

**AGENCY INTERACTION IN
THE IMPLEMENTATION OF INNOVATION POLICIES:
A CRITICAL ASSESSMENT OF NATIONAL PROGRAMMES FOR
SUPPORTING COLLABORATION BETWEEN SMALL FIRM AND
UNIVERSITY IN SOUTH KOREA**

Thesis submitted for the degree of PhD

by

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Abstract

This thesis addressed gaps between policy expectation and policy actions through investigating local agency interaction in the policy delivery system. This thesis particularly focused on regional innovation policies, specifically industry-academia collaboration (IAC) policies in South Korea, a politically centralised country in which an attempt to enhance the role and interaction of local agencies from a perspective of a bottom-up approach was emerging. By utilising an analytical framework underpinned by agency-structure relations, implementation models and the notion of demand-side coherence, this thesis attempted to gain a better understanding of the behavioural differences between diverse agencies in the policy implementation process and the influence of policy delivery systems on their actions.

In order to understand actual gaps between policy expectation and policy actions, this research empirically addressed the barriers to agency interaction and policy coordination which were perceived by the demand-side. In order to identify the barriers and understand their nature, this research adopted a mixed method approach in which quantitative surveys and qualitative interviews could complement each other.

Based on the empirical study, this thesis showed that the human agencies' tendency to pursue self-interest derived from individual-organisational structure relations severely limited interactions between different local agencies in the implementation process of the IAC policies. Also, since the practice of local agencies could be influenced by organisational contexts and their capacity to deal with the policy process, policy context and structure might have limits to conditioning their practices. It was also difficult to predict the behaviours of local agencies, given the limits to central policy-makers' ability to process information about the local level. Accordingly, national innovation policies that were seeking to promote collaborative activities based on strong national initiatives experienced limits in gaining expected policy results, despite government's normative emphasis on the actions of local agencies in the implementation process.

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List of abbreviations

BI	Business Incubator
BT	Bio Technology
CUIAC	Central University for Industry Academia Collaboration
GRDP	Gross Regional Domestic Product
IAC	Industry Academia Collaboration
IACFs	Industry Academia Collaboration Foundations
IT	Information Technology
ITEP	Korean Institute of Industrial Technology Evaluation and Planning
KBE	Knowledge-Based Economy
KIET	Korea Institute for Industrial Economics and Trade
KOTEF	Korea Industrial Technology Foundation
L&RED	Local and Regional Economy Development
LED	Local Economy Development
MOCIE	Ministry of Commerce, Industry and Energy
MOIC	Ministry of Information and Communication
MOCT	Ministry of Construction and Transportation
MOEHRD	Ministry of Education and Human Resources Development
MOST	Ministry of Science and Technology
NID	New Industries Division
NURI	New University for Regional Innovation
PCBND	Presidential Committee on Balanced National Development
PPPs	Public-Private Partnerships
RRC	Regional Research Centre
SMBA	Small and Medium Business Administration
SMEs	Small and Medium Sized Enterprises
STD	Science and Technology Division
TIC	Technology Innovation Centre
TP	Techno-Park
UIRIC	University, Industry and Research Institute Consortium

Chapter 1 Introduction

1.1 Research aim, objectives and questions

The aim of this research was to contribute to knowledge about the occurrence of gaps between policy expectation and policy actions through understanding local agency interaction in a policy delivery system. This research was particularly concerned with regional innovation policies, specifically industry-academia collaboration (IAC) policies aimed at supporting collaborative interaction between small firms and universities. Evidence was collected from South Korea in 2006, a politically centralised country in which a new national development paradigm was emerging.

Innovation has certainly become more highly ranked on policy agendas at national and regional level in most countries (Nauwelaer and Wintjes, 2002). According to OECD (1997), innovation can involve a new or improved product but also process changes referring to the adoption of new or better product methods, including marketing and product distribution. Smallbone et al. (2003) argued that within the context of an approach to innovation emphasising the firm's application of ideas and methods, innovation might be viewed as being incremental rather than radical. In particular, in recent discussions, innovation has been understood as a social and technical process of interactive learning between firms and their environment (Lundvall, 1992). This perspective has developed as a result of criticism of the traditional dominating linear model of innovation (Asheim and Isaksen, 2003), in which innovation was thought to proceed sequentially from research to marketing as a result either of technology-push or market-pull pressures (Morgan, 1997). The main criticism of the linear model was that it neglected the diversity of activities making up the innovation process and the variation across industries, and also that R&D activities were only a part of the entire set of activities and efforts of firms trying to obtain and assimilate new technological knowledge (Autio and Laamanen, 1995; Thomson, 1993). Thus, the majority of recent regional innovation policies have tended to focus on encouraging collaboration between firms and universities or research institutes (Rothwell and Dodgson, 1992). Also, in this context of a new perspective on innovation, many researchers emphasised the importance of interaction between actors or agencies in the policy process

(Garofoli and Musyck, 2003; Morgan and Nauwelaers, 1999). In the sense that a traditional hierarchical model of politics based on a top-down approach might cause communication failures between local actors (Bateira and Ferreir, 2002), agency interaction in innovation policies tended to gain much more importance.

In South Korea, there have been rapid political and economic changes since the late 1990s. Under the reform of the Local Autonomy Act some political powers began to be devolved from the central government to local governments in line with the direct election of local council members and governors or mayors by citizens. In addition, it was acknowledged that a strategy focusing on the growth of large companies caused the financial crisis in 1997 through overinvestment of large companies and their collusion with the government (Lee, 2000). As a result, the Korean government stressed the development of local small firms and tried to promote the business start-up of knowledge and technology intensive firms (Gregory et al., 2002). Also, the government launched diverse technology policies in order to promote regional R&D capacity and innovation networks (Park, 2001). That is, regional innovation policies seemed to expand gradually. In such changes, there was a growing concern for regionally-led and innovation-driven strategies in the national development paradigm (Kim, 2004). In this context, the new Korean government in 2003 announced regional innovation as one of the most important national agendas and also emphasised the role of local actors in regional innovation (PCBND, 2004a). In particular, with respect to industry-academia collaboration, it strongly emphasised that policies needed to be driven by a user-oriented approach pursuing collaborative networks of agencies and co-ordination of programmes (PCBND, 2004b). Given these situations, there was an attempt to enhance the role and interaction of local agencies in the policy process from a perspective of the bottom-up approach

However, in the real world, interaction between local agencies in the policy implementation process is quite complicated and can be seen as being difficult. Interactions between agencies in the policy process are repeated and accompanied by others (Bowen, 1982) in the sense that interaction might be a matter of a mutual subjective orientation toward each other (Rummel, 1976). Also, in the implementation process in which diverse individuals with different interests participate, there are a variety of obstacles in the implementation process which policy-makers have not

taken into account (Picciotto, 2004). Problems originating from the diversity and complexity of agency interaction in the implementation process can cause gaps between policy expectations and actions (Hill, 2005). In particular, South Korea has had a long tradition of centralism and many regional innovation policies have been driven by the strong initiatives of central government despite more recent current political devolution process (Hassink, 2001). That is, the policy delivery system in South Korea was seen as being operated in a traditional top-down approach. Lee (2001) argued that this traditional model assumed that policy-makers had complete knowledge about what would work in policy delivery. However, in practice it might not be easy to predict how firms, universities, and local governments would respond to policies. In this respect, it is questionable as to what extent local agency interaction could be fostered as expected in the implementation process, even if a bottom-up perspective was emerging in South Korea.

Much of literature on regional innovation policies has dealt with the problems of policy operation in a top-down approach from a normative perspective, and has emphasised the importance of local agency interaction. Furthermore, some literature on technology transfer between firms and universities has provided insights about behavioural problems of firms and universities in collaborative activities. Yet, such literature has not sufficiently discussed the question of how human agencies with different interests and operating within different organisational contexts respond to interaction between them in the policy context. For example, the issue of relationships between their self-interest and organisational contexts in policy delivery systems has not been fully explored. In addition, the issues of the relationship between the actions of human agencies and policy delivery systems and the influence of their behaviours on gaps between policy expectation and actions have been relatively neglected. To investigate the actual behaviours of local agencies in the policy delivery system the research utilised an analytical framework underpinned by three main constructs.

Firstly, policy delivery systems can be seen as a context in which agencies operate and thus their interaction might be influenced by policy delivery systems. A policy delivery system can be viewed as “being the total modality of implementing a given policy” (Sandiford and Rossmiller, 1996, p. 5). This research used implementation models (i.e. top-down and bottom-up models) as a background to understand the characteristics of

policy delivery systems. In addition, it more specifically used the typology of innovation support systems (i.e. grassroots, integrated and dirigiste systems) in order to understand different policy making and delivery systems in the context of innovation.

