in responding to government policies, even though the degree of cooperation is not active, and the nature of cooperation is limited to the basic needs to be selected as the government funded projects. It is too early to judge whether or not the cooperation creates real advantages as part of regional innovation, but it can be viewed as a new phenomenon related to the internal transformation of the universities from standing alone into cooperation with others.

8.2.3 Universities to Governments

Both the Triple Helix Model and the concept of RIS emphasize that the government plays an increasingly important role not only in providing funding programmes and regulatory environment but also in encouraging interactive relationships for innovation (Etzkowitz, 2003a; Cooke & Morgan, 1998). Leydesdorff & Etzkowitz (2001) explained the role of government in the triple helix relations in this way;

governments enter the scene as entrepreneurs directly and/or indirectly, to variable extents, not only supplying the resources to the other actors or regulating their relations with each other, but as an instigator of organisational innovations and structural adjustments that increasingly form the basis of innovation systems. (p. 9)

Thus, the reason why the interactions between universities and government are stressed is that through the dynamic communications two institutions can construct exchanging relations that feed back on the institutional arrangements and behaviours. In their interactions, the important point is not the number of contacts, but the recognition and understanding of the other's situation and changing features, which are constructed and identified through interactive processes. In this sense, it is necessary to analyse the interactions between governments and universities by emphasizing the question of how governments recognise the changes of regional universities in response to the policy programmes.

A government in the Triple Helix Model, means both central and regional governments together. In South Korea, with relation to the new policy, the two different governments are expected to play a different role in the construction of RIS.

Central government has the initiative in most of the implementing process of the RIS policy, and regional governments are expected to interact with universities and industry in the localised interactive processes. Therefore, in this section, the universities' interactions with governments are analysed in two ways: universities to central government; and universities to regional governments.

■ Regional universities to central government

At central government, the ministries or committee responsible for the new policy can be identified as follows: the PCONBD (The Presidential Committee on National Balanced Development) which mediates between ministries in the process of planning and implementation; the MEHRD (The Ministry of Education and Human Resources Development) which has direct responsibility for the new university-industry policy, and the MOCIE (The Ministry of Commerce, Industry and Energy) which works with the MEHRD on the CUCI Programme. These ministries and the committee initiate the new policy, and they expect universities to actively engage in the process of knowledge transfer and cooperation and to increasingly realise their benefits emerging from engagement in regional innovative development. However, since the policy has been implemented, central government has recognised universities' inertia. A director of the MOCIE described universities inactivity in this way:

It seems that universities cooperate with industry only for government funding, and it only reluctantly supports firms. ... the MEHRD revised the PAIEIUC, which encourages universities to cooperate with industry. Because of these funding and regulations, universities approach industry. At present, it seems that universities cooperate with firms not with an active but with a passive attitude. (A director of University-Industry Cooperation Team in the MOCIE)

The director criticized regional universities for positively applying to the government funding programmes, but not operating the programmes in a positive manner. A Director General of the PCONBD also criticised the passive behaviour of universities concerning the IACFs;

At présent, I think that the main role of the IACFs is to give their titles when universities contract any project with the government. The IACFs only hang up their signboards, because the government asks them to establish them. ... now they play a role only in accounting. Universities are asking us to provide more money and members for their IACFs, it is strange because universities themselves should do these things. Why do the universities ask

us? (The Director General of the Regional Innovation Bureau at the PCONBD)

The director general argues that regional universities are still inclined to depend on central government, and he emphasises that universities themselves should make the effort to foster cooperation if they want to benefit from it.

On the other hand, central government admits that regional universities have gradually become interested in cooperation with industry, compared to before the policy implementation. It emphasises that regional universities gradually pay more attention to regional issues and in cooperation with industry, while they apply to the policy programmes and operate them. A Director General of the PCONBD admits the universities' change in this way;

Universities have slowly realised that they should cooperate with their regions. The government has given seed money to universities to spread out this awareness. (The Director General of the Regional Innovation Bureau at the PCONBD)

As the director used the term 'seed money', it seems that central government anticipates the current policies playing a role in the transformation of regional universities to long-term perspective. He also explained that:

It is too early to expect that the changes of regional universities towards cooperation with firms could overcome their conventional attitudes and behaviours, because the policy was implemented in September 2003. Only two years have passed. (The Director General of the Regional Innovation Bureau at the PCONBD)

A point to note is that central government, to a certain degree, attributed the universities' inertia to the top-down process of the policy implementation and the tradition highly centralized governance of higher education. A Director of the MEHRD explained this as so:

The current policies followed the top-down system rather than the bottom-up. ... Therefore, universities lack initiative. Sometimes they do not understand the fundamental reasons of the policy. (The Director of the University-Industry Cooperation Division in the MEHRD)

The director argued that the top-down process was an unavoidable result of the lack of universities' efforts at knowledge transfer and cooperation, and it is also because Korean universities have been used to responding passively to government initiatives. However, regional universities are discontented with this top-down process, which is discussed in the above section concerning the establishment of IACFs. Thus, there is

a gap and conflict between central government and regional universities in relation to the process of policy implementation.

■ Regional universities to regional governments

The process of policy implementation should be considered in relation to the role of regional governments. Central government points to the lack of cooperation of regional governments as a major reason for the inertia of regional universities. A Director of the MEHRD underscores the importance of regional governments in the innovation policy in this manner:

The development of a university is based on its region. But, in our case, a university can be regarded as only for the benefit of the nation. A university and its regional government should work together to cultivate regional human resources. It is necessary that regional governments play a leading role in cooperation between regional universities and industry. (The Director of the University-Industry Cooperation Division in the MEHRD)

However, the viewpoints of regional governments are different from central government, and the regional government authorities argue that the specific reasons why their roles are limited in the current policy, as follows. Firstly, the new university-industry cooperation policy expected regional governments to play a certain role in the NURI (large and medium-sized) and CUCI Programmes through their discretion in paying match funds for the project proposed by regional universities. However, the regional governments cannot refuse to pay match funds when regional universities ask because the universities can receive 90%-95% of the total funds from the central government by paying a small percentage of the funding (10% to 5% of the total) from regional governments. Practically and politically, regional governments could not help accepting the offer from regional universities. An officer of Daegu regional government summed it up this way:

Yes, regional universities contacted us in the process of proposal application. However, it was not often but rarely only when they asked for match funds, this is because regional universities well knew the fact that most of the funding is from central government, and the regional government cannot say 'no' about the match fund. (A Staff of Balance & Development Team, Innovation & Development Division of Daegu Metropolitan Government)

Secondly, regional authorities insist that there was no chance of the opinions of regional government to be reflected on the initial stage of the new policy, because

central government initiates all the planning process. The only way that the specific regional industrial needs were reflected on the new policy was the prescription of the NURI programme that regional universities must take into account the Regional Strategic Industries regulated in the SLNBD (Special Law for National Balanced Development).

Thirdly, the regional governments were not delighted that the nation expected them to play a mediator's role, because they did not have any accumulated knowledge about the interactions with regional universities. The regional governments have only experienced the interaction with universities in the mechanisms of specific funding such as RRCs (Regional Research Centres) and TICs (Technology Innovation Centres), as the central government research funding has accompanied with the match/joint funding of the regional governments since the late 1990s. An officer of Gyeongbuk regional government, who has engaged in process of the NURI Programme, acknowledges the difficulties that the regional government experienced:

Central government asked regional governments to participate in the selection process in the funding programme. Therefore, regional government is embarrassed, because we became a sandwich between the MEHRD and regional universities. Traditionally, there was a distrust between regional government and universities, and between regional universities as well. In these complicated political process, we should be in charge of the selection process for the project team. ... thus, basically we mainly followed the universities' opinions in order to reduce the friction... (A Staff of the Industry Promotion Team, The Division of the Industry Promotion for Region, Gyeongbuk Provincial Government)

His expression implies that, even though regional government is eager to foster its regional innovation system, it is hesitant to cooperate with universities. In fact, in the process of the funding programmes, two regional governments were confronted with the difficulties concerning some political issues emerging in regional universities, and they did not react positively to the issues. For instance; in the NURI Programme, whether or not the two regions will be integrated in the application process, became a political issue between related institutions in the regions. Even though the two regional governments supported the premise of integration, they very carefully dealt with the issue because they did not want to be entangled in the political friction between universities.

In terms of the changes of regional universities, regional governments have a slightly different viewpoint from central government. Regional governments point out that the interactions with regional universities have hardly changed since the new policy was implemented. The regional authorities interviewed explain that regional universities may have tried to join the policy project mainly because of the funding without any considerations for regional innovative development. A Director of Gyeongbuk Provincial Government described the behaviours of regional universities in this manner:

*In the operational process after the project teams and universities were decided, the frequency of contact with regional universities has been decreased, compared to the applying process for the government projects. It seems that our regional universities think that they already caught **the fish** they want. (A Director of the University-Industry Cooperation Team, Science & Technology Division of Gyeongbuk Provincial Government: emphasis added)*

The director likened the funds to 'the fish'.

The difference between the central and regional governments in their views of the changes in regional universities is that central government points to 'the inactive behaviour of regional universities', whereas regional officers pay more attention to 'the fund-oriented behaviours of the universities'. It seems that the difference originates from the different angles and positions in viewing the new policy. Central government put itself in the position of an initiator as interested in looking at the degree of proactive behaviour of universities in order to examine the realisation of the policy objectives. Regional governments putting themselves in the position of an assistant have a concern in what universities want when they ask to pay match funds. In addition, central government as a policy maker has carefully investigated the universities' responses, but the regional governments have been somewhat indifferent in how the regional universities have really responded. Moreover, a notable point is central government officers are familiar with the characteristics of regional universities rather than the regional officers. For instance, most of the regional officers do not exactly know the characteristics of HGU, a small regional university, but all interviewed national officers are familiar with.

■ Tensions between central and regional governments and regional universities

Based on the above findings on the relationships, tensions are examined to identify the nature of dynamic interactions between related institutions. It seems that the tensions are mainly caused by the gap between the expectation and the behaviour of the partners in response to the policies. New expectations from the counterpart create a new interdependence, and the gap becomes a conflict between institutions.

Even though mutual expectations between regional universities and central government are not matched, they have mutual dependence on each other created by the new policy. Regional universities are inclined to directly and quickly respond to the funding programmes which give them direct financial benefits. On the other hand, central government wishes regional universities to engage and play an important role in the construction of the regional innovation systems by way of enhancing cooperative interactions. Therefore, central government and regional universities have an interdependence on the regional innovation policy, but their expectations of the policy differ from each other, generating conflicts between them.

With this basic interdependence, the real interactions took place in the top-down process. The policy objectives and contents have characteristics of encouragement rather than control, which is akin to the normative role of the government in the Triple Helix Model (Etzkowitz & Leydesdorff, 2000; Leydesdorff & Etzkowitz, 2001). However, central government takes the initiative in the process of decision-making and implementation, and this becomes the main cause of the conflicts that emerge between the national government and universities. Central government criticizes the inertia of regional universities in the construction of regional innovation systems, whereas regional universities are discontent with the uniformity of the policy, which did not reflect the specific characteristics of regional universities.

An interesting point regarding the conflict is that there was an inter-ministerial tension, even though the policy programmes have been taken into practice in a top-down way. As mentioned earlier, the MEHRD makes the regulation to set up the IACFs in universities, however, the MOCIE does not accept the responsible role of the IACFs when a university's staff tries to contract any project with the MOCIE. That is because the MOCIE cannot be sure that the IACFs could assume the

responsibility of the contract, due to the fact that the IACFs cannot have power to punish the staff who make a mistake in project implementation. Thus, the MOCIE insists the Chancellor of a university should become the contract counterpart. However, the MEHRD already asked the university to establish the IACFs and for them to become the counterpart of the contract with government. This inter-ministerial conflict has been slowly counteracted as the MOCIE has gradually followed the policy principle of the MEHRD.

With relation to the tension between regional governments and universities, it seems that both of them are interested in attainment of the national funding as much as possible, rather than cooperation with each other to enhance regional innovative capacities. Thus, they have mutual dependence on the national funding. However, there is a gap between them in acceptance of each other as a regional cooperative partner. Regional government authorities admitted their financial limitation to promote research, and they took for granted that regional universities prefer to contact directly with central government rather than through regional government. Regional universities consider regional government and its authorities as less competent than central government and its authorities, and therefore they do not expect regional authorities to make a plan and implement regional innovation policies themselves. A professor of KNU depreciated regional government in this way:

The functions of regional governments in promoting and planning for regional innovation are very weak compared to those of central government. It is inevitable because traditionally central government has been in charge of the planning and implementation of important policies for a long time. ... Regional authorities in Daegu and Gyeongbuk regions lack the awareness of their importance in the innovation policy. (The leader of the CUCI project at KNU)

The leader also explained that it would take a long time for regional governments to carry out the new role of promoting regional innovation, and to positively cooperate with regional universities.

Lastly, a notable point concerning the conflict between central and regional governments is that the former expressed their discontentment with the inertia of regional governments, but regional authorities do not express their discontentment

with central government. It seems regional authorities are familiar with top down policy where central government has the initiative, and regions follow it.

8.2.4 Universities to Firms

In knowledge transfer the main interaction is the relationships between universities and firms. Firms are viewed as primary economic agents in the construction of RIS (Cooke, 1998), and in the triple helix relations, the border spanning cooperation between firms and universities may be considered as the main interactions in the trilateral relations (Etzkowitz, 2003a). The dynamic and complex features of the interactions between universities and firms are analysed by using the constructed analytic frameworks, and this section explains their interactions through two parts - the funding programmes and the regulatory programmes in the new policy. The reason for this is that interactions may differ according to the policy programmes.

■ The funding programmes

This part analyses the operational process between regional universities and firms in the funding programmes, and it also identifies tensions between them. By examining and understanding what makes the linkages between regional universities and firms, the nature of their cooperation in the funding programmes may also be explored. Some notable points were discovered in their linking process:

Firstly, in these funding programmes, universities approached firms in advance, but there was no opposite case. This is partly because universities prepared the project proposals for applying to the programmes within two (CUCI programme) or three (NURI programme) months after the programmes had been announced, and therefore they did not have enough time to inform firms of the programme contents and to wait for firms' contact. The other, more important, reason is that the programmes prescribed that cooperative firms must pay a fee for taking part in the programmes:

- the CUCI programme - 5% of the total project funding;
- the NURI programme - regional government and firms should pay 5% (medium scale) or 10% (large scale) of the total funding.