Secondly, since there might be diverse issues in agency interaction in regional innovation policies, such as interactions between central and local agencies, interaction of firm, universities and local government, and interaction between local implementers of different policies, this research used demand-side coherence as an operational framework. This focused not only on agency interaction but also on policy coordination. In particular, in order to investigate the actual gaps between policy expectations and actions which were perceived by target groups, this research used demand-side coherence to explore the perceptions of local agencies of policies.

Thirdly, agencies involved in policy can be viewed as operating not only within a policy structure, including a policy delivery system but also within their organisational structures. Thus, the actions of agencies in the implementation process might be affected by these structures in which they find themselves. In order to understand agency-structure relations in the policy process, this research adopted Giddens's view that structure could both constrain and enable agency action (Giddens, 1984). By using this view with implementation models and demand-side coherence, this research built a more insightful and conceptual understanding of the relationship between agency interaction and the policy delivery system, and the interaction between agencies who belonged to different organisations and had different interests and legitimate roles.

In order to achieve the aim of this research, two objectives were addressed. The first objective was to formulate an operational framework using demand-side coherence to understand interactions between local agencies in the delivery system of the Korean IAC policies. In order to understand local agency interaction in the Korean IAC policies, this research addressed diverse issues that surrounded local agency interaction, such as user-oriented policy, cooperative networks of agencies and regional co-ordination of policies. These were important issues in investigating the gaps between policy expectation and policy actions because the Korean government intended to achieve them in the policy process. These are connected with the notion of demand-side coherence which means that "the programmes are found by the target groups to be well

co-ordinated and tailored to current needs and context” (Christensen et al., 2003, p. 170). The second objective was to understand the barriers to demand-side coherence in the implementation process of the Korean IAC policies. An understanding of the barriers that hindered the achievement of demand-side coherence contributed to knowledge about actual gaps between policy expectations and policy actions.

Based on the objectives, three research questions were formulated:

- What did firms and universities perceive as the barriers to interactions and policy co-ordination in the implementation process?
- How did the perceived barriers occur in the delivery system of industry-academia collaboration policies within Daegu City?
- To what extent was demand-side coherence dependent on policy delivery systems?

Demand-side coherence can be seen as a matter of perception of target groups toward the solutions of policies on specific issues (Christensen et al., 2003). This research, therefore, basically dealt with the perceptions of the target groups about the barriers to interactions between agencies and policy co-ordination to determine demand-side coherence. Firstly, this research identified the barriers to interactions and policy co-ordination which were perceived by local agencies in practice. This was done in order to investigate the substantial problems of policy actions standing in the implementation process (The first question). Secondly, based on the identified barriers, this research investigated the factors and structures that shaped and influenced the barriers in order to gain in-depth knowledge about agency interaction in the context of Korean IAC policies (The second question). Finally, this research examined the relationship between demand-side coherence and policy delivery systems and considered to what extent the perceptions of local agencies of interaction and policy co-ordination were influenced by policy delivery systems (The third question).

1.2 Comparison to previous studies and justifications

This research was concerned with gaps between policy expectation and actual policy actions conducted by local agencies in regional innovation policies, focusing on the relationships between agencies and policy structures and between agency interaction

and the policy delivery system. Because innovation policies in regional economic development in most countries have increasingly become important in the knowledge-based economy, many studies on regional innovation policies, particularly for small and medium-sized enterprises (SMEs), have been conducted.

Among them, the SMEPOL (SME policy and the regional dimension of innovation) (1999) project carried out by several academics under the 'Targeted Socio-Economic Research' programme of the European Union was an outstanding work. This study provided significant knowledge about the characteristics of SMEs regarding innovation activities and the problems of innovation support policies for SMEs through case studies in several European regions. The main focus of the project was to evaluate the effectiveness of the policies and to propose potential improvements.

Some studies of Korean regional innovation policies have been carried out. Lee and Oh (1999) analysed the characteristics of cooperative research programmes in South Korea of firms, universities, and government-funded research institutes. This study made policy recommendations for a more efficient mechanism of technology transfer, dealing with problematic issues regarding support systems of policy instruments. Similarly, Kim (2002) studied the difficulties of SMEs' executing cooperative research programmes between industry, academia and research institutes in South Korea. This study mainly investigated the research environment of academics participating in cooperative research programmes.

A European researcher, also, investigated Korean regional innovation policies and their supporting system. Hassink (2001) studied the evolution process of the regional innovation support system, based on case studies of innovation support agencies in two regions in South Korea. This study concluded that the innovation support system led by strong national initiatives had its limits in the innovation-driven stage.

These previous studies have mainly dealt with policy instruments and their problems in the issue of regional innovation. Unlike them, this research approached interaction between local agencies in the policy context from a more micro-analytical perspective. It explored the behaviour of human agencies with different interests and operating within different organisational contexts, focusing on their individual actions based on

self-interest in interaction with others in the policy context. Many researchers have criticised a traditional top-down model in innovation policies (Kaufmann and Tödting, 2003; Bateira and Ferreir, 2002), but they have not provided enough knowledge about agency behaviours influenced by a top-down implementation system. By addressing the relationship between agency actions and policy delivery systems, this research contributed knowledge about how specific actions of individual agencies were shaped by policy delivery systems. In addition, although this research addressed the practical problems of policy implementation, it was also concerned with problems from the perspective of small firms and universities. By investigating the attitude and perception of small firms and universities who interacted at the local level, this research provided additional information and knowledge about diverse characteristics of agency interaction in regional innovation policies.

1.3 The structure of this thesis

Chapter 2 discusses the contextual background about policy making and implementation in order to understand the change in policy making in South Korea by exploring different approaches to policy implementation. It explores the relationship between agency actions and policy delivery systems through policy implementation models and agency-structure relations in order to build an important analytical framework needed to understand the actions of agencies in the policy delivery system. It also discusses the scope of local agencies in the policy process.

Chapter 3 considers the more specific issues of agency interaction and policy delivery systems. This explores the nature of SMEs and their networking activities. In regional innovation policies, these have generally been targeted at the relationship between SMEs and the urban economy. In addition to the discussion of the relationship between agency and policy delivery systems in chapter 2, this chapter deals more specifically with interaction patterns in different innovation support systems. Moreover, in order to approach the complex issues of agency interaction, this chapter discusses demand-side coherence as an operational framework.

Chapter 4 discusses the methodological issues. It contains the conceptualisation of demand-side coherence. It also sets out the research purposes, research approach and research strategy. Based on these discussions, it deals with individual research methods such as selection of national programmes, selection of study region, surveys, interviews and data analysis. It assesses validity and reliability in this research approach. Chapter 5 describes the properties of the national IAC programmes selected and the profile of the local economy of the selected region, Daegu City. It discusses important issues related to demand-side coherence for the empirical study.

Chapter 6 and 7 present the analyses, interpretations and discussions of the empirical findings. Chapter 6 identifies important factors and barriers to agency interaction and the policy delivery system by analysing the results of the firm and university surveys. Chapter 7 combines these findings from the surveys with analysis of interviews. It analyses the construction of the barriers and how they were shaped in the context of Korean regional innovation policies and in Daegu City's economic situation. It also provides answers to the research questions and relates key issues of the empirical findings to the analytical framework.

Finally, Chapter 8 draws out a summary of the most significant findings from the empirical study and discusses the meaning of these findings from a conceptual perspective and in the wider context of South Korean innovation policies. The limitations of this research and issues for further research are also presented.

Chapter 2 The actions of agency in the implementation process

As outlined in chapter 1, this research was concerned with regional innovation policies in South Korea in which the normative perspective on policy making and delivery process for local economic development considerably changed. In the late 1990s South Korea experienced rapid changes politically and economically. Local council members and governors or mayors were directly elected by local citizens in 1991 and 1995 respectively under the reform of the Local Autonomy Act. Local autonomy was virtually launched and in such process political devolution was gradually underway. The new government inaugurated in 2003, particularly, regarded decentralisation and regional innovation as one of the most important policy agendas in order to enhance national competitiveness in knowledge-based economy (Jones and Yokoyama, 2006). Also, the government attempted to shift national development paradigm from nationally-led to regionally-led growth (Kim, 2004). In particular, it pursued ‘independent regionalisation’ where independent decision-making of regions was harmonised with the support of the central government, emphasising the role and collaboration of local actors in economic development policies (PCBND, 2004a). These changes were seen as an attempt to move from top-down to bottom-up approaches in policy making and delivery process. This change in the policy delivery system was an important contextual background for this research, since it addressed the interaction between local agencies in a policy delivery system.

The notion of a policy delivery system has been closely related to policy implementation in the sense that a policy delivery system can be viewed as “being the total modality of implementing a given policy” (Sandiford and Rossmiller, 1996, p. 5). Therefore, policy implementation can be used as an important construct to understand a policy delivery system. Furthermore, the actions of policy agencies might involve compliance with policy rules, the utilization of policy opportunities and self-initiated actions that promote policy goals (Schneider and Ingram, 1990). Foxon et al. (2004) argued that as individual agents participated in the policy process, they did so within an established structure and any political action did not take place in conditions of

absolute autonomy. In this regard, the relationship between agencies and environments or the context in which agencies found themselves, namely the agency-structure relation, was an important analytical framework needed to understand the actions of agency in policy delivery systems. This chapter seeks to build a contextual background and analytical framework about policy making and implementation, and the relationship between the actions of agencies and policy delivery systems, by exploring policy implementation models and agency-structure relations. The chapter starts by exploring economic and political transition in South Korea before exploring policy implementation process by focusing on the characteristics, logic and values of the most dominant implementation models, namely 'top-down' and 'bottom-up'. It then explores the general relationship between agency and structure through Giddens's structuration theory, which can be regarded as one of the most comprehensive contributions to understanding the relation of structure with agency (Hay, 2002; Bogason, 2000; Sewell, 1992).

2.1 Economic and political transition in South Korea

In South Korea, the issue of regional economic development and innovation was not important to national economic policy before the 1980s. After Korean War, central government tried to maximise national development in pursuing efficiency (Hong, 2003). During this period Korea's economic development relied on the rapid growth of large firms and specific regions such as Seoul, the capital city. In fact, Korea's development model largely resulted from a government-led strategy focusing on the growth of large-scale industry such as heavy and chemical industries and a strong export drive and as a result, this caused an increasing concentration of economic activity in conglomerates, the so-called *chaebol* (World Bank, 2000). Central government policy focused on the capital city, Seoul, which had locational advantages such as concentration of the major decision making bodies, information infrastructure, and skilled labour. As a result, population and economic activities increasingly concentrated in the city (Hong, 1997). Such situation caused regional inequalities of economic development. Moreover, during this period innovation was relatively neglected in policy area. In the 1960s and mid 1970s, labour intensive industries such as textile and apparel, which did not need to develop new or advanced technology,

were dominant. Most industries drew upon simple technology transfer from other countries because there was not infrastructure for research and development (R&D) (Kim, 2002). In the late 1970s and 1980s the central government began to establish basic research institutes in the field of heavy and chemical industries, and large R&D projects such as Special Research and Development Project (1982) and Research and Development Project for Industrial Infrastructure (1987) were launched by the government (Park, 2001). Nevertheless, since such efforts were for promoting national R&D capacity, regional innovation policy was not taken into account in national policy area.

However, in the 1990s the political and economic environment encompassing local and regional economy development (L&RED) in the national context rapidly changed. Firstly, some political powers began to be devolved from the central government to local governments. South Korea was characterised as a highly centralised administrative system until the late 1980s, and in such an administrative system local governments was regarded as little more than branches of the central government (Jones and Yokoyama, 2005). However, after the reform of the Local Autonomy Act in 1988, local council members and governors or mayors were elected by local citizens in 1991 and 1995 respectively, and local autonomy was virtually launched. In such change of the administrative system it was increasingly required that regional policies of governments properly reflected local needs and demands because local agencies took a growing interest in L&RED. In addition, this political event seemed to serve as a momentum for rearranging the relationship between the central government and regional governments as the regional government had legitimate authority in some policy areas. Moreover, along with such concern for relationship between governments, the disparities between regions (particular between the capital regions and other regions) was more strongly criticised and voices articulating a need to tackle the problems became even louder. However, despite such political transition, the practical autonomy of local governments was still limited because local governments were largely dependent on the central government in terms of financial resources, due to the imbalances in the distribution of revenues between the central government and local governments (Kim, 2007).

Secondly, due to the Asian financial crisis in 1997 and the shift toward a knowledge-based economy, developing regional innovation strategies with focus on the role of local small and medium-sized enterprises (SMEs) became an important national economic policy issue in Korea (Park, 2001). It is generally acknowledged that the *chaebol*-oriented policy was regarded as one of significant factors to Korea's rapid economic growth. However it was strongly blamed after the foreign exchange crisis in November 1997 because many stressed that the *chaebols* strongly influenced the crisis through their overinvestment and collusion with the government (Lee, 2000). Moreover, the *chaebol*-oriented economy in South Korea caused the weakness of the foundation of SMEs which was one of reasons for the financial crisis (Gregory et al, 2002). Since 1998 the Korean government placed more emphasis upon the development of SMEs and particularly made efforts to promote the business start-up of knowledge and technology intensive companies by assisting SMEs locally and enhancing their international competitiveness (Gregory et al, 2002). In fact, in the 1980s the government tried to shift focus from industrial policy to technology policy (Hassink, 2001), and some SMEs began to establish R&D centres in the late 1980s and the number of knowledge and technology intensive SMEs began to increase. As a result, regional clusters of SMEs in technology intensive sectors were gradually developed. In addition, the government established science parks and high tech parks in non-Capital region areas in the 1990s and also the government launched diverse policies for promotion of regional R&D capacity in the mid 1990s such as Technology Innovation Centre and Regional Research Centre. They also facilitated the development of local clustering of innovation networks (Park, 2001). Thus, in such process, regional networks between agencies began to develop and the role of SMEs became important in regional innovative development in Korea (Park, 2001).

This tendency has emerged in developed countries since 1980s. Up to about 1980s regional development policies in European countries largely relied on exogenous strategies attracting branch plants of large national and foreign firms to locate regions and thus focusing on the acquisition of enterprises or investment from other areas (Isaksen 2003; Rothwell and Dodgson, 1992). However, these strategies caused some problems such as a lack of structural linkages between the new investment and the economic tradition of regions (Martinelli, 1998). After that, a solution for regional economic problems shifted focus from external factors to internal factors within the

region and thus SMEs, which had a strong regional orientation, became a new target in policy (Hassink, 1993; Rothwell and Dodgson, 1992). In addition, in the mid 1980s when concern for regional initiatives for economic development started to arise innovation concept has moved to the heart of regional development approach (Moulaert and Sekia, 2003). In this respect, most of regional development policies have focused more on the creation and enhancement of regional technology transfer infrastructures and the encouragement of collaboration between academic institutions and industry in order to assist existing SMEs (Rothwell and Dodgson, 1992). Similarly, in South Korea, since 1990s a variety of policy for regional innovation seeking to promote networking activities began to be implemented by the central government and this tendency was more enhanced after Asian financial crisis.

In particular, the issue of decentralisation, the disparities between regions, and regional innovation were emphasised by the new government inaugurated in 2003 compared to the previous governments. The government regarded decentralisation and balanced regional development as a major policy agenda and mean to enhance the competitiveness of the country (Jones and Yokoyama, 2006; Lee, 2004). To support these policy agendas the government enacted three special bills: 1) The Special Act on Balanced National Development; 2) The Special Act on Decentralisation; 3) The Special Act on Construction of the New Administrative Capital. Moreover, in terms of innovation policy, the government adopted regional innovation strategy as a part of the national economic development strategy (Kim, 2007). That is, the concept of regional innovation, which began to emerge in national context during the 1990s, became a key word in national policy in the 2000s. In particular, in the regional innovation strategy, the government emphasised 'independent regionalisation' where independent decision-making of regions based on their dynamics was harmonised with the support of the central government (PCBND, 2004a). The government strongly believed that it was necessary to establish regional innovation systems through networking activities of a variety of local agencies for regional innovation. That is, the government emphasised that the development of regional innovation systems (RISs) was a decisive factor to achieve 'independent regionalisation', defining RIS as a system in which local agencies such as local government, universities, firms, and research institutes created new innovation and contributed to regional development by collaboration and interactive learning in diverse areas such

as R&D, production of new goods, reform of administrative institution and cultural activities, and so on (PCBND, 2004a).

To achieve its regional innovation strategy, the government designed and performed a variety of policy instruments. Among them, essential instruments were the establishment of a Regional Innovation Council, the support of local universities and New Industry-Academia Collaboration Policy. Firstly, the Regional Innovation Council composed of a variety of local agencies such as local government's officers, firm owners, academics, and researchers, etc aimed to contribute to building and facilitating regional innovation systems by deliberating regional innovative development plans, establishing innovative network between local agencies, and serving as a channel for communication between the central government and regional government (Kim, 2007). In addition, the government emphasised the role of local universities in building regional innovation systems because it believed that universities provided knowledge-based workers and contributed to creation of knowledge-based firms with new and advanced technology (PCBND, 2004a). Thus, the government allocated remarkable amount of funds to support local universities, for example, New University for Regional Innovation (NURI) programme for strengthening competitiveness of local universities and therefore contributing to the formation of regional innovation (Kim, 2007). Moreover, previous industry-academia collaboration (IAC) programmes were criticised in the sense that they were implemented in a university-oriented way focusing basic research activities and they were not well co-ordinated (PCBND, 2004b). In order to tackle these problems the government launched New Industry-Academia Collaboration Policies including the Central University for IAC (CUIAC) collectively carried out by two ministries and the establishment of Industry-Academia Collaboration Foundation (IACF) in universities for general and synthetic management of IAC affairs. That is, according to Presidential Committee on Balanced National Development (PCBND) (2004b), the basic principle of the New Industry-Academia Collaboration Policies was a user (i.e. firm)-oriented mode pursuing collaborative networks of agencies, regional coordination of the programmes and constant innovation. Given these efforts of the central government for regional innovation strategy and decentralisation, national development paradigm shifted from nationally-led growth and input-driven strategy to regionally-led growth and innovation-driven strategy, as shown in figure 3.1.