It seems that it seldom expects any firm to voluntarily apply and pay for the fund for the cooperative programmes.

Secondly, universities prefer to cooperate with large firms rather than SMEs. From a universities' point of view, the cooperation with large firms gives them more benefits than that with SMEs. Above all, large firms have more possibilities to accept universities' requests, owing to having a stronger financial capacity than SMEs. A professor acknowledged universities' preference in this way:

We mainly cooperated with Samsung and LG Electronics. They have considerable room to accept our offers, but in the case of SMEs, we must accept their offer. Therefore, we mainly approached the large firms. (Head of Electrical Engineering & Computer Science Faculty at YU)

In particular, in the case of the NURI programme, through cooperation with large firms, universities could expect their graduates to be employed in the firms. Furthermore, it is convenient for universities to cooperate in the government project with small numbers of large firms rather than with many SMEs. Lastly, the cooperation with large firms may promote the reputation of universities in recruiting new student and in employment of their graduates.

The interviews of firms' CEOs and managers revealed their opinions regarding regional universities with a distrust that they believed that regional universities contacted and cooperated with firms for their financial benefits. A director of the Gumi Branch of National Industry Complex Corporation expressed his opinion in this way:

Firms still distrust regional universities. ... in fact, universities try to attain only government funding. There has been no substantial contribution of universities in cooperation with firms (A Director of the University-Industry Cooperation Team, the Gumi Branch of National Industry Complex Corporation)

A chief director of Samsung Electronics, in charge of the cooperation with universities, illustrated his distrust of regional universities in this way:

*Since 2003, in our case, the 20 projects for cooperation with universities have been increased, and the financial **burden** of our firm in cooperation with universities has also been increased. In other words, we should pay match funds for cooperation with regional universities in government projects. ... even though it does not harm us, it becomes a **burden**. Regional universities demand many things of us, however, they do not think of what they can do for us. Moreover, they cannot follow our demands. (The Chief Director of VTC & HRDP (Vocational Training Centre and Human Resource Development Part), Gumi Complex, Samsung Electronic Co.: interviewee's own emphasis)*

It seems that the term 'burden' implies that the firm does not expect to have the benefits from the cooperation in proportion to the amount of its funding. The chief director's expression denotes that the firm finds itself on the horns of a dilemma; even though the firm agrees with the normative point that regional universities and firms should construct cooperative relationships, in particular to cultivate highly qualified graduates, it cannot expect that regional universities could meet its demand.

It seems that 'the distrust' is viewed as an obstacle to interaction between universities and firms. Even though universities might try to make an effort to cooperate with firms, it might be that firms consider it as the fund-oriented reactions of universities. As mentioned earlier relating to the importance of 'trust' in localised interactions, on the one hand, to share 'trust', it needs recursive and routine process in interactions, yet on the other hand, social relations and network depend highly on being trusted interrelationships between organisations or actors. Therefore, distrust between regional universities and firms in the two regions may cause a vicious circle with respect to cooperation.

Doing the cooperative programmes with universities, firms, to a lesser degree, recognised the changing feature of regional universities. The interviewees of firms said; "*sometimes some regional universities have an inclination to make an efforts to cooperate in a project*"; "*the contact numbers by universities for cooperation have been increased*"; "*the attitude of university scientists in cooperation becomes a bit more proactive than before*"; "*universities try to cooperate in the development of their curriculum*". However, they doubt whether these examples results from the universities' changed attitudes, or from the responding features to the programmes. ↵

It seems that universities and firms acknowledged the interdependence on each other, in particular, in order to cultivate qualified graduates reflecting on regional industrial needs, which is a main aim of the NURI programme. Both large firms and SMEs need competent regional graduates. In the funding programmes, as central government set regional universities to play an initiative role in cooperative process, the power between universities and firms becomes unbalanced. As universities assume a managing role in initiating the operation process of the programmes, participating firms cannot assure universities can produce the expected results. This

may be mainly because firms distrust universities in terms of their motivation in cooperation. As universities take the initiatives in these programmes, universities positively approached large firms to extend their benefits rather than SMEs. Accordingly, it can be said that the conflicts between universities and firms may be generated from the unbalanced initiative over the policy programmes, and the low-trust relations aggravate the conflicts.

Consequently, even though firms start to recognise universities' changing behaviour, they still cynically view universities' responses. They regard universities' cooperation with them as policy and fund-oriented behaviour. It can be said that universities' responses to government funding programmes do not construct trust between them, nor do they break the vicious circle of distrust.

■ The regulatory programmes

This part explores the universities' interactions with firms in terms of the regulatory programmes of the new policy, and those are the establishment of IACFs and the operation of CCIs.

● *Interaction with the IACFs*

All the interviewees from the firms recognised the establishment of the IACFs in regional universities, and they expected that the IACFs, as a unified contact point, could positively contribute to their approaches to universities. However, few firms identified a contact with the IACFs. This is because, on the one hand, the IACFs have concentrated on the internal role such as accounting for government projects, rather than the interface with outside organisations, and on the other hand, firms have kept in contact with the project team or research centres directly with which they have cooperated. With regard to IACFs, the CEO of a SME cynically states:

Regional universities stick to their old systems, and I do not think they are changing. ... I knew the IACFs were newly established in each university, but I have never contacted them. ... but I was informed that the IACFs did not play the roles which we expected. ... yes, in some degree, it is strange we expect the sudden change of universities. (CEO, Sense & Sense Co.)

In the background of the CEO's statement it seems that there is a distrust of universities owing to his previous experiences in the cooperation with universities.

As a whole, firms acknowledge the existence and superficial role of the IACFs, but the IACFs do not exactly know their expected role and what they currently do. It appears they may not expect that the IACFs can play an important role in the shift of universities towards contribution to regional knowledge transfer and cooperation. This is partly because of their experiences in interactions with universities, that is to say, they think universities have a conservative stance in the changing environment, the bureaucratic inflexibility of both academic and non-academic staff and the low motivation to participate in knowledge transfer. Consequently, firms are inclined to regard the IACFs of universities as merely a relevant office when they want to approach universities rather than playing a role in spinning boundaries between firms and universities.

- *The CCIs and interactions*

As mentioned earlier, the policy of the CCIs intends universities to chart a specific course that reflects regional industrial needs through contracts with firms. After the regulation came into effect in September 2003, as seen in Table 7.1, eight new courses have been generated in the researched universities. Five courses were created based on the new regulation of the PAIEIUC, and the universities had the benefit of an extra student quota. However, the other three courses at KNU did not follow the PAIEIUC, even though most of the contract agreement and programmes are similar to those of the PAIEIUC. The reason why the latter cases did not follow the new regulation providing extra student quota is partly because it is difficult for both universities and firms to meet the conditions of the regulation, and partly because they need flexibility to change agreements themselves depending on dynamic situations.

Some interesting points were discovered regarding the relationships between the universities and firms in the contracted courses. Firstly, the firms engaging in the courses are all large, such as LG and Samsung Electronics, as seen in Table 7.1. The main factories of these two firms are located in Gumi National Industrial Complex, and they recruit competent regional graduates who want to work in the region for the long-term. They have difficulties in keeping skilled engineers in the Gumi area, because many of them want to migrate to the Capital area. The two firms also must retrain their current employees, and give them the chance to attain a higher degree.

Regional SMEs also recognise the need of competent regional graduates, however, the number of their recruits and employees are too few to cooperate in the contracted course. Moreover, from the viewpoint of firms, the contracted courses, in particular, 'the educational track for recruitment', becomes a preoccupation for high quality students, thus it can be assumed that high quality students do not want to be employed in SMEs. Additionally, the PAIEIUC regulated in the CCIs, the universities and firms must pay 50% of the total student fees, thus, firms must spend money on the creation of the courses, which cause a difficulty for the SMEs designing the courses.

Secondly, firms approached universities in advance in most of the cases, which is opposite to the funding programmes. In addition to the general reason to cutting down the retraining cost for recruitments, firms are interested in: pre-acquisition of regional graduates having high quality; and the welfare of their employees by providing a chance not only to study more but also to attain higher degree. A chief director of Samsung Electronics, who is in charge of cooperative courses with universities, underscored their efforts for the contracted courses in this quote:

With respect to the CCI, regional universities had not known the detail of the law and the way to operate that. We studied the law for long time...we positively approached the universities for that. (The Chief Director of VTC & HRDP, Gumi Complex, Samsung Electronic Co.)

The director criticised regional universities for the lack of active effort to develop joint curricula. However, when firms approached universities for the contracted course, universities reacted positively. From the viewpoint of regional universities, they welcome firms' approaches for contracted courses, for several reasons: the students following the educational track for recruitment can receive scholarships from the contracted firm and eventually be employed by the firm; if the firms are large and famous, the university can have additional effects such as on advertising and raising its image as an entrepreneurial university. However, the universities have some disadvantages from the contracted courses compared to general courses. For instance: the university should be in charge of some of the tuition fees in the CCIs regulated in the PAIEIUC; lecturers should go to firms taking more than one hour's drive away from the university; and universities should accept the demands of firms regarding the details of the curriculum. Consequently, it appears that regional universities are proud of their cooperation with firms in the contracted courses,

because their advantages outweigh their disadvantages. Even though firms approached universities in advance, both universities and firms consented to cooperate on contracted courses.

Thirdly, the firms did not approach all the regional universities. Above all, the firms considered the universities' research ability and student quality. They have a preference to KNU in the recruitment for these reasons. However, other factors also influenced their relationships, such as the geographical location of universities and the personal relationships between universities and firms. For instance, in the case of the KNIT, it has an advantage in interacting with firms because of its geographical position in the National Industrial District rather than its reputation. In the case of the CCI between YU and Samsung Electronics, and 'the educational track for recruitment' between KNU and Mando Company, personnel relationships influenced these interactions.

From the above characteristics, it is discovered the mutual dependence between universities and firms in the cooperation of educational programmes, and their actual interactions are different from the funding programmes. In the line of thinking, it seems that their interactions and motivations for cooperation are highly dependent on the fact of who has initiative and who needs the project more immediately. In terms of initiating the cooperation, none of them has dominant initiative in the contracted courses, but it depends on the contents of the contract. Even though firms distrust of universities' efforts in the course, it seems that they consider that their opinions can be reflected through the contracting and operating process. Thus, firms firstly approached universities, which is different from the funding programmes.

Regional universities expect to gain direct and indirect benefits from the contracted courses, however, universities' responses are slower and less active than the funding programmes. It seems that this is because this policy programme is different from the funding programmes that are based on the competition between universities and the direct benefits from funding. Yet firms feel more immediate needs for the contracted course than universities, because it may directly affect their productivity and educational cost.

The other important lesson from this contracted course is that the consensus already constructed between regional universities and firms became an important factor for the policy to effect up on. This policy programme arouses the attentions both of universities and firms due to the need of a cooperative curriculum, and it encourages them to try new efforts. Even though some contracted courses had already been operated, it seems that this policy results in universities and firms re-recognising the necessity of the cooperative curriculum.

8.2.5 The Triple Helix Relations and Regional Boundaries

In the research regions, the identification of regional boundaries is different within each helix and between the three helixes. The interviewees from the regional universities identified their regions concerning so-called 'regional innovation' differently depending on the universities' situations, which is mentioned in the previous chapter.

Firms also differently identified their regional boundaries depending on their size and market. Large firms such as Samsung and LG Electronics explained that the notion of the region was useless to them. Even though their factories are located in a certain region, their cooperative partners can be placed all over the country and the world. They agreed with the fact that sometimes they interact with regional institutions within their regional boundaries, but it is not critical to their business. If it were critical, they would decide whether to move to an alternative place or to remain and solve the problem. On the other hand, some of the SMEs identified their regions as an integrated area of the Gyeongbuk and Daegu, but some of them explained the difficulties to define their regional concept, one of which is illustrated in this quote:

We hardly have any concept of our region. The market and our competitors have no relation with this region. The prices of the world market and the technology of the competitors are more important to us (The Manager of Management Department, SL LCD Co.)

The manager of the high-tech small firms producing LCD (Liquid Crystal Display) remarked that a firm relies on its region when it needs something from its region.

Central and regional governments also have different perceptions depending on the situations. Central government has a dichotomised the definition; administratively

the Gyeongbuk Province and Daegu City are two different regions, but in RIS building they are considered as an integrated region. As mentioned earlier, in the NURI programme, central government encouraged these areas to be integrated, with 5% incentive for the total funding allocated to the regions. In the CUCI Programme, it prescribed these areas as one.

However, the two regional governments have some difficulties with regard to the flexibility to integrate their regional boundaries. Many internal and external actors such as central government and regional interest groups, have asked the two regions to be integrated or separated, which causes difficulties in deciding their boundaries case by case. For instance, central government sometimes urges the two regions to be integrated and work together, but a collision of their interest may happen in the case of integration, which can be a political issue in each region. A director of the Gyeongbuk regional government summed it up this way:

We agree that, beyond the administrative region, these two regions should be considered as one, because both have economic and cultural homogeneity. I think that it is useless to divide these regions into two. However, in reality, a competitive sense is very strong between the two regional governments. Sometimes, Non-Governmental Organisations argue that two regions should work together in regional economic issues, but the reality is different (Director of the University-Industry Cooperation Team, Science & Technology Division, Gyeongbuk Provincial Government)

All the regional authorities interviewed agreed with the need for the integration to build regional innovation systems, but they also indicated the difficulty in reality due to different administrative regions.

The above illustrations of the different identifications in regions may be discussed with relation to the gap of regional boundaries between the regionalized triple helix relations and the RIS policy as follows.

In the NURI Programme, central government and regional NGOs (Non-Government Organisations) encouraged the two regions to be integrated in this programme, and each regional university compared its benefits in the cases between an integrated region and two separate regions. KNU located in Daegu, firstly suggested that two regions should be integrated in the programme, which was described in the previous chapter (see Section 7.3.1). However, except for KNU, most of the universities in

both of the two regions opposed the premise of the integration. In Daegu region, Keimyung University did not want to lose its advantage of sharing the total funding allocated its region with only KNU. The universities in Gyeongbuk region wanted to escape from competing with KNU, the leading and largest national university. The two regional governments agreed with the opinion of KNU, partly because they were an inclined to follow the encouragement of central government: 5% of incentive of the total fund allocated to the two regions can be added in their regions as the result of integration. This is also partly because, politically, regional opinion groups such as regional NGOs and regional press supported integration.

As central government, two regional governments and public opinion supported the opinion of the integration, the regional universities positioned on the opposite side of KNU reluctantly agreed with the integration. However, they required an important condition in the application for the programme: 'in the large-scale project of the programme, each university can apply for only one project'. This condition was generated to prevent KNU's monopoly in the large-scale project. As KNU accepted the requirement reluctantly, this condition becomes a new regional rule applicable to the competition between regional universities in the programme. This new rule concerning imperfect competition is made by regional universities themselves in the process of their political negotiations, regardless of the consideration of the effectiveness to construct regional innovation system. Accordingly, in the NURI programme, the regional boundary was politically decided through the negotiation between universities.

In the CUCI programme, although central government prescribed that these regions could apply for this programme as an integrated region, complicated problems were discovered. As mentioned earlier and seen in Table 7.2, two collaborative teams applied for this programme, and the two regional governments supported different teams; Daegu regional government promised to pay its match funding for the collaborative team of KNU and the Pohang University of Science & Technology; Gyeongbuk regional government made an agreement to its match funding for the collaborative team of YU and the KNIT. This is because, in the competition of the two teams, each regional government supported the universities located within its

region and also played a managing role (not complementing role) in the operating processes.

As the result of the competition, KNU and the Pohang University of Science & Technology were selected for this programme by central government. However, this team did not positively support the firms located in the Gyeongbuk region, because this regional government did not pay the match funding for the selected team. A professor working as a leader of CUCI Project of KNU illustrated the difficulties in operational process of the programme with relation to regional integration in this way:

In our CUCI programme, only a regional government, Daegu City paid the match funding, Gyeongbuk Province did not. If we consider the question of where the fund came from, it is really difficult to work beyond the regional boundary of Daegu City. Because Gyeongbuk did not pay a match fund to our CUCI programme, therefore, we are not positively support the firms located in Gyeongbuk. But if they only ask us to help, we will do so. (The Leader of CUCI Project at KNU)

The leader's comment denotes that these regions are not well integrated, even though central government implemented this programme under the premise of an integrated region.

As a whole, with respect to the tensions happening in the controversial process of assigning the regional boundary, the conflicts emerged because the change of the boundaries creates a new order between regional stakeholders concerning their expected benefits from the policy. A point to note is that, in these processes, firms did not have any chance to participate in the discursive process of the regional boundary. This is partly because the government and universities initiated the political and policy processes, and partly because as they are not interested much in these funding programmes, so they are indifferent to the matter of regional boundaries. However, as a consensus or interdependence between regional stakeholders firms may be viewed as an important factor in order to construct a localised interactive process, it can be a problematic issue that firms were excluded due to the political and controversial issues.

The discussion of the regional boundary is regarded as not only a physical, geographical issue but that also involves cultural processes encompassing political

and economic factors. Cooke and Morgan (1998, p. 64) emphasize 'regionalism', as a part of the concept of 'region', involving political demands and culturally defined territorial autonomy. From this point of view, in the two administrative regions, to construct the learning process based on the regionally constructed boundaries, it is necessary to construct 'a collective consensus', similar to the terms 'social capital' (Putman, 1993) 'untraded interdependency' (Storper, 1997) and 'trust' as discussed in Chapter Two.

Consequently, it can be said that in the research areas, there is a gap between the boundaries of RIS policy and the actual interactions of the regional triple helix relations. It seems that the gap is mainly originated from the difference between the fixed boundaries of the policy and the diversities and dynamics of the actual interactions.

8.3 Reflection on the Universities' Interactions

Reflecting the above analysis, this section discusses the universities' interactions in three directions related to the analytic frameworks conceptualised from the triple helix relations; the degree of the interactions; the characteristics and nature of the interactions; and the issue of regional boundaries. The discussion of this section is to further scrutinize the above analysis in terms of the analytic frameworks, and it also aims to explore the research questions outlined in Chapter One.

8.3.1 The Degree of the Interactions

Based on the above analysis of the universities' interactions, this section discusses the question of the extent to which the regional universities interact with government and industry in terms of the Analytic Framework One. From the aspect of each stage in the four processes, the above interactions are revised.

■ Internal transformation of regional universities: the first stage

In the four developmental processes of the Triple Helix Model, the first stage is characterized as 'internal transformation' in each of the helices, and the 'revision of existing tasks' in the university (Etzkowitz, 2000b, p. 315-6). As the university redefines its traditional academic tasks under the pressure of changing environments, it tries to reconstruct its mission and role to set up new organisations to foster knowledge transfer (Sutz, 1997). The internal transformation of the university in these developmental mechanisms refers to an ongoing process within university to blur the traditional boundaries between university, industry and governments (Leydesdorff, 1997). In the internal changes within each helix, it includes not only the shift in each university of its values, norms and organisational formations, but also the development of lateral ties with other universities. The outstanding difference between the first and second stage is that this stage focuses on the changes within each helix, whereas the second underscores the influence of one helix on another and the relationships between the helices.

Two specific questions which were shown in Table 5.1 are raised to examine and identify the internal transformation of four regional universities;

- Have these universities made any internal changes related to knowledge transfer in response to the government policies, such as establishing new organisations and rules, or changing their mission and their members' perspectives?
- Have any lateral tie been newly created between regional universities in response to government policies?

With relation to the first question, the changing features of the universities can be discussed in two directions that reflect the above analysis (see Section 8.2.1); one is the structural transformation such as the establishment of new organisations and rules, and the other are the changes of the operational process and the perspective of universities and their members on the cooperation. In terms of the structural transformation of the universities, the establishment of IACFs and the new rules for patent management are viewed as internal changes of the universities. This is a turning point that they pay much attention to the cooperation and the commercialisation of knowledge. These changes are inevitably and directly influenced by the new policy programmes because of the state-dependent framework,

strictly speaking they are permitted by the policy programmes. Thus, it can be said that the policy programmes attained the expected result at least outward formation of the structural changes within universities.

However, in terms of the operational process and the perspective of universities and their members on the cooperation, the universities and their members have been struggling to find ways to follow the structural changes and the new environment emphasising the cooperation. For instance; the operational process of the IACFs did not match the expected role in the policy programme; there were some gaps and conflicts between universities and their members considering the cooperation. It seems that these features show the dynamic and ongoing processes of internal transformation of the universities, even though they imply uncertainty in the degree of the change.

Accordingly, the first question can be answered: even though the universities have not been transformed to the degree that the policy expected, it can be said that they have attempted to respond to the policy and to a certain degree they have been transforming internally toward the cooperation.

With respect to the second question, as analysed above (see Section 8.2.2), regional universities have collaborated with each other in response to the policy programmes, and two main characteristics were found in their collaboration processes. Firstly, each university strategically selected their partner after the consideration of their expected benefits such as; strengthening the bidding power in the competition; keeping competitors in check; and the assignment of funding between the managing and complementary universities. Secondly, the degree of constructed trust between universities had an influence on the collaboration. When universities tried to find their partner, they considered the cooperative experiences and personal relationships to minimise troubles that may occur in the operational process of the programmes.

Therefore, it can be said that the collaboration between regional universities may be near to a strategic alliance to increase their own benefits and to operate the project/programme without difficulties rather than to produce the better outcomes through localised interactive learning.

■ The creation of new relationships: the second stage

The second stage of the triple helix relationships is characterized as 'trans-institutional impact' which means the 'influence of one institutional sphere on another' in bringing about transformation (Etzkowitz et al., 2000, p. 315-6). As industry and government increasingly develop their capabilities for the knowledge capitalization, the imbalance between the three spheres emerges (Etzkowitz, 2003a). Thus, they try to construct new relationships between them, which may be a driving force of the triple helix relations.

The difference between this stage and the next stage is that this stage emphasises bilateral interaction from one sphere to another, but the third stage focuses on 'a new trilateral relationships or overlay' between them.

A specific question in this stage was raised (see Table 5.1) to identify the creation of new relationships between universities, government and industry in response to the policy programmes;

- Do industry and governments recognise that these universities have been changing to such a degree that they consider these universities as their cooperative partners?

As analysed above (see Section 8.2.3 and 4), in the interviews, common themes when governments and firms talk about the universities' interactions are '*universities' inertia*', '*inactive behaviour of regional universities*', '*distrust*', '*fund-oriented behaviour*'. Central government criticises the universities' inactive behaviours and inertia, and regional governments and firms point out fund-oriented behaviours of the universities. However, central and regional governments and firms admit, though to a lesser degree, that regional universities have gradually become interested in cooperation while they apply the policy programmes and operate them.

Consequently, it can be said that even though regional universities have become aware of the cooperative relationships and responding process to the policy, the relationships between the three helixes have not been developed to the degree in the creation of new cooperative relationships.

■ Interface processes and trilateral organisations: the third and fourth stage

The third developmental process of the Triple Helix Model is summarized as ‘the creation of a new overlay of trilateral linkages between the three helixes’ (Etzkowitz et al., 2000, p. 314-5). The emergence of ‘trilateral linkages’, developed beyond bilateral relations, is a main characteristic of this process, encouraging trilateral interactions between universities, industry and government. One important task of trilateral linkages is to maximize interactions between the three helixes to minimize the various gaps generated between different institutions in an innovation system.

This fourth stage is characterised as ‘the creation of hybrid organisations that enhances the recursive effect of inter-institutional relations on the three institutions and the larger society’ (Etzkowitz et al., 2000, p. 314-6). This stage may be viewed as an ideal arrangement of the triple helix relations to generate innovation between universities, governments, and industry, moreover with the larger societies that they engaged. Over time, through the process of interaction and negotiation, the institutions and their actors are reproduced and changed, and with these courses of reflection, trilateral and hybrid organisations are created to solve their social and economic problems. The organisations are not fixed but are unstable, because the interactions between actors are still ongoing.

The difference between the third and fourth stages is that the fourth stage focuses on the creation of ‘new hybrid organisations’ between the three helixes and the wider society as well, but the third stage emphasises the creation of ‘new linkages/overlay’ between the three. The fourth stage concentrates on ‘the continuing feed back process’ to enhance the recursive effect of inter-institutional networks, whereas, the third stage stresses ‘interface process’ to encourage new ideas and routes of knowledge transfer (*ibid*; Etzkowitz, 1997, p. 142; 2003a, p. 301).

Trilateral overlay and organisations may be viewed as a result of the recursive interactions and institutional routines based on trust and untraded interdependency between regional stakeholders. Furthermore, a new trilateral overlay or organisation may underpin the construction of ‘institutional thickness’ (Amin & Thrift, 1994), ‘regional innovation system’ (Cooke, 1998), and ‘collective learning’ (Keeble &

Wilkenson, 1999), because it supports the communication and interactive process between regional institutions.

In order to examine the universities' interactions in terms of these two stages, these questions were raised respectively (see Table 5.1):

- Do the universities influenced by the new policy create any new substantial overlay for trilateral interactions between the three helixes?
- Have the universities played an initial role in forming regional trilateral organisations to foster regional innovative capacities?

With relations to the above questions, a limitation with collected data was found: the data collection of this thesis focused on the universities' interactions with government and industry, thus, it does not have enough evidence to fully explain the trilateral interface processes, in particular, between firms and government. It may be viewed as a limitation of this thesis, which cannot fully examine all aspects of interactions occurring between universities, government and industry. However, in the analysis of this research, the third and fourth stages are not independent from the previous stage, even though the four developmental processes can occur simultaneously and even, to some extent, in reverse order (Etzkowitz, 1997; 2003a). Therefore, by reflecting on the above analysis and the discussion of the first and second stages, it can be said that in order to develop trilateral overlay or organisations, the regions should overcome the following difficulties.

Firstly, the regions lack constructed-trust relations between universities, and in particular, between universities and firms. As discussed in the previous section, the interviewees of firms directly expressed their distrust to regional universities. Even though regional universities recently attempted to make an effort to cooperate with firms, it might be that firms considered it as fund-oriented actions as they had acknowledged through the previous cooperation with them. Thus, distrust between regional universities and firms in the two areas may create a vicious circle in cooperation and interactions, and it can be said that the distrust prevents them from developing their interactions and cooperation in the degree of interface process and recursive effects in the regional triple helix relations.

Secondly, in the research areas, regional governments have played a limited role in the regional triple helix relations. In order to construct recursive effects between universities, government and industry, the role of regional government as a coordinator is a critical. However, in the regions, regional governments did not play an active role in the construction of RIS, and it seems that they are inclined to depend on central government and follow its initiatives.

Thirdly, in terms of the policy programmes, this is partly because the policy was initiated by central government and implemented through a top-down process. Therefore, it is necessary to draw more interest from regional stakeholders and to contextualise the regional characteristics including the differences and similarities of universities into policy programmes.

Lastly, it is too short a period (less than two years) to create a new overlay or organisation in response to the government policy. It is widely accepted, in the literature of regional innovation, that creating intangible regional assets such as 'social capital' requires longer time than tangible regional assets like physical infrastructures. Even though the new policy programmes played a role that regional universities are aware of the necessity of cooperation and interactions, they did not lead to the construction of new hybrid organisations.

Accordingly, in order to develop the degree of the construction of substantial trilateral overlay or organisations, the triple helix relations in the regions confronted with some difficulties, such as: the lack of trust relationships; inactive engagement of regional governments; the gap between the diversities of regional universities and other characteristics and the uniformity of the policy programmes all over the country; comparatively short period of time to develop or create a new hybrid overlay or organisations.

8.3.2 The Characteristics of the Interactions

Considering the dynamic interactions of regional universities, and the tensions in the regional triple helix relations, this section explores the characteristics and nature of

the dynamic interactions in the relational triple helix relations based upon the Analytic Framework Two.