Figure 3.1: Shift in national development paradigm

1960s-1990s		2000s
Centralisation and concentration		Decentralisation and dispersion
Nationally-led growth		Regionally-led growth
Input-driven strategy		Innovation-driven strategy
Standardisation by region		Specialisation by region

Source: adapted from Kim (2004)

In such political and economic changes, the Korean government seemed to attempt to change the policy making and delivery system for local economic development policies from top-down to bottom-up approaches, emphasising the role of local agencies in the implementation process of the policies. This change was observed not only in South Korean but also in other countries. Since the Second World War in most Western Europe L&RED policies had been carried out by central government, but in the 1970s and 1980s due to the influence of regional economic autonomy locally and regionally directed policy had emerged (Eisenchitz and Gough, 1993). Thus, the role of regional governments increasingly became important in L&RED policies in many developed countries. In many Asian countries, which had a long history of state-controlled development, national governments had played a central role in stimulating economic development at the local and regional level (Shah, 2000). However, such national-led strategy in Asian countries for L&RED incrementally changed toward regional-led one in the process of devolution like the case of Western Europe (Shah, 2000). This emergence of a series of bottom-up local economic polices in these countries since 1990s was mainly attributed to a result of the failure and criticism of traditional top-down policies in the challenges created by globalising economy. Basically in a top-down approach public actions were formulated and managed by the national central administration, and thus they tended to be supply-led policies (Pike, et al, 2006). In this approach, local economic development policies normally focused either on infrastructure strengthening or on attracting industries and foreign direct investment to areas with a weak industrial fabric on the basis of the idea that

“poor accessibility, or the absence of firms that could dynamize the local industrial tissue and generate technological transfers, was at the root of the problems of many lagging areas” (Rodríguez-Pose, 2002, p.6).

Although these policies, to some extent, encouraged new employment in local firms, they did not always deliver the expected results (Moulaert and Sekia, 2003). In particular, a serious problem of these policies was a lack of structural linkages between new investments including large firms' branches and the economic tradition of the areas (Martinelli, 1998). The failures of such policies were observed in many areas of the world by some scholars (Cuadrado Roura, 1994; Cano, 1993; Trigilia, 1992). Due to the problems of traditional top-down policies for local economy development, practitioners and academics tried to develop an alternative approach. This new approach was mainly based on bottom-up strategies. The emphasis of this approach was by and large associated with the emergence of a 'new regionalism' placing an emphasis upon "the roles of institutions in local and regional development" (Pike et al., 2006, p. 130) in the sense that behaviours of economic actors were locally shaped by institutional incentives, learned behaviours and routines and cultural values and norms (Keating et al., 2003). However, more fundamentally, this change was closely related to debate between different approaches to public policy implementation, namely top-down and bottom-up approaches.

2.2 Different approaches to policy implementation

2.2.1 Understanding policy implementation process

It can be argued that policy making does not end once a public policy is set out (Parsons, 1995), but rather public policy should also be implemented (Hill and Hupe, 2002). Thus public policy does not have meaning until implemented. Anderson (1975), focusing on the problem-solving aspect of intervention, argued public policy was "a purposive course of action followed by an actor or set of actors in dealing with a problem or matter of concern..." (p. 3). Similarly Jenkins (1978) defined a policy as

"a set of interrelated decisions taken by a political actor or group of actors concerning the selection of goals and the means of achieving them within a specified situation where those decisions should, in principle, be within the power of those actors to achieve" (p.15).

These definitions provide an understanding of public policy as government's or political actor's action to solve problems. As Hill and Hupe (2002) argued, this point was important to understand the nature of policy implementation in the sense that implementation was always associated with specific policies responses to specific problems in society. In particular, Jenkins (1978) also stressed that policy making was a process, and not simply a choice. In this respect, Dixit (1996) argued that every event or act of policy making was characterised by a continuum between constitution making or rule setting at one end and individual policy acts at the other. Many authors set out models of the policy process. For example, Jenkins (1978) pointed out the following stages in the policy process: initiation; information; consideration; decision; implementation; evaluation; and termination. Hogwood and Gunn (1984) identified: deciding to decide; deciding how to decide; issue definition; forecasting; setting objectives and priorities; options analysis; policy implementation, monitoring and control; evaluation and review; policy maintenance, succession and termination. The policy process was seen as being continuous, iterative and interactive due to feedback flows between all stages (GTZ, 2001). Thus, Hill (1997) pointed out that initiation of a new round in the continuous process could come from anywhere in the policy system. Given this aspect of policy process it might be difficult to separate a certain stage from a whole policy process. However, implementation might be seen as a very different process from policy formulation (Hill and Hupe, 2002). According to Mazmanian and Sabatier (1983),

“Implementation is the carrying out of a basic policy decision, usually incorporated in a statute but which can also take the form of important executive orders or court decisions. Ideally, that decision identifies the problem(s) to be addressed, stipulates the objective(s) to be pursued, and in a variety of ways, structures the implementation process” (p.20).

Given this point of view, policy implementation can be seen as the continuing process of post policy-making. Many scholars tended to understand implementation in terms of what Barrett and Fudge (1981) called the ‘policy-action continuum’ (cited in Hill and Hupe, 2002, p. 7). John (1998) argued that policy implementation referred to “the stage in the policy process concerned with turning policy intentions into action” (p.204). Also, O’Toole (2000) defined implementation as “what develops between the establishment of and apparent intention on the part of government to do something, or stop doing

something, and the ultimate impact in the world of action” (p. 266). For Ferman (1990) policy implementation was viewed as “what happens between policy expectation and policy results” (p. 39). Thus, an understanding of the implementation process might be mainly concerned with the problems of post-policy making and thus be concerned with how the expectation created by decision-making turned into results or achievements. In this respect, implementation was in most cases distinguishable from policy formulation which was somewhat connected to the decision-making stage. These definitions and characteristics of policy implementation were important to this research the sense that this research addressed the occurrence of gaps between policy expectations and actions through understanding local agency interaction in the policy implementation process.

A wave of studies examining the implementation of public policy only emerged in the United States in the early 1970s and in Europe in the late 1970s (Hill, 2005). Goggin et al. (1990) identified three generations of implementation studies. Until the end of the 1960s, it had been taken for granted that political mandates were clear and administrators were thought to implement policies according to the intentions of decision makers (Hill and Hupe 2002). However, there had been a ‘missing link’ (Hargrove, 1975) between concern with policy making and the evaluation of policy outcomes in the study of public policy. In the 1970s, the first generation of implementation studies tried to explain “how a single authoritative decision was carried out, either at a single location or at multiple sites” (Goggin et al., 1990, p. 13). Although theory building was not at the heart of the first generation of implementation studies, the first generation of implementation researchers contributed to raising awareness of the issue amongst academics and practitioners (Pülzl and Trieb, 2006). The second generation began to approach to implementation in terms of more theoretical frameworks (DeLeon, 1999). This period was characterised by debates between top-down and bottom-up approaches to implementation research. Top-down researchers saw policy designers as the central actors and concentrated their attention on factors that could be manipulated at the central level (Matland, 1995). The bottom-up researchers stressed the actions of local implementers, as opposed to those of central government, focusing on the nature of the problem which a policy was designed to address (Schofield, 2001). The third generation of implementation research tried to bridge the gap between top-down and bottom-up approaches by incorporating the insights of both models into their theoretical models (Pülzl and Trieb, 2006).

This evolution of implementation studies was related to understanding of the complexity of the implementation process. That is, in the past, the processes by which policies were translated into action were regarded as mundane and taken for granted (Hill, 2005). However, in many cases, policy implementation based on such thoughts failed to achieve the expected or intended goal of the policy in practice. In fact, in the real world it was not easy to predict how institutions and people involved would respond. In this respect, Kaufman (1991) argued that implementation took place in a situation in which there was necessarily conflict between numerous divergent interests, actors and organisations. Thus implementation was characterised by a complicated process (Hill and Hupe, 2002). In other words, it became generally acknowledged that implementation involved a large number of participants and the potential for a good deal of conflict which was not predicted in policy decision-making stage (Parsons, 1995). Such situations seemed to require wider and broader approach to the policy implementation. In this regard, O'Toole (2000), argued "implementation research concerns the development of systematic knowledge regarding what emerges, or is induced, as actors deal with a policy problem" (p. 266). Under these circumstances, Parsons (1995) suggested that "modes of delivery or 'systems' of policy delivery have become a central concern of analysis of and in the modern public sector" (p. 491). Policy delivery very often became synonymously used with policy implementation in the sense that policy delivery was also understood as the stage of post decision-making. However, they were slightly different in terms of their focus. When the former was referred to, participants or organisations involved in policy implementation process were more explicitly expressed, especially including target groups. For example, with regard to the delivery of welfare services, Self (1993) argued that "the provision of welfare can be regarded as a complex mixture of contributions from four sources: government, market, voluntary organizations and individual households" (p. 121). Similarly, the Cabinet Office in the UK (2004) defined the delivery mechanism as:

"the business of government is carried out by a network of different types of organisation, for example government departments, non-departmental public bodies, non-governmental partners or intermediaries. The organisation or hub that is constructed to deliver a service is a delivery mechanism for government" (p. 3).

Indeed, the concern about diverse inter-governmental and inter-organisational interactions in delivering public goods and services increased in implementation studies (Parsons, 1995). Thus, by using the term policy delivery, a focus could be placed on the complexity of the implementation process that mainly stemmed from diverse interactions between the policy actors or agencies that were the main focus in this research. According to Parsons (1995) “public goods and services are now provided through an ever more complex and diverse set of institutions and instruments” (p. 491). Such complexity and diversity of policy delivery led to a need to understand policy delivery in terms of systems. A policy delivery system was defined as: “the unique set of institutions, individuals, processes and rules that together deliver the benefits of the policy to a target group and enable control to be exercised to ensure adherence to the rules of access” (Sandiford and Rossmiller, 1996, p. 5); and as “the mix of instruments, institutions and values which are used in providing public policy” (Parsons, 1995, p. 461). However, policy delivery behaviours were basically understood in the context of policy implementation and they differed with approaches to policy implementation.

2.2.2 Debates between top-down and bottom-up approaches

In order to understand the contextual background of the Korean government’s attempt to move from a top-down to a bottom-up approach in the area of local economic development, an exploration of the different perspectives on the logics, methodological concerns and values of the two approaches is required.

Top-down models

Top-down approaches started from the assumption that policy implementation began with a decision made by central government (Pülzl and Trieb, 2006). Thus, top-down models were concerned with the degree to which the actions of implementing officials and target groups coincide with the goals embodied in an authoritative decision (Matland, 1995). This model was developed by Pressman and Wildavsky (1973), Van Meter and Van Horn (1975), as well as Sabatier and Mazmanian (1983). Pressman and Wildavsky’s original work was based on a rational model approach where implementation research sought to analyse the difficulties in achieving goals set by

policy (Pülzl and Trieb, 2006; Hill and Hupe, 2002). Policy was seen as “a hypothesis containing initial conditions and predicted consequences. If X is done at time t_1 , then Y will result at time t_2 ” (Pressman and Wildavsky, 1973, p. xiii). Hence, they saw implementation as an “interaction between the setting of goals and actions geared to achieve them” (Pressman and Wildavsky, 1973, p. xv). Such an approach viewed the relationship between policy goals and their implementation as linear (Pülzl and Trieb, 2006). Van Meter and Van Horn (1975) were concerned with whether implementation outcomes corresponded to the goals set out in initial policy decisions. Thus, they hypothesised that “implementation will be most successful where only marginal change is required and goal consensus is high” (ibid., p. 461). Although their starting point was very similar to that of Pressman and Wildavsky in terms of the linear relationship between policy goals and their implementation, they were less concerned with advising policy makers on successful implementation but more with providing a sound basis for scholarly analysis (Pülzl and Trieb, 2006).

Mazmanian and Sabatier were among the core authors who fully developed a top-down model (Matland, 1995). Their starting point was the expectation of analysing the implementation of a ‘top’-level policy decision that was made by governmental representatives. In their normative models they presented six criteria for effective implementation: (1) policy objectives were clear and consistent; (2) the program was based on a valid causal theory; (3) the implementation process was structured adequately; (4) implementing officials were committed to the program’s goals; (5) interest groups and (executive and legislative) sovereigns were supportive; and (6) there were no detrimental changes in the socioeconomic framework conditions. Given these frameworks, a top-down approach was essentially based on the assumption that implementation began with policies or legislative objectives, which were designed by central governments, and that the processes of implementation would follow on in a fairly linear fashion from this (Schofield, 2001). However, top-down researchers were criticised in several ways. Matland (1995) suggested three sets of criticisms. First, top-down models ignored the significance of actions taken earlier in policy-making process. Second, top-down researchers were accused of seeing implementation as a purely administrative process and either of ignoring the political aspects or of trying to eliminate them. Third, by emphasising the statute framers as key actors, these analysts ignored the role and expertise of local actors in implementation process. In addition,

Schofield (2001) argued that one of important criticisms of top-down models was their overriding belief in the rational approach. In the rational approach, it was assumed that the context of policy was given and a rational actor in the given context would always choose precisely the same course of action (Hay, 2002). In this respect, top-down models assumed that policy actors acted rationally and predictably in the policy structure made by central government. However, given the complexity of the real policy world this assumption might be seen as being too naive. Accordingly, the models might fail to deal with the complexity and diversity of the implementation process, particularly at the local level, and the incorporation of the role of local actors involved in policy process into their model was limited.

Bottom-up models

Bottom-up models responded to these problems of top-down models. Bottom-up researchers argued that a more realistic understanding of implementation could be obtained by looking at a policy from the perspective of the target population and the service delivery (Matland, 1995). They focused on the networks of actors involved in actual policy delivery and local bureaucrats, which were seen to be much nearer to the real problems than central policy makers (Pülzl and Trieb, 2006). Bottom-up models were led by the American researchers Lipsky (1971, 1980) and Berman (1978, 1980) as well as the Swedish scholar Hjern (1982) in collaboration with other authors such as Porter and Hull. According to Lipsky (1971), analysts of public policy should take account of the interaction of bureaucrats with their clients at a 'street-level'. He showed that street-level policy making, created by the use of scarce resources, developed methods that enabled public workers to cope with the problems they faced with their everyday work and uncertainties (Pülzl and Trieb, 2006). Berman (1978) stressed the influence of local contextual factors in implementation. According to him (ibid.), policy implementation occurred on two levels: at the macro-implementation level where central actors devised a policy; and at the micro-implementation level where local actors responded to the macro-level plans, developed their own programmes, and implemented them. Berman (ibid.) argued that most problems in implementation stemmed from the interaction of a policy with the micro-level institutional setting. However, central planners had little power to control micro-level

factors, such as contextual factors within the implementing environment, so that implementation patterns of the same national policy varied at the local level (ibid.).

Given these conditions, the bottom-up researchers believed that if local level implementers were not given the legitimate authority to adapt the policy to local conditions it was likely to fail (Palumbo et al., 1984). Elmore (1982) attempted to describe these contextual factors which were located away from the centre, by conducting a 'backward mapping' exercise. His concept of 'backward mapping' suggested that the analysis of implementation processes should start with a specific policy problem rather than its goal. Hjern and colleagues like Porter and Hull, developed an empirical network methodology to the study of the implementation process (Hjern 1982, Hjern and Porter 1981, Hjern and Hull 1982). The policies they studied depended on interactions between several different organisations (Hill and Hupe, 2002). They focused on how formal boundaries of organisations structured the way people actually constructed working relationships. Thus, they saw activities as within 'implementation structures', formed by organisations through processes of consensual self-selection (Hjern and Porter, 1981). In the empirical work, Hjern (1982) found that central initiatives were not adapted to local conditions very well. That is, policy success was to a large degree dependent on the skills of actors in the local implementation structure who could adapt policy to local conditions.

Given these arguments, the bottom-up researchers generally focused on the goals, strategies, activities, and contacts of the actors involved in the micro-implementation process as it was at the micro-level that policy directly affected people (Matland, 1995). Thus, they stressed the role of street-level bureaucrats, the multi-actor and inter-organisational character of policy delivery, and the skills of individuals in local conditions. Such characteristics of bottom-up models were more clearly marked when compared with top-down models. Pülzl and Trieb (2006) presented several differences between both models such as competing research strategies, contrasting goals of analysis, opposing models of the policy process, inconsistent understandings of the implementation process, and conflicting models of democracy. First, while top-down models started from a policy decision reached at the 'top' of the political system, bottom-up models started out with the identification of actors involved in policy delivery at the 'bottom' of an administrative system. Second, in terms of the goal of

analysis top-down scholars had a strong desire to present prescriptive advice, but the bottom-up scholars had put more emphasis on describing what factors had caused difficulty in reaching stated goals (Matland, 1995). Third, both models also had different views with regard to models of the policy process. Top-down researchers did not focus on the whole policy process, but merely on what happened after a bill became a law (Bardach, 1977). This was based on the assumption that the policy cycle might be divided into several clearly distinguishable phases. In contrast, bottom-up approaches argued that policy implementation could not be separated from policy formulation in the sense that policy making continued throughout the whole policy process. Fourth, for top-down scholars, implementation was an administrative, apolitical process and thus they emphasised power of central decision-makers, who were capable of hierarchically guiding policy process. In contrast, the bottom-up scholars focused on the decentralised problem-solving of local actors rather than on hierarchical guidance. They argued that policies were not so much determined by the statutes emanating from governments and parliaments but by the largely autonomous political decisions of the actors directly involved in policy delivery. Finally, while top-down approaches were rooted in traditional, elitist conceptions of representative democracy, bottom-up approaches stressed that local bureaucrats, affected target groups and private actors had legitimate concerns that ought to be taken into account as well.