In the research areas, the universities' behaviours were not independent from the government policy including the regulatory framework and national funding relationships. In particular, central government directly affected the internal transformation and external interactions of the universities, apart from the extent to which the universities followed the objectives of the policy programmes. For instance: the regulation of PAIEIUC made it possible for the establishment of IACFs within all universities and patent management in national/public universities; through applying funding programmes, the universities interacted with government and firms.

Therefore, the specific contexts and the implementing process of the policy influenced the features of the regional triple helix relations. For example: the initiatives of central government may lead to the indifference of regional governments; and depending on who had control over the cooperative processes in the policy programmes, regional universities and firms presented their preferences differently in cooperation.

It seems that the benefit seeking behaviours of the regional universities have also an influence on the shape of the responses to the policy and the interactions with other institutions. In the interviews, common themes concerning the expected benefits of the universities in the cooperation are 'reputation', 'employment of graduates', and 'financial gain'. Therefore, it seems that the interdependencies and conflicts between the universities and other institutions, and between universities' organisations mostly originate from the result of the benefit-seeking considerations.

However, even though, in the areas, the universities' interactions in the triple relations have been mainly influenced by two main categories such as the policy context and their benefits, other complex factors are also related to the universities' behaviours, for instance: the gap of the perspective in the cooperation between the university and its members; capabilities of the university; spatial location of the university; and the degree of trust-building. In particular, regional political processes and power relations between universities influence the competition and cooperation

processes, as seen in the designation process of a regional boundary and imperfect competition in the NURI programme.

Additionally, in the research regions, not only distrust between universities and firms but also the disparities of trust relations between the stakeholders affect the interactions. In some cases, there were high-trust relationships, for instance; 1) as seen in Figure 8.3, some regional universities have interacted closely based on a high degree of trust between Gyungil University and KNU, and between National Universities of the regions in the NURI programme; 2) in the CCIs, personal networks played a critical role in the creation of the contracted courses – between YU and Samsung Electronics, and between KNU and Mando Company. In these cases, it seems that the participants had already constructed ‘strong ties’ between specific institutions or actors, but it is necessary to keep an eye on the fact that these strong ties may easily degenerate ‘from ties that bind into ties that blind’ (Grabher, 1993, p. 4). On the other hand, in most of the cases, firms and regional government distrusted regional universities, and the low-trust relationships can reduce the capacity for inter-institutional cooperation, which is vital for interactive learning and innovation (Cooke & Morgan, 1998).

Consequently, it is difficult to catch the overall characteristic and nature of the universities’ interactions because of the dynamic and complex relations of the triple helix. However, by reflection on the above discussion, it cannot be said that universities always proactively contribute to the construction of regional development, and their interactions are highly dependent on not only the regulatory framework and national funding relationships, but also the considerations of their benefits and other various factors.

8.3.3 The Boundaries of Regionalized Triple Helix Relations

With respect to the issue of regional boundaries in the construction of RIS, there were diversities in the identification of the term ‘region’ between the helixes and within each helix.

In general, when called 'regional innovation' or 'regional innovation system', regional universities identified differently depending on their situations. For instance; the KNIT explained regional boundary around Gumi City where Gumi NIC (National Industrial Complex) is located; but HGU interpreted the meaning of 'region' as its recruitment areas, and expanded over the administrative regions. Firms differently identified depending on their size and market, and central and regional government stressed an integrated area of the two administrative regions in the matter of regional innovation.

However, with particular respect to the specific policy programmes, the boundary of 'region' in the regional triple helix relations appeared with the political considerations of expected benefits of each institution. These are seen in the responding and interacting process of the NURI and CUCI programmes in the research areas. In practice, difficulties and conflicts were found from the gap between the administrative regional boundary and the newly encouraged boundary by the policy programmes. As the policy programmes encouraged the two administrative regions to be unified as an integrated area, the two research areas were unified in the programmes at least superficially. However, the triple helix relations in the areas were not matched with the integrated boundaries because of the political and economic decisions of the participants.

Consequently, it seems that, in reality, the boundaries for regional triple helix relations are decided not transcendently but through the ongoing dynamic selective processes for the benefits of each organisation within each helix.

Chapter 9 Conclusion

9.1 Introduction

This thesis has looked at the seeds of RIS (Regional Innovation System) policy in South Korea in the light of universities' role in their territorial development. It was motivated by the issue of the gap between the conceptual framework of RIS and the actual interactions of universities. It began with a discussion about the increasing importance of universities' role in their territorial development in the era of pervasive globalisation and the knowledge-based economy. It has raised key questions in relation to the universities' interactions in RIS building, with a critique of the argument in most RIS literature that firms, universities and other regional institutions might harmoniously engage in localised interactive mechanisms (Cooke & Morgan, 1998; Cooke et al., 1997; Braczyk et al., 1998),

In Chapter One (p. 4), three key questions were raised;

- In what ways, and to what extent, have regional universities responded to government policies to promote innovation-based regional development?
- What is the nature of universities' interactions with government and industry arising from their responses to innovation policies?
- How are the regional boundaries identified in the construction of regional innovation system?

And some sub-questions concerning the regionalized triple helix relations were raised;

- In terms of the type of interactions in four developmental stages of the Triple Helix Model, at which stage are regional universities undergoing transitional process?
- What tensions emerge in the localised practical process of interactions between universities, government and industry?
- What is the gap in the identification of regional boundaries between the regional triple helix relations and the RIS policy?

These questions were investigated with a conceptual framework of RIS and by an analytic tool of the Triple Helix Model. The new policy programmes implemented in 2003 for RIS building were analysed to link the theoretical literature to the

empirical study, and the empirical fieldwork was done in two administrative regions of South Korea by selection of four regional universities amongst twenty-three universities.

This chapter concludes the discussion of the thesis at several levels of generality. At the most specific, and therefore most certain level, this thesis provides an analysis of the degree and nature of universities' interactions in two specific Korean regions by using the Triple Helix Model. Taking into account the specific outcomes, in a larger context, it also generates some problematic issues arising from RIS development and its policy in South Korea.

At a more general level, the thesis provides the basis for some speculation about the tensions in the localised interactive processes and the matter of geographical boundaries in the construction of RIS. At the most abstract level, this research leads to developments about the theoretical understanding of regional innovation systems in terms of the role of universities and their interactions with government and industry. It also develops the knowledge of the Triple Helix Model through its application to the analysis of the localised interactive mechanisms.

The first section draws some conclusions from the research questions. In the light of these conclusions, the second part discusses some problems and issues arising from regional innovation strategies associated with the broader context of the key questions. The third part identifies the contributions, limitations and further research of the thesis. With some final words, the last part will be closed.

9.2 The Role of Universities in the Construction of RIS

This section draws some conclusions from the research questions with reflections on the issues that were generated in the discussed literature and empirical research. The stories of the studied areas demonstrated the influence of the policy programmes on the responses and interactions of universities.

9.2.1 The Degree of Universities' Responses and Interactions

In the two studied areas, the regional universities responded somewhat positively to the government initiatives for RIS building in terms of outward appearances. However, the outward features of their responses may be viewed as the result of the state-dependent framework of higher-educational governance and the fund-oriented behaviours of the universities. Moreover, the cooperation in the responding processes may also be viewed as the result of a necessary condition of the policy programmes that the university should cooperate with firms and regional government, and selectively with other universities in applying for the two funding programmes.

Regarding the extent of the universities' interactions, it can be concluded overall that, in the areas, the features of the dynamic interactions were matched to the characteristics of the first stage mostly, and the second stage rarely in the four developmental processes of the triple helix relations. Therefore, it appears that the degree of the universities' interactions seen as an ongoing transition process is positioned in somewhere between internal transformation (the first stage) and the creation of new relationships (the second stage).

In terms of the first stage of the regional triple helix relations, the four universities have internally changed in responding to the policy programmes such as the establishment of the IACFs (Industry-Academic Cooperation Foundations) and the new regulation for Patent Management. However, they have not fully transformed to the degree that the policy expected, for instance; the operational process of the IACFs and the perspective of the universities and their members on cooperation have been struggling to find their way following structural changes. In addition, the collaboration between regional universities may be viewed as a strategic alliance which aimed to increase their own benefits rather than to produce a better outcome for localised interactive learning.

From the perspective of the second stage concerning the creation of new relationships, it was found that the four universities have gradually recognised, though to a limited degree, the importance of cooperation in responding to the policy,

but not to the extent of developing new cooperative relationships. The common themes from central and regional governments and firms were ‘universities’ inertia’, ‘inactive behaviour of regional universities’, ‘distrust’, ‘fund-oriented behaviour’.

In the development to the third and fourth stages, i.e. interface process and trilateral organisations, the regional triple helix relations in the areas were confronted with some difficulties, such as; the lack of mutual trust; the fluctuation of regional boundaries; the limited role of regional government. In addition, these problems are also associated with the larger context of the RIS policy and universities’ role grounded in South Korea, thus, they suggest some meaningful issues in relation to the role of the state and policy, and the power distribution between nation and region.

The above evidence explains the specific features in the four regional universities of the two areas in South Korea, thus, there is a limitation to the generalization of the findings. However, they can suggest a lesson to the other Korean regions in terms of the extent of response and interaction of regional universities arising from the policy programmes. This is because the policy programmes were carried out all over the country except for the Capital area, with the same contents and process, and this is also because of the highly-centralised characteristic of the country.

9.2.2 The Nature of Universities’ Interactions

The rationale and nature of the limited extent of the interactions can be found through examining the tensions emerging in regional triple helix relations. In the studied areas, the interactions happened with complex processes based on interdependencies and conflicts between the three helixes, and the following discoveries explain the nature of the interactions.

Firstly, the benefit seeking behaviours of the regional universities had an influence on the shape both of responses to the policy and interactions with other institutions. Even though it is not clear whether their benefit seeking endeavours connected or matched to the regional innovation strategies or not, it seems that each university has firstly considered its benefits from the cooperation or interactions rather than the construction of regional innovative development. The interdependencies and

conflicts between the universities and other institutions mostly originated from the result of these benefit-seeking considerations. This finding leads to us further discussion about 'public choice' in relation to universities' role in their communities. Thus, the main point can be the extent to which the universities' behaviours maximising their own individual interest through rational choice are connected to maximising regional innovation by aggregating individual choices in each university (Barnes, 2000).

Secondly, the universities' behaviours were not independent from the policy programmes of the regulatory framework and national funding scheme. In particular, the internal transformations of the universities were inevitably and directly influenced through the regulatory framework of the policy programmes. The external interactions of the universities also were affected by the national funding scheme of the programmes. It can be said that the policy programmes constructed new interdependencies between organisations around and within universities. These findings may be thought as associated with the role of state which has an influence on the institutional thickness in regions by the creation of new norms or routines (Amin & Thrift, 1994). Therefore, it seems that in South Korea, the role of universities should be considered with relation to the role of the state because of the state-dependent framework of higher educational governance.

Thirdly, the contents of the policy programmes also had an influence on the cooperating and interacting processes between the three helixes. Regional universities and firms presented their preferences differently in cooperation depending on who had control over the cooperative processes in the policy programmes. Thus, it can be concluded that the policy context was one of the important factors influencing the cooperative process and interactions in localised learning process.

Fourthly, there was an unstable state of mutual distrust between the three institutions in the cooperative process. Even though regional universities might make fresh efforts to cooperate with firms, it might be that firms considered these efforts as fund-oriented actions. Thus, distrust between regional universities and firms in the two areas may cause a vicious circle in cooperation and interactions. On the other

hand, in some cases, 'strong ties' through personal networks and accumulated cooperative experiences also affected the interactions, which may fail to keep abreast of new learning opportunities (Grabher 1993a; Cooke & Morgan, 1998). This problem, better known as 'the weakness of strong tie' in network theory, happens when collaborators are so deeply committed to a given set of routines that they fail to contact to new sources of information and to learn new ways of working and opportunities (Granovetter, 1973). Therefore, in research areas, various degrees of trust between actors co-existed. These embedded features suggest that proper trust-building should be treated as an investments enhancing 'social capital' and 'intangible assets', which can promote the effectiveness of tangible assets (Putman, 1993).

Fifthly, there were diversities between the four universities in their internal changes and external interactions in triple helix relations depending on the size, location, history and policy experiences. The assumption that 'the university is not a homogenous unit' addressed in Chapter Five (see Section 5.2), was developed to show how, in reality, regional universities engaged differently in the regionalised triple helix relations. The heterogenous characteristics of regional universities imply that the policy concerning their roles or behaviours should be reflected in their diversities.

Sixthly, regional political and power relations between the universities influenced not only the competition and but also the cooperation processes in the research areas. These features were found in the regional processes in deciding the regional boundaries and an imperfect competition in the NURI programme. In addition, the shape of the competition decided the shape of the collaboration between regional universities, because the regional universities tried to keep their competitors in check. This finding is closely associated with the benefit seeking behaviours of universities, because it may also be viewed as a result of their selective processes to maximize their own individual interest.

The above evidence provides general implications for some speculation about the nature of universities' interactions in their territorial development, even though they result from specific features of certain Korean regions. This is because the tensions

emerged in the regions with interdependencies and conflicts might, more or less, happen in any interaction of the triple helix.

9.2.3 The Role of Universities and RIS Building

The above evidence suggests that the role of universities in RIS building should be regarded with a basic consideration of the tensions between and within the institutions rather than an expectation of harmonious interactions from an optimistic perspective. Moreover, a conclusion can be carefully drawn from the evidence that the universities are not benign agencies, and they seek their own benefits above others, whether in ways which pay attention to territorial development or not. It cannot be said that universities always proactively contribute to the construction of RIS. Their engagement in the construction of RIS is associated with the considerations of their benefits and other various factors such as the political relations; the existence of their competitors; mutual trust with other institutions; and the contents of policy.

Accordingly, the overall conclusion to be drawn about the universities' role within RIS is that universities might be viewed as a central part of the construction of a regional innovation system. However, it is difficult for them to co-ordinate into the localised interactive process as a part of regional innovative strategies. Therefore, with respect to the role of universities, it is necessary to take into account the tensions between interdependence and conflict arising from the localised interactions with other stakeholders rather than the loosely-based assumption that universities may engage actively in their territorial development and interact harmoniously with others. The above conclusions lead to the development and extent of the theoretical understanding of the regional innovation systems and the role of universities, which can be viewed as the most abstract level of generalisation in this thesis.

In particular, the above conclusion supports our understanding of the universities themselves concerning their engagement in regional innovative processes, such as; their diversities, benefit seeking behaviours, political engagement and state-dependent characteristics. In addition, it also provides a lesson for how the policy for regional innovation or university-industry cooperation should be implemented in

relation to the engagement of regional universities, for instance; policy should take into account the interdependence and conflict emerging in and around universities' interest or benefit. Lastly, it suggests that the dynamic and complex processes of the engagement and interactions of universities lead us to identify the role of universities within a larger context such as the role of the state and the relation between nation and region rather than localised interaction in itself.

9.2.4 Regional Boundaries and RIS Building

The literature concerning the issue of regional boundaries was discussed in Chapter Two (2.3.1) and Chapter Four (4.4.1), and the question was raised in Chapter Five (5.3.4) with relation to the possible gap between the boundaries of RIS building and the actual interactions of the regional triple helix relations. Documentary analysis was done in Chapter Three (3.3) about the historic and economic relations between the two regions, and in Chapter Seven (7.4.3) and Eight (8.2.5 and 3.3) the boundaries identified through the localised triple helix relations were empirically analysed.

In the trilateral discursive issue in regional boundaries between the construction of RIS, the regional triple helix relations and the RIS policy, the conclusion to be drawn here is that there were diversities in identifying regional boundaries not only between universities, but also between universities, government and firms. This is because each organisation within a helix has defined its regional boundaries depending on its specific situation in general and the considerations of its benefit from a specific policy in particular. In the implementation processes of RIS policy, conflicts have been emerged between the administrative boundaries and the newly re-drawn boundaries by the policy programmes.

It appears that, in reality, the boundaries of regional innovation systems are closely related to the political and economic decisions of the participants, which are based on their benefits and specific needs. Consequently, it seems reasonable to conclude that the boundaries for the regionalized learning, or the triple helix relations in the construction of RIS, are determined not beforehand but through ongoing dynamic selective processes for the benefit of each organisation within each helix. Therefore,

it seems that the regional boundaries in constructing RIS may be considered with relation to the interdependent relationships and conflict happening in the interactions between the participants.

The policy boundaries delineated by the government played a role in providing a guideline to the participants, but it was not a decisive factor when they adopted their boundaries. Regional political and power relations between the participants also had an influence on the selective processes for regional boundaries, which could be seen relating to the NURI programme. From the above conclusions, it was suggested that similar processes may take place in other geographical areas and therefore that these specific conclusions may also provide partial explanations for the discussion of the boundaries in RIS building in general.

9.2.5 RIS Policy, Triple Helix Model and Some Implications

■ RIS policy and its implication

In South Korea, government policies played an important role in promoting the engagement of universities in cooperating with firms, because of the state-dependent framework of the higher-educational governance. The new policy programmes by the new government were expected as a turning point in the creation of the new relationships between universities and firms. In terms of outward appearances of the universities' responses to the policy, it might be concluded that it looked like the policy programmes were positively received by regional universities.

However, the policy programmes did not contextualise the characteristics of regionally embedded milieus and the diversities of regional universities, and they were implemented through a top-down process: central government took the initiative, and regional governments and universities followed. There was a gap between the policy contexts and the regional situations in the construction of regional innovative development. Therefore, in terms of the construction of RIS at which the policy eventually aimed, as seen in the extent of universities' interactions, it can be said that the policy programmes did not construct the regionalized interactive processes between the three institutions.

It is also true that there was some evidence that regional universities had transformed internally in response to the government initiatives, and they had gradually recognised the importance of the cooperative relationships with firms. Accordingly, it might come to the overall conclusion that the policy programmes had played a role in the awareness raising of the cooperation and the importance of the localised interactive process to regional universities, even though they did not result in the change of the directions or dynamics of the regional innovation system.

The above conclusion leads us to the discussion of some issues related to policy implication of RIS policy in South Korea. The first issue is how to deal with the regional identity and characteristics. Each regional area has its own specific characteristics such as industrial base, economic infrastructure and the number and quality of universities. It cannot be said that all the regions in the country should try to construct RIS, and there may be variations in the innovative capacities region to region. However, the Korean RIS policy cannot be easily distinguished from the national innovation system, because the policy has been implemented with the same formation into every region except for the Capital area. To the policy maker, this issue may be approached in two different ways; one is to change the institutional framework of the country focusing on the relationships between central and regional governments, which will be discussed later (see 9.3); the other is to give more discretion to regions than the current policy, which makes it possible for each region to develop its own innovation strategies even though central government has the financial hegemony. In this line of thinking, in South Korea, it seems that the policy maker should pay much more attention to diagnosing the basic conditions for the construction of RIS rather than the policy context itself.

Secondly, with regard to regional boundaries, the policy makers need to consider, not only the possible participants, but also the boundaries where they interact. They also need to put into consideration the possible conflicts between administrative boundaries, socio-economic boundaries, and the boundaries of the policy. On the other hand, the policy maker takes into consideration the issue of how regions connect to globalised issues in relation to economic innovation and industrial development. The Korean RIS policy focused on the localised interactive processes, but the closed system in a certain area cannot respond to global needs and develop its

competitive advantage. In the globalised economic environment, regional competitiveness can be viewed as one of criteria to evaluate the degree of regional innovation system building, thus the regionalised triple helix relations could be connected to any other regions outside of the country with globalised consideration.

The third implication for the policy maker is that the RIS policy needs to consider the tensions between universities and the other stakeholders rather than the interaction in itself. Through paying attention to the possible interdependencies and conflicts between participants, the policy can develop the interactive mechanisms. The above study shows that the contents of university-industry policy was highly influential on interactions between university and industry, thus it is necessary for the policy maker to keep in mind the importance of policy contexts in creating new interactions between stakeholders.

Fourthly, the RIS policy needs to reflect the regional specific contexts, and it is also necessary to encourage regional governments and universities to realise the importance of regional endogenous development. This is because the RIS policy cannot be separated from the institutional characteristics which are regionally constructed and embedded, and also because the inertia of regional government and universities prevents the region from constructing RIS.

In relation to the Korean regional innovation strategies, some implications for universities can also be understood as follows; firstly, regional universities in South Korea should be aware of the fact that their main partners have been changed from central government to firms and regional communities in line with the increasing emphasis on localised learning processes based upon the knowledge-based economy. Whilst central government had some power to control or intervene in the system of higher educational governance; regional universities should find their own strategic way by breaking through their path dependency to central government. This is because government may not support and cannot guarantee the continued development or survival any university. In particular, Korean universities are confronted with a critical difficulty owing to the decrease of university-bounded population, which will increase the competition between regional universities and at the same time the role of government will be decreased.

Secondly, regional universities should try to open up a new field so as to find shared interest between universities and their communities. As discussed earlier, regional universities attempt to find their own benefit in responding to government policy, which can be viewed as an organisational strategy as an agency. However, universities are partly responsible for making a bridge to connect between their benefit and the development of their communities. This is mainly because the development of universities cannot be separated from the economic situation of their communities.

Thirdly, in terms of 'trust' between regional stakeholders which can be viewed as a critical factors in the localised learning process, it is necessary for regional universities to pay much attention to constructing trust relations with other regional institutions. The members of universities should take into account 'trust-building' as an intangible asset in each university.

Lastly, in some cases, regional universities need to collaborate with each other in order to cope with the changing environment, even though competition with each other is inevitable. Their collaboration may give a chance for them to express their needs and opinions to government and their regional communities as well. Moreover, it can help policy makers to grasp the regional interests of universities in making policy, and it also promotes the sharing of information between them.

■ Triple Helix Model and its implication

The Triple Helix Model was used as an analytic tool to investigate dynamic interactions between universities, government and industry. By reflection on the analysis of the regional triple helix relations and the above conclusion, some implications were found in relation to the advantages and limitations of its usage in the analysis of the South Korean situation.

With respect to its advantage in application to South Korea, firstly, the four developmental processes of the triple helix relations were useful not only to examine the degree of universities' interactions, but also to identify the limitations in improving the localised interactive processes. In particular, it was the first case

where the four processes were applied to South Korea, thus, they played a role in classifying the interactive relationships in the areas. From the four classified angles, the regional interactive processes were well identified in terms of the triple relations between universities, government and industry.

Secondly, the tensions (see Analytic Framework Two) emerging in localised triple helix relations became a useful tool to identify dynamic relations between the regional stakeholders. The actual interactions in the studied regions were much more complex and dynamic than expected, but the Triple Helix Model made it possible to grasp the interactive relationships. By way of examining conflict and interdependence, the hidden meanings of the outward behaviours were found.

Thirdly, in South Korea, compared to European countries, institutional arrangements have rapidly changed, for instance; Korean universities have intensively experienced the first and second academic revolution at the same time for the last three decades. The dynamic changes of the triple relations between universities, government and industry may be well matched to quickly changing societies. Therefore, the transitive and unstable model may be apt to explain Korean situations.

However, there were some limitations in application for the Triple Helix Model to South Korean situations; firstly, the model highlights the functional relations between three institutions, thus, it is necessary to clearly identify the three institutions such as universities, government and industry. However, in South Korean policy and its implementation process, it was difficult to identify the role and position between central and regional government. The two governments had different roles and relationships with industry and the universities, thus, in the analytic process, the actual relations were fourfold rather than triple.

Secondly, the normative role of government in the model is that government does not control the other two institutions, but encourages new institutional arrangements (Etzkowitz & Leydesdorff, 2000a). As seen in Figure 5.1, there are different kinds of government role in the triple helix model from a statist model to a laissez-faire model, but, the normative role is to create trilateral networks and hybrid-organisations. South Korea has its own system; in some aspect universities are highly state-

dependent, but in some aspect, it has the characteristics of a laissez-faire model. With relation to the university-industry policy, state had a dominant power compared to the other institutions such as regional government, universities, and industry. This imbalance in power relationships hindered the analyse using the triple helix relations, because the driving force to develop the interactions between helixes depended too much on the government policy.

Lastly, the model focuses on the changing role of universities in the knowledge-based economy, and it seems that it has an assumption that the changing role of universities is critical in the economic and industrial development. However, it is questionable as to what extent, regional universities may play a crucial role in their territorial development in the studied regions. Considering the limited role of government is widely accepted in modern neo-liberal society, the role of regional universities may not be omnipotence. In this regard, the role of universities in the construction of the regional innovation system may be much more limited than the Triple Helix Model generally expects, in that regional universities in South Korea are confronted with some critical difficulties such as the steep decrease of university-bounded population.

9.3 Problems and Issues Arising From Regional Innovation Strategies in South Korea

The key questions of the research have been answered above, and these have included issues directly to do with the role of universities in the construction of RIS. However, some more general issues might be identified as relating to the policy context grounded in South Korea. This section will outline some of the problems and issues associated with the larger context of the key questions, which is related to regional innovation strategies.

A first issue derived from the above conclusion is associated with the benefit seeking behaviours of regional universities when they engage in regional innovation processes in the socio-economic situation of South Korea. Although regional

universities are viewed as a regional stock of knowledge compared to other regional institutions, it seems that they play only a comparatively modest role in regional innovative development within their own decision for their benefits. It is also true that they have been confronted with critical difficulties such as: student recruit and financial gains mainly because of the steep decrease in the college-bounded populations; the increasing socio-economic demands from their communities in line with the emphasis of localized learning processes; and the increasing gap between regional universities and the universities located in the Capital area. Taking into account these difficulties and the above conclusion, it may be a questionable point to policy makers about how to aggregate the individual choice of regional universities in enhancing regional innovative capacities within the state-dependent institutional framework of higher educational system. It may be broadly associated with the choice of policy tool to be applicable regarding intervention or devolution between market oriented policy and interventionist policy or between top-down and bottom-up processes (Dalum et al., 1992). In South Korea, it seems that the current policy is close to an interventionist and top-down policy, and it could be argued that the government should consider the more fundamental issue relating to the choice of policy reflecting on the nature of universities' interactions in response to policy.

In this sense, the second issue is associated with the governance structure of the current policy. In terms of power relations between nation and region, the current policy has been implemented and controlled by central government. It generates a dilemma in relation to the role of regional government in RIS building; normatively, the active engagement of regional institutions is decisive in constructing a successful RIS. However, practically, as central government supports regional innovative development, regional governments could play a limited role because central government has the power over most of the policy process. In this line of thought, if regional innovation policy by central government pays more attention to the role of regional universities, a paradox could happen in that regional government and other regional institutions may be more excluded because of state-dependent characteristics of the higher education and governance system in South Korea.

Therefore, in relation to the role of universities in RIS development in South Korea, the new power relationships or devolution between nation and region may be a

fundamental issue, or at least, the policy processes reflecting on regional issues in a certain specific programme should be argued before they are implemented. From the empirical study and conclusion, some meaningful findings can be drawn from a discursive argument in the relationships between nation and region;

- The current RIS policy was designed and has been implemented by the consideration of national perspective rather than regional one
- The policy was embedded in national political and economic values such as national balanced development.
- Thus, in the RIS policy, the diversities between regions or between regional universities were comparatively ignored due to the influx of national perspective.

These characteristics imply a limitation of the Korean RIS policy, and raise a question about what is the difference between national innovation systems and regional innovation system.

The above problems and issues lead us to more fundamental discussions concerning the objectives of the current RIS policy, which are balanced national development and regional endogenous development. As discussed in Chapter Six (see Section 6.3.2), there is a contradictory relationship between balanced national development and regional endogenous development. Through empirical research, it became clear that the policy processes emphasized a balanced national development keeping the powerful role of the state to attain a balance between regions, but on the policy paper, it stressed endogenous regional development paying attention to the regional role of universities and the localized interactive learning. It seems that this shows a dilemma in the role of the state between promoting regional economic development and keeping its power to control regions.