In these comparisons, bottom-up models contributed to an understanding of the complexity of implementation process by moving away “from single-actor, single-case approaches, to one concerned with multiple actor analysis” (Schofield, 2001, p.251). Bottom-up approaches were, however, criticised in some aspects. The first criticism was that a bottom-up approach was based on a normative perspective. Thus, Matland (1995) argued that “in a democratic system, policy control should be exercised by actors whose power derives from their accountability to sovereign voters through their elected representatives” (p. 149). In this respect Schofield (2001) argued that much of critique of bottom-up models depended upon their view on the limits to discretion and political legitimacy. Second, more important criticism was that the bottom-up methodology overemphasised the level of local autonomy (Matland, 1995). The bottom-up scholars ignored the influence of central actors and central policy on the local situation (Schofield, 2001). According to Sabatier (1986) central policy

makers were often able to keep street level bureaucrats and target groups within acceptable bounds over time. Similarly, Matland (1995) argued that central policy actors could structure the goals and strategies of participants who were active and, furthermore the institutional structure, the available resources, and the access to an implementing arena might be determined centrally and they could affect policy outcomes substantially.

This review of implementation models has helped to understand the normative construct of top-down and bottom-up approaches and the contextual background to the Korean government's attempt to change policy making and delivery systems for local economic development. As noted, while the concern of top-down approach was the effectiveness of government policy and the ability of central government or actors to control the policy, bottom-up approaches were more concerned with understanding the role and interaction of actors (Sabatier, 1986). In this respect, the emergence of a bottom-up perspective which sought to describe networks of implementation made an important methodological contribution to understanding of policy implementation process (Schofield, 2001). The situation in Korea where the role of local actors in the policy process was normatively emphasised was likely to be associated with this view. In particular, this bottom-up approach developed from the discussion of policy implementation might also influence the emergence of bottom-up policies addressing local SMEs and their networking activities in South Korea. That is, in South Korea the chaebol-oriented policy might be based on a top-down perspective, whereas SME-oriented policy might be closely related to a bottom-up approach. Moreover, as mentioned in comparisons between both approaches while top-down approach separated policy implementation from policy formulation, the bottom-up scholars were concerned with the whole process of how policies were defined, shaped, implemented and redefined (Pülzl and Trieb, 2006). Although implementation was distinguishable from policy formulation, it was difficult to exclude policy formulation in the sense that the policy process was seen as being continuous and interactive. This was closely related to the fact that agency interaction in the implementation process tended to gain importance in the context of Korean local economic development policies. In particular, the debate between the two approaches has provided an important implication to construct understanding of policy delivery systems.

Even if a bottom-up approach in Korea emerged, the problems with bottom-up approaches could not be ignored in the policy implementation process. As explored above, bottom-up approaches were criticised in terms of its failure to recognise the role of central actors and central policy. That is, as a bottom-up approach overemphasised the level of local autonomy (Matland, 1995), the role of central actors and central policy were not dealt with adequately. However, many scholars argued that they affected politics, resources, institutional behaviour and individuals (Matland, 1995; Majone and Wildavsky 1978). In particular, the construct of policy delivery systems within which local actors behaved might be influenced by central actors and policy goals. Therefore, the central actors and policies to some extent needed to be taken into account to understand policy expectations. Even though the bottom-up scholars stressed the street-level bureaucrats in the implementation process, they argued that the success of implementation depended on the skills and activities of individuals in implementation structure or environment (Hjern, 1982; Berman, 1978). Thus, the way the implementation structure was influenced by them also was an implicit concern in a bottom-up approach. Pülzl and Trieb (2006) argued

After years of debate between top-down and bottom-up scholars, both sides seem to agree that implementation is a continuum located between central guidance and local autonomy. The preferences of street-level bureaucrats and the negotiations within implementation networks have to be taken into account to the same extent as centrally defined policy objectives and efforts at hierarchical control.

Also, Maynard-Moody et al. (1990) argued that since implementation took place within the interaction of policy and setting, it was unrealistic to expect the development of a simple or single model that was context free. Thus, to understand the implementation process in a more realistic way it was decided to take a more pluralist position, particularly in terms of methodology. This point has helped to construct methodological perspectives on agency interaction in policy delivery systems which was a key concern in this research. However, this review of different approaches to policy implementation has not provided sufficient insightful knowledge about understanding about how local agencies took actions in the implementation process.

2.3 Agency actions in policy delivery systems

2.3.1 The relationship between agency and policy delivery systems

According to Schneider and Ingram (1990), the actions, which a large number of people in different situations took in policy objectives, might involve compliance with policy rules, utilization of policy opportunities, and self-initiated actions that promoted policy goals. McDonnell (1988) and Elmore (1987) argued that mandates (e.g. providing rules), inducement (e.g. providing money), and system-changing tools (e.g. altering the arrangement of agencies) could influence the actions of agencies. Under these circumstances, environmental factors surrounding agencies such as policy frameworks, specific tools, rules, resources seemed to be important in understanding the actions or behaviours of agencies in the implementation process. That is, there seems to be a certain relationship between agencies and the environment in which they find themselves. Such relationship between agency and environment, namely agency-structure discussion, was thought to be the exclusive issue of sociologists and philosophers, but recently it was discussed within other disciplines, such as political science (Hay, 2002). Such attempts, however, basically relied on a prior strand of sociological and social theoretical works (Hay, 2000). Among the works, the most comprehensive discussion of structure and agency was probably Giddens's structuration theory (Hay, 2002; Bogason, 2000; Sewell, 1992). Giddens insisted that structures must be regarded as 'dual' because they were "both the medium and the outcome of the practices which constitute social systems" (Giddens, 1981, p. 27). Structures influenced peoples' practices, but it was also people's practices that constituted structures. Such contention was basically based on criticism against extreme approaches to structure and agency, namely structuralism and intentionalism.

Structuralism was the explanation of social and political effect, outcomes and events exclusively in terms of structural or contextual factors (Hay, 2002). In structuralism, the unit of analysis in either research or theory construction was not human behaviour or individual but social organisation (Mayhew, 1980). Thus, the behaviour that researchers did study was that of the variables which defined various aspects of social organisation, its population, environment, ideological and technological subsystems (Mayhew, 1980). In this respect, in structuralist theories, political actions and choices

were regarded as predetermined by demographic, social and economic factors outside human control (Hill, 2005). However, this perspective was criticised in the sense that structuralism ignored the influence of actors upon the course of political events, and regarded humans as mere automatons whose behaviour was entirely predictable in the context in which they found themselves (Hay, 2002). On the other hand, intentionalism completely ignored the structures in which the activities and behaviours of agency were located (Bieler and Morton, 2001). According to Hay (2002) 'intentionalism' implied that actors were able to realise their intentions, and thus, social and political outcomes could be explained by the intentions of the actors directly implicated. Thus, he argued that

“pure intentionalism tends to imply a condition of near anarchy in which all outcomes are entirely contingent upon the immediate conduct of the direct participants and in which, consequently, all outcomes are entirely indeterminant” (ibid., p. 111).

In this regard, structuralism saw political actions determined by powerful contextual forces, whereas in intentionalism the actions were seen as being flexible according to agency's role. Like structuralism, however, pure intentionalism was also criticised in the sense that it failed to consider both the structural constraints on actors' ability to recognise their intentions and the structural significances of their practices (Hay, 2002). Unlike these two extreme views on the agency-structure debate, Giddens' structuration theory attempted to reconcile these two perspectives. He focused on the idea of a duality, in which structure and agency were seen as two sides of the same coin rather than that of a dualism in which structure and agency were externally related (Hay, 1995). Thus, for Giddens structure and agency were internally related through social practice (Bieler and Morton, 2001). The key to Giddens' theory was characterised by the two concepts: duality of structure and structuration. First, in relation to duality of structure, he (1984) argued that

“structure as the medium and outcome of the conduct it recursively organises; the structural properties of social systems do not exist outside of action but are chronically implicated in its production and reproduction” (p. 374).