9.4 Contributions, Limits and Further Research Areas

9.4.1 Contributions

In terms of theory, methodology and practice, this research has endeavoured to make a contribution to the expansion of social scientific knowledge in the concept of RIS and the role of universities within it by applying the Triple Helix Model.

This thesis has used the concept of RIS as a conceptual framework to view the role of universities and their interactions in the real construction of RIS. By using the concept, the thesis has contributed to the accumulation of knowledge concerning: 1) the role and interactions of universities in RIS building; 2) the nature of interactive processes between universities, government and industry in the construction of RIS; 3) RIS policy and its implications; 4) the regional boundaries in RIS. Even though the research results were from specific areas in South Korea, they can provide the basis of some speculation about the above issues.

With respect to the Triple Helix Model, this thesis has expanded the knowledge of the model through conceptualising processes. The Analytic Framework One and Two based on triple helix relations introduced new ways to analyse localised interactive relationships. In particular, the Analytic Framework Two developed the understanding of the driving and binding forces in dynamic interactions between universities, government and industry. It may be said that this approach focusing on the tensions underpinned the further development of the model in the research of the dynamic interactions, the localised learning process and the innovation process.

The two Analytic Frameworks also contributed methodologically to the analysis of the dynamic interactions between regional stakeholders in the construction of RIS, and they can be viewed as a new way of analysing the complex processes of interactive mechanisms focused by the RIS concept. Much of RIS literature emphasises the interactions between regional institutions, but does not provide a micro-analytic way to look into the localised learning and interactive processes. The thesis, therefore, presented a new way to analyse the dynamic interactions in the RIS building by using the Triple Helix Model.

In addition, with respect to the matter of boundaries in the construction of RIS, the thesis examined these through regional triple helix relations. This approach identified the boundary in the system of regional innovation through examining the functional relations between the three institutions, which may shape their boundaries. Thus, methodologically it contributed to the analytic way to identify the boundary of RIS building by investigating the regional triple helix relations.

Much of the literature studying the Triple Helix Model has used quantitative methods to analyse the triple relations (Park, H-W et al., 2004; Leydesdorff, 2006; Leydesdorff et al., 2006). However, this thesis has mainly used a qualitative approach to look into the dynamic interactions more deeply and the features of ongoing transitions. Thus, the last point to note for the methodological contribution is that this thesis has presented an idea about how the triple relations have been studied and analysed qualitatively, and in which ways the Triple Helix Model has been conceptualised in order to apply a qualitative methodology. Most of the quantitative method in the Triple Helix Model focuses on statistical data such as the amount of cooperative research or intellectual property, but it fails to identify the background meaning and the dynamic relationships between the three helixes. The qualitative method in this thesis made it possible to grasp the dynamic and complex features of triple helix relations by examining not only the relationships between actors but also their perspectives.

With respect to practical contributions, by studying the university-industry cooperation policy implemented after 2003 in South Korea, this thesis has provided an empirical analysis of the implementation process and responses of the policy. Thus, it contributed practically to the critical analysis of the current university-industry cooperation policy aiming at the RIS building in South Korea.

9.4.2 Limits and Further Research Areas

This research, as a pioneering study of South Korean RIS policy by using the Triple Helix Model as an analytic tool qualitatively from the perspective of regional innovation system, opens wide potential areas for further research, which are, at the same time, the limitations of the thesis.

First of all, the two studied regions were geographically and socio-economically closed, thus, it did not allow a comparative analysis in order to identify the different features of RIS building between regions in South Korea. The comparison with other Korean regions might produce a richer empirical knowledge theoretically and practically. The comparative study with other countries would have underpinned the

comparison of different institutional setting and thickness with relation to the university and the RIS policy. In this thesis, the comparative study was an acceptable trade-off for the investigation of the regional boundary and the qualitative in-depth research focusing on the two regions with blurred boundaries.

Secondly, with relation to the term ‘dynamic interactions’ which are used to identify the complex and transitive features in the triple helix relations, this research did not examine a longitudinal change of the interactions. In this research, there are two different kinds of interpretations that may be possible with respect to ‘dynamic interactions’;

- One is a longitudinal changing feature, such as policy implementation → responding to it by universities and others → feedback process → new changed policy → new responding to it → new feedback → other policy. In order to identify these changes, it is necessary to conduct research over an extended period (at least five years), which makes it possible to apprehend the whole processes of changing interactions between policy and its recipient.
- The other is to identify unstable relationships including tension between actors in a certain time period (comparatively short term), which may imply a transitional relations influenced by conflict and interdependence.

This thesis investigated the ‘dynamic interactions’ happening in localised triple helix relations by using the second way, because time and resource constraints meant it was not possible in this study to empirically grapple with the developmental trajectories of RIS building and the constant change of regional triple helix relations. Therefore, a further longitudinal study would contribute to the identification of the developmental trajectories of the triple helix relations and RIS in the research regions.

Thirdly, this thesis focused on ‘how’ questions of universities’ responses and interactions, and it examined ‘why’ questions in relation to the ‘how’ questions (see Chapter One – 1.1 and Two - 2.4.3). A further investigation focusing on explanatory factors shaping universities’ engagement in regional development in South Korea would have contributed to the identification of the problematic issues concerning the role of universities in their regional innovative development.

9.5 Final Words

This study has attempted to understand the role of universities in the construction of regional innovation system in two administrative regions of South Korea. This research specifically focused on the interactions of regional universities with government and industry in response to the university-industry cooperative policy. It began with a critique of the optimistic view that universities may effectively interact with industry and government for their territorial development.

The theoretical perspective of this research has drawn on the concept of Regional Innovation System to capture how regional innovative development takes place in a particular geographical area with relation to the role of universities. It is generally accepted in the concept of RIS that the innovative performance of regions is improved when regional institutions such as universities and firms are encouraged to become better innovators by interacting with each other. However, the concept of regional innovation system implies a significant degree of empirical validation, which makes it difficult for researchers and policy makers to acknowledge what a regional innovation system is or should be. In this sense, some critiques and problematic issues were generated such as the role of universities in RIS building, the gap between the policy and actual RIS building, the high-possibilities of unreality of the ensemble interactions in the RIS and the boundaries of the RIS.

Methodologically, this research used qualitative methods of interviews and documentary analysis to identify the dynamic interactions of regional universities with government and industry. In particular, in order to cover the lack of micro-analytical background of the RIS concept, it used the Triple Helix Model as an analytic tool to investigate the interactions. Furthermore, the model was conceptualised to be applicable in empirical research to explore the key research questions. The developed analytic framework of the model was from the four developmental processes of the triple helix relations and the tensions as a driving force of the relations. In addition, this research attempted to identify the actual boundaries of RIS building by examining the localised triple helix relations.

Analysis of the empirical study revealed significant findings. The regional universities responded positively to the government policy in terms of outward appearances, but their interaction with government and industry did not develop to the degree of creating new relationships. Thus, it seems that it is difficult for universities to co-ordinate into the localised interactive processes as a part of regional innovation strategies, and the boundaries for the regional triple helix relations are determined through ongoing dynamic selective processes for maximising the benefits of each organisation.

The importance of this study was to show in detail the dynamic interactions of regional universities with government and industry in response to the specific government programmes in South Korea. This research, therefore, expanded theoretical understanding of regional innovation systems concerning the role of universities and their interactions, and has also developed the knowledge of the Triple Helix Model through conceptualising and applying it to qualitative empirical work.

Appendix A: An Overview of Administrative and Financial System in South Korea

1. Administrative System

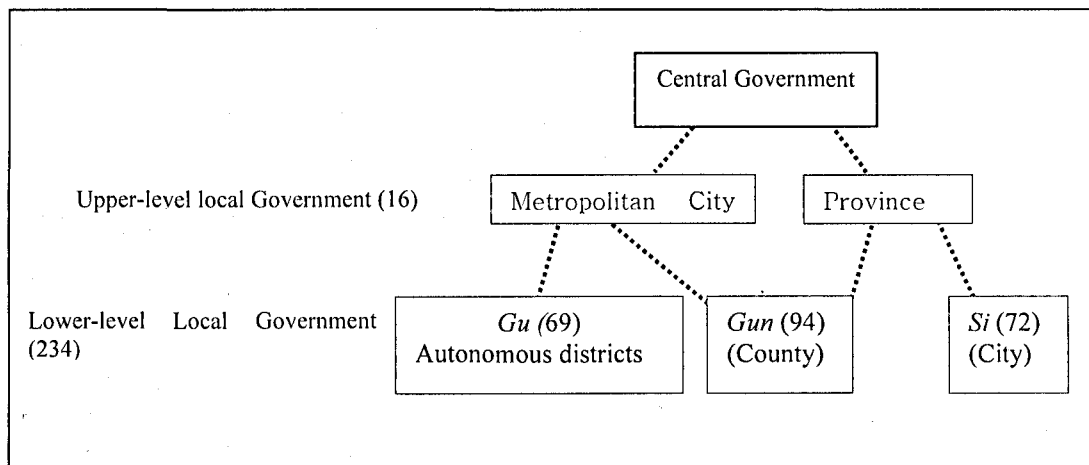
South Korea has a strong traditional history of highly centralized government, where local governors were appointed centrally. There were no local councils, and their capacity for autonomous decision-making was nonexistent. Since the late 1980s, Korea has been taking steps to decentralise the public administrative system, and the process has been largely motivated by the political objectives of enhancing local democracy and autonomy. In 1988, the revised Local Autonomy Act and Local Finance Act prompted the devolution of power and fiscal decentralisation away from central government, and the devolutionary processes have gradually progressed.

From July 1995, local governments have had autonomy, with local governors and council members elected by their citizens. The functions of the elected local government governors, according to law (Local Autonomy Act), include the following: any functions delegated by central government; management of public properties and facilities; assessment and collection of regional and local taxes and fees; provision of services and goods to residents; and management of other administrative affairs (Articles: 92-96). Local councils are also authorized to inspect and audit their governments. Each of the local governments has a Board of Education for handling educational matters belonging to primary and secondary school, thus the national government is responsible for higher educational matters.

The local government in Korea is divided into two tiers. The upper-level local government comprises Seoul Metropolitan City, six other Metropolitan Cities and nine Provinces. The lower-level local government is composed of 234 *si* (city), *gun* (county), and *gu* (autonomous district). Upper-level local governments not only have to some extent their own functions, but also serve as an intermediary between the central and lower-level local governments. Their administrative units match one-to-one with ministries of the central government; thus, policies and programmes implemented by a certain ministry can be handled by a corresponding unit in the provincial and metropolitan city governments. This administrative system is similar

to that of lower-level local government. Lower-level local governments deliver services to the residents through an administrative district system such as, *eup*, *myeon*, *dong* and *gu*. District offices are engaged mainly in routine and simple administrative and social service functions.

Frame of administrative system



Sources: Adapted from Ministry of Government Administration and Home Affairs. Retrieved August 13, 2005 from <http://www.mogaha.go.kr/>

With relation to intergovernmental relations, local governments depend on the central government for decisions and funding for their roles and functions, organisation and personnel, and budgets. Even though their main functions are to implement their own policies and to provide services for their citizen, many of their functions are to implement centrally determined policies and programmes as directed by central government ministries (Baek & Ryu, 2004).

2. Financial System

Despite structural changes in local administrative bodies with the autonomous system since 1995, fiscal management in their areas is still significantly dependent on central government finance. In principle, it is can be said that in order to settle the local autonomy system, local public finance should be operated with the local governments' own tax revenues of the local autonomies. However, in Korea, because of shortages in these tax bases in local autonomies and disparities in tax bases between local autonomies, local governments receive subsidies and grants from the central government in addition to their own tax revenues (MOPB, 2003). For

example, as seen in the below table, in 2004, 87% of regional and local autonomies, and half (8 out of 16) of regional governments were dependent on central government for more than 50% of their revenue. Only Seoul Metropolitan City provided over 90% of its own revenue.

Financial independence of local governments (2004)

Financial independence ration*	Total		Metropolitan cities and provinces	Cities	Counties	Autonomous districts
	Number	Per cent (%)				
Less than 10%	10	4	-	-	10	-
10-30%	126	50	7	32	72	15
30-50%	83	33	1	30	6	46
50-70%	20	8	3	14	-	3
70-90%	7	3	4	1	-	2
90% and over	4	2	1	-	-	3
Total	250	100	16	77	88	69

* The financial independence ration is computed by dividing local tax and non-tax revenues by the total local budget of general account

Source: Ministry of Government Administration and Home Affairs, Local Financial Open System, Retrieved August 15, 2005 from <http://lofin.mogaha.go.kr:8100/help/NoticeRead.jsp?type=&word=&num=2&pg=1>

Local government budgets are financed by local revenue and intergovernmental transfers. Local revenue is composed of tax and non-tax revenue. Intergovernmental transfers from national government to local autonomies consist of tax sharing (*Regional and Local Share Tax*), conditional grants (*National Treasury Subsidies*) and more broadly defined capital grants (*Regional and Local Transfer Fund*).

■ Local revenue

- **Tax revenue:** local tax revenue is provided by seventeen taxes. They are regulated both by the assessment rules and actual property tax rates implemented by the central government. Therefore, local governments have limited discretion in practice.

- **Non-tax revenues:** local governments receive revenue from their profit-oriented businesses, regional and local public enterprises, as well as from various fees and charges.

■ Intergovernmental Transfer

- **Tax sharing:** *Local Share Tax* is a vertical tax-sharing system designed to equalize vertical and horizontal disparities. It sets a fixed percentage (15%) of the total national tax income that goes to local level. The equalization formula between local governments is based on the concept of “standardized fiscal deficiency”, which is calculated as the difference between standardized fiscal needs and standardized fiscal revenue.
- **Conditional grants:** *National Treasury Subsidies*, which may be called ‘matching-grants’, are provided to local governments for specific projects. They are allocated depending on national policy priorities for the specific needs of each economic sector or geographical area.
- **Conditional capital grants:** *Local Transfer Fund* is somewhere between tax sharing and conditional grants and is often called ‘block grants’ because of its relatively broad objectives. The revenues may be spent on road maintenance, farming and fishing development, water purification and local development.

Because of low financial independence originating from a lack of balance in the distribution of revenue sources in tax between central and local governments and poor tax base in many of the local governments, local governments depend heavily on the finances of intergovernmental transfer. Moreover, only *Local Share Tax* is unconditional support, and the other two are conditional. Accordingly, local governments are limited in generating their own policy because of their low financial capacities. In addition, specific policies which carry grants from central government asks local governments to spend their budget on a so-called ‘matching fund’; thus the financial resources of local government are decreased. In terms of higher educational system, HEIs (Higher Education Institutions) are governed centrally by the MEHRD (The Ministry of Education and Human Resources Development), while local governments play an ancillary role such as paying match funds for national policies (Ryu, et al., 2006).

Appendix B: Statistics of Higher Education by Types of HEIs in South Korea

(In April 2004)

	HEIs	Student	Staff	Student-Staff Ratio
University				
National	24	376,413	11,974	31.44
Public	2	20,939	529	39.58
Private	145	1,439,297	34,502	41.72
Sub-total	171	1836649	47005	39.07
Industrial University				
National	8	86,892	1399	62.11
Private	10	102,143	1144	89.29
Sub-total	18	189,035	2,543	74.34
Univ. of Education				
National	11	23,335	756	30.87
Air & Corr. University				
National	1	290,728	123	2363.64
Technical College				
Private	1	196	0	
Miscellaneous School				
Undergraduate Course	4	1,064	30	35.47
Junior College Course	1	89	5	17.80
Sub-total	5	1,153	35	32.94
Cyber College & University				
Undergraduate Course	15	36,716	276	133.03
Junior College Course	2	2,734	21	130.19
Sub-total	17	39,450	297	132.83
Junior College				
National	7	14,721	374	39.36
Public	8	24,026	357	67.30
Private	143	858,842	11,141	77.09
Sub-total	158	897,589	11,872	75.61
College in Company				
Private	1	62	0	
Graduate School College				
Private	28			
Grand Total	411	3,278,197*	62,631	52.34

* Postgraduate students are excluded.

Source: Educational Statistics Database of KEDI (Korean Educational Development Institute), Retrieved December 11, 2004 from http://std.kedi.re.kr/jcgi-bin/educ/educ_basic_frmc.jsp?menuid=1

Appendix C: Interviewee List

Institutions and Position	Date (2005)	Dur. (min.)
Daegu Metropolitan City Government		
▪ Director of Balance & Development Team, Innovation & Development Division	11/April	50
▪ Director of the University-Industry Cooperation Team, Industry & Technology Division	12/April	55
▪ Staff of Balance & Development Team, Innovation & Development Division	12/April	40
Gyeongbuk Provincial Government		
▪ Director of the University-Industry Cooperation Team, Science & Technology Division	7/April 29/July	60 40
▪ Director of the Industry Promotion Team, The Division of the Industry Promotion for Region	13/April	45
▪ Staff of the Industry Promotion Team, The Division of the Industry Promotion for Region	28/June	70
Local Government		
▪ Director of the Investment and Trade Division, Gumi City	19/May	45
National Government		
▪ Director General of the Regional Innovation Bureau, Presidential Committee of National Balanced Development	30/May	50
▪ Director of the University-Industry Cooperation Division, the Ministry of Education and Human Resources Development	1/June	60
▪ Director of the University-Industry Cooperation Team, the Ministry of Commerce, Industry & Energy	1/June	60
KNU (Kyungpook National University)		
▪ Professor, Dean of Planning Office	13/April 28/July	60 30
▪ Professor, Leader of NURI Project	26/April	50
▪ Professor, Leader of CUCI Project	26/April	60
▪ Professor, Head of IACF	3/May	40
▪ Cooperative Director of IACF	4/May	50
▪ Director of Technology & Science Team, IACF	4/May	40
▪ Director of University-Industry Cooperation Team, IACF	4/May	30
▪ Professor, Head of KNU Techno-Park	28/April	50
▪ Professor, Head of Electrical Engineering and Computer Science	21/May	40
YU (Yeungnam University)		
▪ Professor, Dean of Planning and Research Office, and IACF	9/April	70
▪ Professor, Leader of NURI Project	27/April	50
▪ Director of IACF	12/May	45
▪ Professor, Head of the YU Centre for SME Cooperation	29/April	60
▪ Director of Educational Supporting Team, Office of Educational Affairs	12/May	30

▪ Professor, Head of Electrical Engineering & Computer Science Faculty	17/May	50
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The KNIT (The Kumho National Institute of Technology)		
▪ Professor, Dean of Planning Office	20/April	70
	2/August	40
▪ Professor, Leader of the NURI Project	20/April	60
▪ Professor, Head of IACF	20/April	50
▪ Professor, Head of Business Incubator	11/May	50
▪ Professor, Head of Electronic Engineering Faculty	19/May	40
<hr/>		
HGU (Handong Global University)		
▪ Professor, Dean of Planning and Research Office, and IACF	21/April	60
▪ Director of Planning and Research Office, and IACF	24/May	40
▪ Professor, Head of Business Incubator	21/April	50
▪ Professor, Head of Computer Science & Electronic Engineering Faculty	23/May	60
▪ Professor, Bioscience & Food Technology: CEO, Mistle Biotech Co.	26/May	70
<hr/>		
Other Universities		
▪ Professor, Cooperative leader of NURI Project with YU, Daegu university	8/August	50
▪ Professor, Cooperative leader of NURI Project with KNU, Gyungil University	9/August	50
▪ Professor, Cooperative leader of NURI Project with KNIT, Daegu University	9/August	50
<hr/>		
Firms		
▪ Chief Director of VTC & HRDP (Vocational Training Centre and Human Resource Development Part), Gumi Complex, Samsung Electronic Co.	10/May	50
▪ CEO, MAXAN Co.	15/June	40
▪ CEO, Sense & Sense Co.	17/May	40
▪ CEO, DaiKwong Co.	13/May	30
▪ Manager of Management Department, SL LCD Co.	13/May	45
▪ CEO, Laon Electronic Co.	19/May	40
▪ Management Director, Mistle Biotech Co.	26/May	30
▪ Associated Researcher, POSVAC Co.	23/May	50
▪ CEO, Mobil Ware Co.	7/June	40
▪ Head of Display R&D Dept., LG Electronics Co.	13/June	60
▪ CEO, Digen Co.	8/June	40
<hr/>		
Regional Technology Park and Others		
▪ Director of Promotion Department, Daegu Technology Park	6/May	40
▪ Director of Planning Department, Daegu Technology Park	10/August	50
▪ Head of Gyungbuk Technology Park	7/May	50
▪ Director of Promotion Department, Pohang Technology Park	23/May	40
▪ Director of the Technology Supporting Department, the Regional Office of the Small & Medium-Sized Business Association	27/April	30
▪ Director of the University-Industry Cooperation Team, the Gumi Branch of National Industry Complex Corporation	11/May	50

Appendix D: A Sample of Interview Question

Group: University -

Interview Date:

Position: **Leader in Planning Office**

Name:

Contact:

- Introduction of myself and interview objectives
- Questions reconfirming the interviewee's status or position for the interview

■ General Questions

1. Can I record this interview with the tape recorder?
2. How long have you worked in this position?
3. What did you do before working in this position?

■ Main Questions

The CUCI and NURI programme

1. Could you explain how your university applied the CUCI and NURI Programmes?
 - Preparing process
 - The style of cooperative alliance with other institutions
 - The way of networking with firms and government
 - The lightening of new goal, etc.
2. How and who contact to firms and government?
3. Please, compared with these other three universities, what are the differences of your university related to the CUCI and NURI Programmes?
4. Asking more specific questions depending on;
 - The stage of developmental process
 - The differences from other universities
 - The changes after implemented the new programme

The IACF

1. Did you involve in establishing IACF and organising its staff?
2. Could you explain the characteristics of the IACF's staff including its leader? Or what qualification did you consider to select the members for IACF?
 - Why
3. What are the differences or characteristics distinguished from other three universities' IACF?
4. What have changed since IACF was built?

The CCIs

1. Is there the CCI in your university?
2. Could you explain CCIs in your university?
 - when is it created?
 - how and in what process it created?
 - who contact to firms?
 - why did you create the course?

3. Asking more specific questions depending on;
 - The stage of developmental process
 - The differences from other universities
 - The changes after implemented the new programme

Spatial Issue Questions

1. How do you (in relation to your work) define region when you are saying regional innovation or regional development?
 - Why? and Why other people define differently?
 - Do you think the definition of the region has changed since 2003?
2. With relation to the above programmes, how do you define the boundaries where your university interact?
 - Why
 - Could you tell me any story happening in the matter of regional boundaries if there is?
3. Do you think your university identifies its regional territories as being of great priority in its mission? Or state or international?
4. Do you think the engagement or role of your university in your region have changed since the programmes implemented?
 - Why and how?

Appendix E: The List of Secondary Data

■ From Government

• Published Government Document

- Discussion Paper for National Agenda in Balanced National Development, 2004, PCONBD
- A New Vision for University-Industry Cooperation, 2004, PCONBD
- The Evaluation Report of the Performance in National Balanced Development Project, 2005, PCONBD and MOCIE
- The First Five-Year Balanced National Development Plan, 2004, PCONBD and MOCIE
- Planning Paper: Demand-oriented Nurturing System for Industrial and Technical Human Resources, 2005, MOCIE

• Unpublished Government Document from Official Web site

- Announcement for the NURI programme, January/2004, MEHRD, available online at: <http://www.moe.go.kr/index.html> (accessed 20 February 2005)
- Announcement for the CUCI programme, April/2004, MEHRD, available online at: http://www.kotef.or.kr/info/notice_list.asp?currPage=2&swork=0001&sdata=&field=&key= (accessed 5 March 2005)
- Brochure: The IACF, February/2004, MEHRD, available online at: <http://www.moe.go.kr/administrative/administrative20.html?> (accessed 10 December 2004)
- New System of University-Industry Cooperation and the IACF, October/2003, MEHRD, available at: <http://www.moe.go.kr/administrative/administrative20.html?> (accessed 5 December 2004)
- Vision and Agenda for Balanced National Development, PCONBD, March/2003, available online at: http://www.pcbnd.go.kr/pds/balance/view.php?b_id=52&page=1&theme=&keyfield=title&keyword=비전과%20과제&nid=1150819234 (accessed 11 June 2004)
- Planning Paper for the NURI programme, 2003/MEHRD, available online at: <http://www.moe.go.kr/index.html> (accessed 20 February 2005)
- Planning Paper for the Cooperative Implementation of the CUCI programme, April/2004, PCONBD, MEHRD and MOCIE, available online at: <http://www.pcbnd.go.kr/pds/balance/list.php>, (accessed 5 March 2005)
- Regional Science & Technology Year Book 2004, MOST, available online at: http://125.60.0.168:8080/dms/servlet/media?service=list&template=client2_list&category_id=34, (accessed 20 January 2005)
- Regional Science & Technology Year Book 2005, MOST, available online at: http://125.60.0.168:8080/dms/servlet/media?service=list&template=client2_list&category_id=34, (accessed 21 May 2006)
- The list of selected universities in the CUCI programme, July/2004, MEHRD, available online at: http://www.kotef.or.kr/info/notice_list.asp?currPage=2&swork=0001&sdata=&field=&key= (accessed 5 March 2005)

- The list of Support in the NURI programme 2004, November/2004, MEHRD, available online at; <http://www.moe.go.kr/index.html> (accessed 20 February 2005)
- Vision and Strategy for New University-Industry Cooperation, September/2003, PCONBD, available online at: <http://www.pcbnd.go.kr/pds/balance/list.php>, (accessed 02 December 2004)
- Unpublished Government Document from Interviewees and Institutions
 - A Restructuring Proposal for Regional Innovation Project, 2005, MOCIE
 - The Budget and Performance of the NURI Programme and its Matching Fund, August/2004, Gyeongbuk
 - The Budget and Performance of the NURI Programme and its Matching Fund, August/2004, Daegu
 - The list of Applicants in the NURI programme (Classified by universities and Project Size), August/2004, Gyeongbuk
 - The information of the IACF and NURI programme in regional universities, 2005, Gyeongbuk
- Government Web site
 - PCONBD: <http://www.pcbnd.go.kr/index.php>
 - MOEHRD: <http://www.moe.go.kr/index.html>
 - MOCIE: <http://www.mocie.go.kr/>
 - MOST: <http://www.most.go.kr/>
 - National Statistical Office: <http://www.nso.go.kr/nso2005/index.jsp>
 - Daegu Regional Government: <http://www.daegu.go.kr/>
 - Gyeongbuk Regional Government: <http://www.gyeongbuk.go.kr/>
- **From Universities**
- KNU: <http://www.knu.ac.kr/>
 - Business Incubator: <http://www.knutp.org/ktp/ktp4.html>
 - NURI Project: <http://www.nuri-it.com/>
 - CUCI Project: <http://alice.knu.ac.kr/>
 - IACF: <http://rsc.knu.ac.kr/>
 - Statistic Year Book: http://knusys6.knu.ac.kr/knu/owa3/khome_news.lst?t_gubun=X3
 - Brochure: ALICE, 2005, KNU
 - The Memorandum of IACF in KNU
 - The Regulation of Intellectual Property in KNU
- YU: <http://www.yu.ac.kr/>
 - Business Incubator/YUCSC: <http://smbc.yu.ac.kr/index.php>
 - Statistic Year Book : http://www.yu.ac.kr/about/index.php?c=about_03
 - Brochure: The Contracted Course: YU and Samsung, 2004, YU
 - The Memorandum of IACF in YU
 - The Regulation of Compensation for Researcher Invention in YU
- KNIT: <http://www.kumoh.ac.kr/>
 - IACF: <http://iacf.kumoh.ac.kr/>
 - NURI Project: http://www.kumoh.ac.kr/nuri_main.htm
 - Business Incubator: <http://bic.kumoh.ac.kr/>

- The Memorandum of IACF in KNIT
- The Regulation of Intellectual Property in KNIT
- HGU: http://www.handong.edu/n_handong/main.html
 - http://www.handong.edu/n_handong/organisation/institute_06.html
 - The Memorandum of IACF in HGU