Also, structuration was conceived by Giddens (1984) as: “the structuring of social relations across time and space, in virtue of the duality of structure” (p. 376). By the notion of duality of structure, he (1976) implied that social structures were both

constructed by human agency, and yet at the same time were the very medium of its constitution. Structures shaped people's practices, but it was also people's practices that constituted (and reproduced) structures. In this respect, "structures must not be conceptualized as simply placing constraints on human agency, but as enabling" (Giddens, 1976, p. 161). In particular, for Giddens, dual structures were potentially mutable and thus structure must be regarded as a process, not as a steady state (Sewell, 1992). Giddens (1984) argued that structuration should be understood as a continuing process of constituting and reconstituting conditions for action. In this theory, structure, which was established by the way agents operated, was defined as "rules and resources recursively implicated in the reproduction of social systems" (Giddens, 1984, p. 377). Rules and resources were basically interrelated and rules might be conceptually distinguished into those concerned with the constitution of meaning and those concerned with the sanctioning of modes of social conduct. Moreover, in terms of the framework within which individuals made their choices, structure might be seen to inhere in the various resources that agents could access and the rules that they considered governed their behaviour (Healey and Barrett, 1990). Thus, individuals drew upon the rules and resources in the production and reproduction of social life and structures were reproduced through the rules and resources. In addition, Giddens (1984) defined system as "the patterning of social relations across time-space, understood as reproduced practices" (p. 377). Structure was closely related to social system. Social systems, according to Giddens, had no existence apart from the practices that constituted them, and these practices were produced by the 'recursive' (i.e. repeated) enactments of structures. That is, structures were the principles that patterned these practices. In this respect, Hay (2002) argued that Giddens' notion of system was understood as the context in which action occurred.

However, Giddens's theory was challenged in some respects, particularly the concept of structure. Sewell (1992) pointed out that the concept of structure in the theory did not seem to be sufficiently clear or robust in the sense that the terms of rules and resources were quite obscure. Giddens argued that the practice of human agencies constituted structure. However, Archer (1990) asserted that an elaborated structure had properties which could not be reduced to social practices composed of rules and resources practically revealed through human interaction in the present. In this respect, "at any given time some properties are more resilient or engender more resistance to

change than others” (Archer, 1990, p. 78). Similarly, Bieler and Mortan (2001) argued in Giddens’ definition of structure there was a lack of a differentiation between various types of structural properties and thus “this lack of differentiation makes Giddens exaggerate voluntarism and minimise constraint” (p. 8). Despite these critiques Giddens’s approach presented a rich insight into social interaction (Bieler and Mortan, 1990). In particular, Giddens’s conceptualisation suggested it would be fruitful to research the way in which individual agents drew upon rules and resources to determine what they did (Healey and Barrett, 1990). Giddens’s theory was adapted to the studies of policy process by some scholars (Boganson, 2000; Healey and Barrett, 1990). In the study of land and property development processes, Healey and Barrett (1990) argued

“This approach provides little more than a way of focusing our ideas and empirical research onto the way in which ‘structure’ both affects and is changed by the way individuals act within the development process.... Within the context of development processes and the ‘social systems’ of which such processes are a part, this leads to a research emphasis on: (a) the *resources* for development, as channeled via the financial system and the interrelation of supply and demand ; (b) the politico juridical *rules* which limit the construction of development opportunities...” (p. 93-4).

Also, Boganson (2000) in the institutional policy analysis, applied Giddens’s idea to an institutional setting in the policy process as follows:

“This general idea is easy to transfer to an institutional setting: individuals acting within an institutional arrangement, using rules as constraints as well as resources for action, and doing this in a dynamic way so that, over time, the arrangements themselves may be subject to change” (p. 100).

In these arguments, Giddens’s view has provided a basic idea in understanding the actions of local agencies in policy delivery systems which this research addressed. Firstly, this view might be useful in understanding relationship between human agencies and their organisational structures to which they belong in a policy delivery system. Although human agencies act within the policy structure, their actions might not be seen as being separated from their organisational structures if structures shape human agencies’ practice (as argued by Giddens). Accordingly, this view has helped to understand the actions of human agencies with different organisational structures in

policy delivery systems. Secondly, this view has also contributed to understanding the relationship between agency interaction and policy delivery systems. Given Giddens's theory, a policy delivery system might be understood as a 'structure' in the sense that a policy delivery system including diverse elements such as instruments, institutions, values and rules which are used in providing public policy, could constrain and enable local agencies' action. That is, local agencies act within the policy delivery system, using rules (e.g. policy guidance) as constraints as well as resources (e.g. individual policy instruments, financial support) for action. Thus, local agencies' actions can be shaped by a policy delivery system in which they act and exist and also, a policy delivery system could be affected by local agencies within the policy implementation process. Consequently, based on Giddens's idea it can be assumed that a policy delivery system can be an important contextual element to shape the actions of local agencies. However, as noted previously, since top-down and bottom-up delivery systems had different logics, norms and values which agencies could draw upon, the actions of local agencies could differ with delivery systems.

As discussed above, the top-down approach followed on in a fairly linear fashion from central government, ignoring the role and expertise of local agencies in the implementation process (Schofield, 2000; Matland, 1995). Thus, the actions of local agencies were not an important issue in successful implementation. In this regard, policy delivery systems based on a top-down approach might not have sufficient instruments to encourage the actions of local agencies in the implementation process. In addition, it can be assumed that since policies designed by central governments might be implemented at the local level as expected in this delivery system, the discretion of local agencies might not be very well taken into account. Thus, Bateira and Ferrier (2002) argued that a traditional top-down approach might hamper to shape the quality of transorganisational relations. Similarly, Nauwelaers and Morgan (1999) argued that an important ingredient to open and foster local dialogue was related to the presence of a well-endowed and legitimate 'animateur', stimulating and organising the multi-lateral dialogue. They (ibid.) stressed that in cases where regions lacked the institutional legitimacy to engage in the role of defining goals for the regions, constructing regional development strategies and actions, and making priorities or coherence between them clear, this was seen to be a danger because it might easily weaken the commitment of local agencies. From this point of view, it can be argued

that a top-down delivery system where local agencies do not have discretion to control policies initiated by central governments can constrain the actions of local agencies. According to the structuration theory, structure was both constraining and enabling. In this regard, what if a top-down delivery system is constructed to have instruments to encourage local agency to engage in the policy process and to interact with other agencies? Pressman and Wildavsky (1984), who were celebrated as the founding fathers of implementation studies (Hill and Hupe, 2002), argued that the degree of co-operation between agencies should be very close to a hundred per cent if a situation was not to occur in which a number of small deficits cumulatively created a large shortfall. However, Bowen (1982) pointed out this formulation neglected the extent to which the interactions between agencies occurred in contexts in which they rarely concerned simply one individual affair; rather these interactions were repeated and accompanied by others. In the real world the actions of agencies might be complicated and thus, such complexity might not be controlled by a certain policy formulation as expected, particularly in the top-down delivery system ignoring the role of local agencies in the implementation process.

On the contrary, as explored above, a bottom-up approach focused on the decentralised problem-solving of local agencies (Pülzl and Trieb, 2006) and thus for the bottom-up scholars, a policy success was to a large degree determined by the largely autonomous political decisions of local agencies involved in policy delivery. In this respect, in a delivery system based on a bottom-up model, it can be assumed that local agencies may be given the freedom to adapt policy to local conditions. What Nauwelaers and Morgan (1999) called the presence of a well-endowed and legitimate 'animateur' able to stimulate and organise the multi-lateral dialogue could be found in this delivery system. In addition, the bottom-up scholars stressed that the policies depend on networks or interactions between different agencies. Accordingly, the actions of local agencies might be more encouraged in this delivery system based on a bottom-up model because of more discretion of local agencies which they draw upon in the policy structure, compared with the one centring on a top-down model. However, it is questionable whether the presence of discretion of local agencies in the implementation process could always guarantee a high degree of local agencies' involvement in the implementation process. Nauwelaers and Morgan (1999), based on

the studies of regional technology plans in Europe, the US and Canada, suggested that other factors influenced local dialogue:

“the need to overcome rigidities of institutions and individuals which prevents them having new conversations”... “the need for an innovative and strategic capacity within the public sector itself” (p. 226).

They (ibid.) noted that weaknesses in the competence of institutions and individuals, which might be related to distrust in the regions or the absence of a spirit of collaboration, were at the centre of their development problems, and that could be a main barrier to innovation. Furthermore, even though the local ‘animateur’ was empowered and thus it was assumed that they could facilitate local dialogue, the intended effects might not be produced if there was a lack of an innovative spirit of the regional authorities and they did not perceive themselves as cooperative partners (ibid.). These arguments seem to attempt to supplement the critique of a bottom-up approach limiting their view to discretion and political legitimacy. The delivery system based on a bottom-up model could encourage the actions of local agencies in the implementation process. However, since the practices of local agencies could be influenced by their ability to organise and foster local policy actions, even the delivery system in which the greater discretion of local agencies could be found could not enable the actions of agencies as expected.