■ From Firms

- LG Electronics: <http://www.lge.co.kr>
- Samsung Electronics: <http://www.sec.co.kr/>
- MAXAN Co: <http://www.maxan.com>
- POSVAC Co.: <http://www.posvac.com>
- Sense & Sensor Co.: <http://http://www.s-s.co.kr/>
- SL LCD Co.: <http://www.slcorp.co.kr>
- DaiKwong Co.: <http://www.dkok.co.kr>
- Mobil Ware Co.: <http://www.mobilware.co.kr/index.asp>
- Digen Co.: <http://www.dkico.com/>
- Mistle Biotech Co.: <http://www.mistlebio.co.kr>

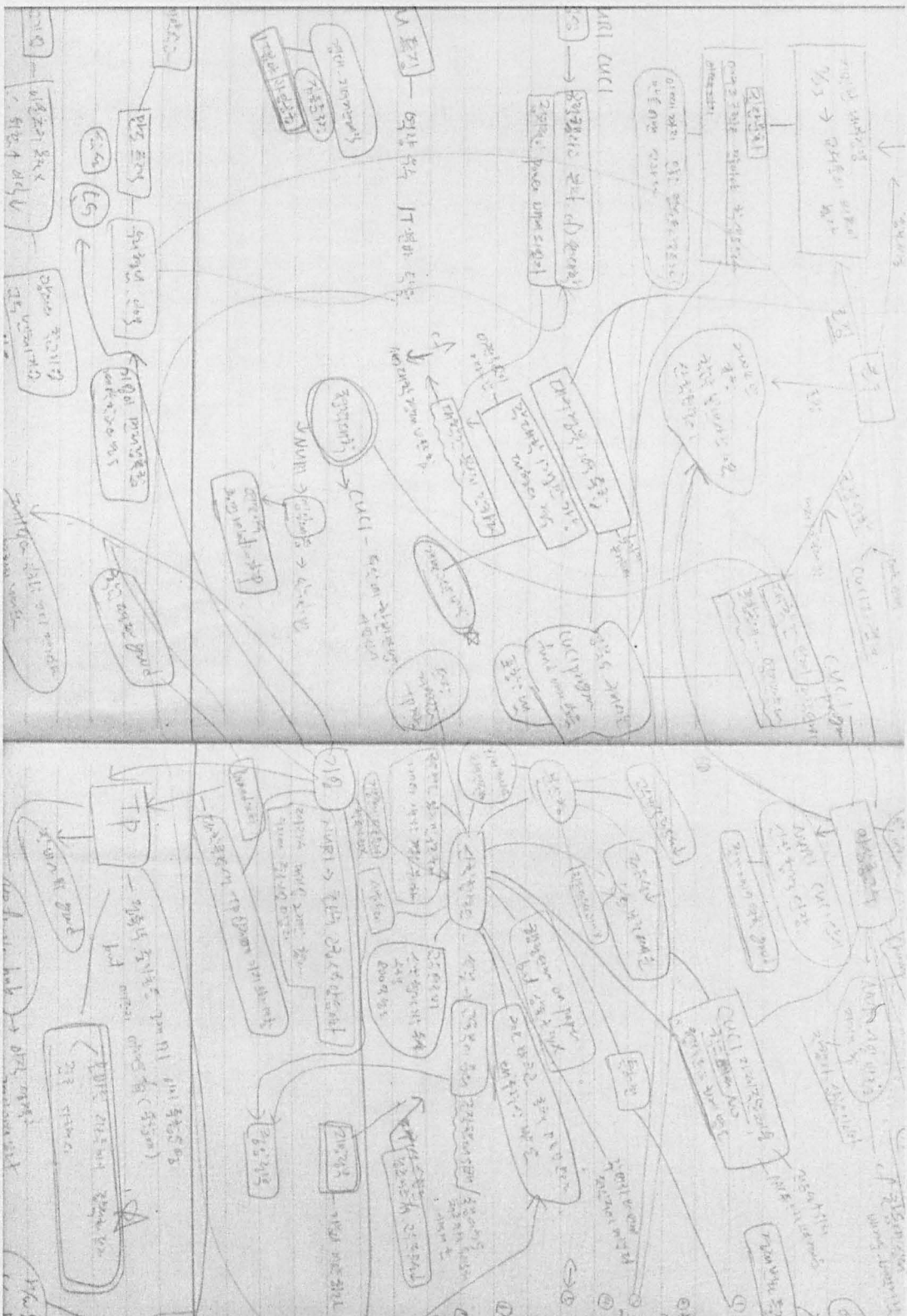
■ From Techno-Park and others

- Gyeongbuk Technology Park: <http://www.ktp.or.kr/>
 Planning Paper for 2003, 2002, Gyeongbuk Technology Park
 Planning Paper for 2004, 2003, Gyeongbuk Technology Park
 Planning Paper for 2005, 2004, Gyeongbuk Technology Park
 Brochure: KTP, 2005, Gyeongbuk Technology Park
- Daegu Technology Park: <http://www.ttp.org/>
 Planning Paper for 2003, 2003, Daegu Technology Park
 Planning Paper for 2004, 2003, Daegu Technology Park
 Planning Paper for 2005, 2004, Daegu Technology Park
 Brochure: Daegu Technology Park, 2004, Daegu Technology Park
- Pohang Technology Park: <http://www.pohangtp.org/>
 Planning Paper for 2003, 2002, Pohang Technology Park
 Planning Paper for 2004, 2003, Pohang Technology Park
 Planning Paper for 2005, 2004, Pohang Technology Park
 Brochure: Pohang Technolopark, 2004, Pohang Technology Park
- The Daegu & Gyeongbuk Regional Branch of SMBA:
<http://daegu.smba.go.kr/>
- The Gumi Branch of National Industrial Complex Cooperation:
http://www.kicox.or.kr/kix_main.jsp

■ Newspapers

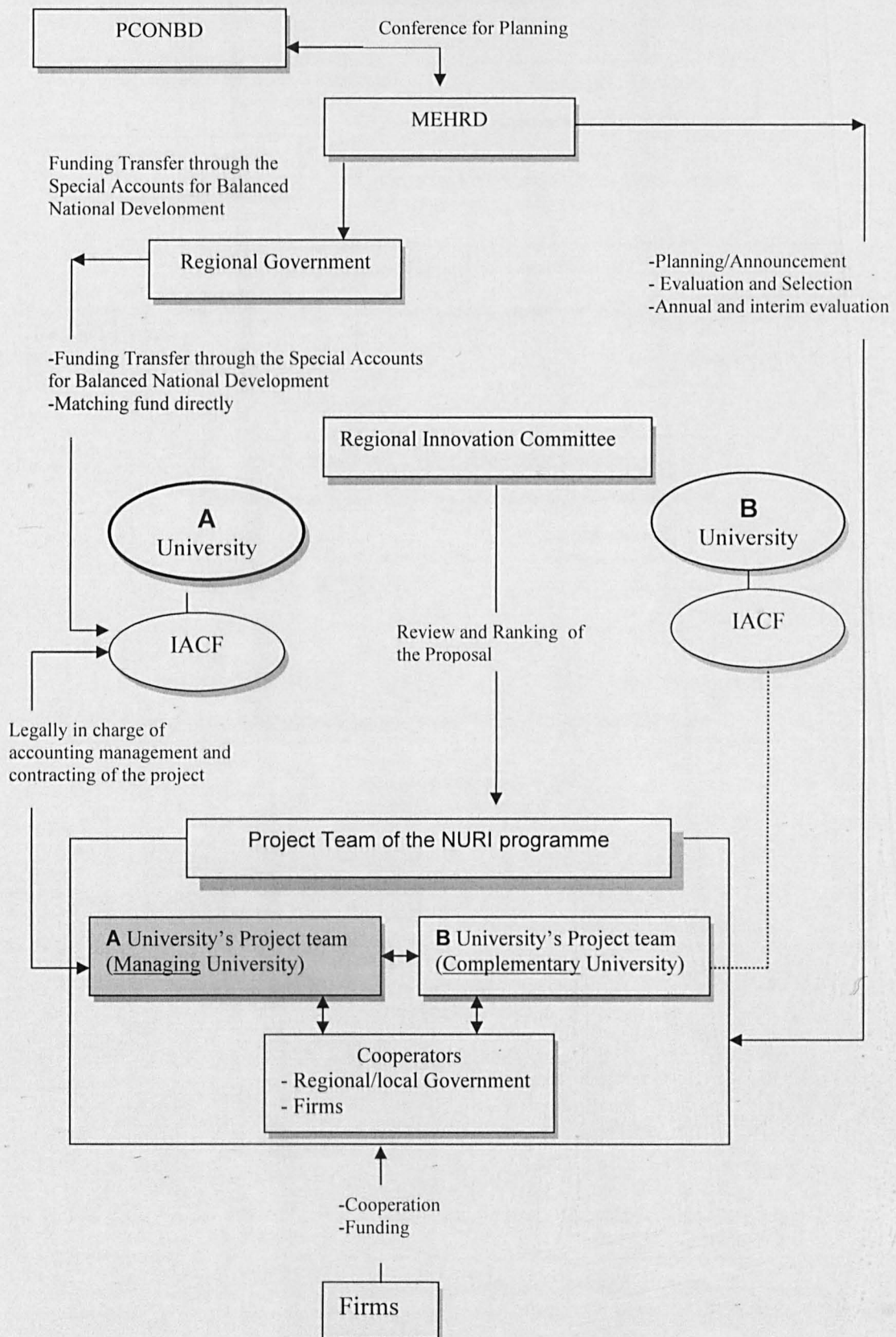
- Chosun Ilbo: <http://www.chosun.co.kr/>
- Hankyereh Shinmun: <http://www.hani.co.kr/>
- Maeil Shinmun: <http://www.imaeil.com/>
- Yeongnam Ilbo: <http://www.yeongnam.co.kr/yeongnam/index.shtml>

Appendix F: An Example of 'Mapping' Analysis



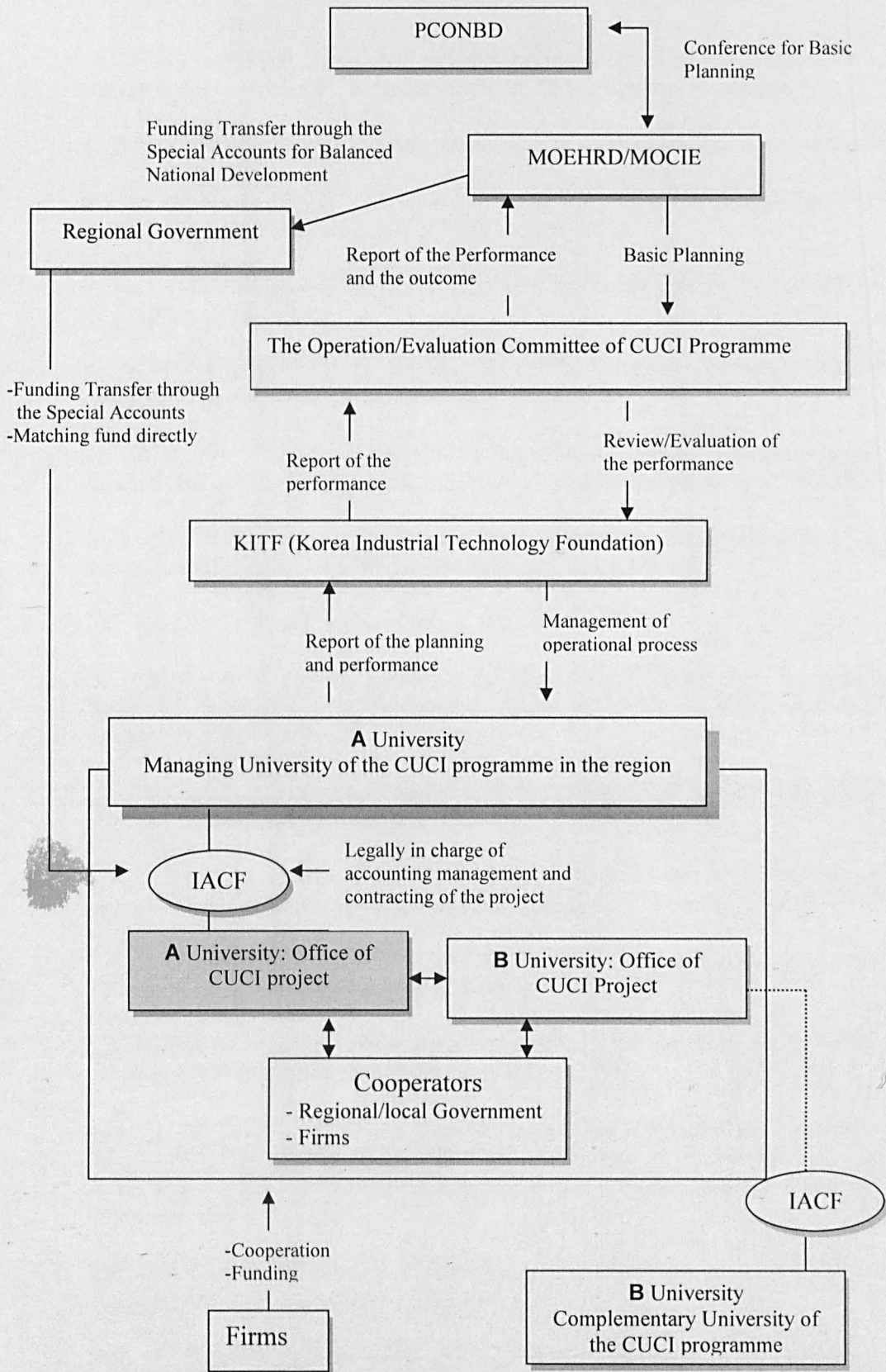
Appendix G: Processes of the NURI and CUCI Programmes

■ The NURI programme



Source: Modified from government document - planning paper for the NURI programme, 2003/MEHRD

■ The CUCI programme



Source: Modified from government document - planning paper for the cooperative implementation of the CUCI programme, April/2004, PCONBD, MEHRD and MOCIE

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