2.3.2 The meaning and scope of local agency in the policy process

The discussion of the relationship between agency actions and policy delivery systems provides that the implementation process might be complicated. This is probably because potentially many agencies or actors can be involved in the process. These include the state, local governments, interest groups, firms and citizens. Sometimes they are understood as human actors or agents (e.g. policy-makers) or non-human organisations (e.g. governments). Also in some ways they can be seen as public and private agencies. In this respect, it is important for this research to explore meanings of terms, actors and agencies.

For a long time, the focus in social relations was human actors. Giddens (1979) argued that a corporation could be an agent in law, but human agents interpreted and applied law and framed themselves in the first place. More recently social science ideas have extended the category of actors or agents to non-humans. Thus, it became acknowledged that they could be categorised into micro-actors (generally individuals) and macro-actors (institutions, corporations, governmental organisations, etc.). In this regard, actors might be understood to include non-human entities to which individual humans belonged. This tendency was influenced by the concept of 'actor-network' to a large degree, where actors were defined as "any entity able to associate texts, humans, non-humans and money" (Callon, 1991, p. 40). This placed a focus on associations of human agents but also the role of non-human intermediaries in the associations (Lagendijk and Cornford, 2001). According to Callon (1991),

"the network of intermediaries accepted by an actor after negotiation and transformation is in turn transformed by that actor – converted into a scenario, carrying the signature of its author, looking for actors ready to play its role" (p. 142).

Thus, it was difficult to understand people's social, economic and political behaviours without recognising distinctive properties that interwove actors, institutional cultures, knowledge environments, texts, and scripts (Latour, 1986). Actually, in society, human actors were not given free reign because they might be seen as behaving within a context of institutions, norms and rules which, to a large degree, determined their choices and relations (Boggs and Rantisi, 2003). Thus, if actors in policy are understood simply as humans, there might be some limitations in understanding actors' behaviour in the policy implementation process in which actors act.

In relation to policy actors another important issue is agency. The term of agency has been often used with many other terms, for example, human agency, public agency, administrative agency, private agency, social agency, international agency and implementing agency, etc. What is agency? Giddens (1984) argued that agency referred to people's capability of doing things. Similarly, Sewell (1992) defined agency as "entailing the capacity to transpose and extend schemas to new contexts" (p. 18). Other definitions included "the capacity of persons to transform existing states of affairs" (Harvey, 2002, p. 173) and "the capacity of the individual to plan and initiate

action” (Onyx and Bullen, 2000, p. 29). Agency had a series of important properties. First, from such definitions it was inferred that capability or capacity was a significant factor to compose agency. Giddens (1984) asserted that such capabilities were logically related to power, and thus “an agent ceases to be such if the or she loses the capability to ‘make a difference’, that is, to exercise some sort of power” (p. 14). In this respect, Dietz and Burns (1992) argued that there could be no agency without power. Second, to have agency actions must be intentional. According to Giddens (1984) human agency could be defined only in terms of intentions in the sense that for an item of behaviour to count as action, whoever did it must intend to do so. However, this was criticised in the sense that “to limit the discussion to intentions and actions is to foreclose on the ways in which the unconscious enters into human agency” (Gregory, 2000, p. 350). Third, to have agency, agents must be able to monitor the effects of their agency (Dietz and Burns, 1992). This feature was closely related to the second one. Giddens (ibid.) argued that all action was purposeful in the sense of being reflexively monitored by actors. Such reflexive monitoring of activity, he contended, was a continual feature of all action and involved the conduct not just of the individual and but also of others.

These properties might be seen as being important to understand the meaning of agency, but this research addressed how human agencies were influenced by policy structures and how they operated in policy delivery systems. It, therefore, did not aim to examine the properties of agency in detail. However, these features provided enough information to understand the concept and properties of agency. In the definitional perspective on agency which focused on the capability to determine action of human being, agency might be restricted to humans. However, agency in the policy process did not always mean human actors. In particular, in the actor-network theory emphasising on not only human actors but also the role of non-humans in social relations, a concept of agency was not restricted to human actors (Rose et al, 2005). Also, agency was not always limited to ‘capacity’ of ‘capability’. In some cases, it might be seen as an entity, particularly in public administration and political science studies. In policy areas, agency has been very often seen as ‘public or administrative’ agency. Pollitt et al. (2001) explained the characteristics of such agency as follows:

“they are at arm’s length from the main hierarchical spines of ministries...; they carry out public tasks... at a national level; their core staff are public servants...; they are financed, in principle at least, by the state budget...; they are subject to at least some administrative law procedures...” (p. 274-5).

However, if agency, in the policy area, was focused on public or administrative dimension, the private sector (market or civil society dimension) could be excluded. In fact, in many cases the private sector became the target group of policy and also it was sometimes given public tasks to carry out and public money to do it (Pollitt et al., 2001). Moreover, SMEs or universities have been regarded as a typical important agency in regional innovation policies. Thus, some scholars understood agency in a broad and extensive way. Greve et al. (1999) argued that agencies included a type of ‘quango’, defining it as covering virtually the whole of the state-market dimension except ministries at one end and profit-oriented commercial companies at the other.

These discussions illustrate that the scope and definitions of agency can be diverse and might differ according to academic disciplines. This could make it difficult to understand agency simply. In fact, many entities could be involved in the policy implementation process and also they might take actions individually and collectively on the basis of their ability to act. In particular administrative organisations such as central and local governments had a significant role to play in the design and implementation of policy (Newman and Dale, 2005). Also, it became acknowledged that with the new paradigms of decentralisation and partnership, the role of target groups to respond to policies was also important to successful implementation. More specifically, in the sense that SMEs and universities have been seen as important components of regional economic development policy due to their strong regional orientation (Keane and Allison, 1999; Hassink, 1993), their actions in the policy implementation process have gained importance. Such actions and roles, articulated in the policy process, might be understood as those of human actors or non-humans such as organisations themselves. That is, organisations could act alone or in cooperation and similarly individuals could act on the basis of organisational belonging (Bogason, 2000). In this respect, in order to approach people or organisations in the policy process in terms of agency it was necessary to understand agency in an extensive way. Marginson and Rhoades (2002) asserted that the term of agency meant an entity or

organisation that could exist at the global, national, or local level as well as the ability of people individually and collectively to take action (exercise agency). Given these circumstances, this research basically approached agency in terms of an entity. In addition, since this research focused on not simply the nature of the entities involved in policy implementation but their actions and interactions, the aspect of capability of the entities was also importantly taken into consideration. Accordingly this research approached the concept of agency in a broader way, taking two meanings of agency: 'entity' including not only human actors but also non humans and 'capability' in order to understand the actions of humans belonging to organisations within the context of the policy implementation process.

2.4 Issues

From the literature and Korean situations, it has been possible to draw out some issues for further discussion. The first issue is the normative construction of policy making and the delivery system. The Korean government attempted to shift policy making and delivery systems to a bottom-up approach, emphasising the role of local agencies in the implementation process. Given Giddens's idea that structure could both constrain and enable the practice of agencies, policy delivery systems could shape the role and actions of local agencies in the implementation process and in turn be shaped by agencies. The delivery system based on a top-down model might be limited in fostering agencies' actions since the rules and resources which local agencies drew upon in a top-down delivery system could not encourage local agencies to actively engage in the implementation process at the local level. In contrast, the delivery system relying on a bottom-up model might enhance the actions of local agencies in the implementation process more than a top-down delivery system. In this respect, in Korea, a bottom-up perspective emphasising the role and interaction of local agencies emerged in the context of the emergence of a bottom-up policy focusing on SMEs and their networks. However, due to the complexity of agencies' actions which could be influenced by diverse factors, the actions of local agencies might not seem to be solely constrained and encouraged by policy delivery systems. Thus, a bottom-up delivery system emphasising the role of local agencies might raise doubts about the active

engagement of local agencies in the implementation process. That is, in the policy delivery system based on a normative construct, it might be difficult to expect that local agencies behaved predictably in a certain policy delivery system as intended.

The second issue is that Korea was in a transitional situation between centralisation and decentralisation and between *chaebols* and SMEs. Despite economic and political transition in Korea, the central government still had strong power on local and regional economy and the practical autonomy of local governments was still limited. In this respect, although the central government set decentralisation and regional innovative development as a major policy agenda, it is questionable as to what extent the roles of local agencies were taken into account in local economic policies and if they could play a key role in the policies in practice. Also, there was a long time tradition of centralism and *chaebol*-oriented policy and local governments were still dependent on the central government in terms of financial resources. In this circumstance, the policy delivery system where the role of local agencies in the policy process was enhanced might be limited in encouraging local agencies to engage in the implementation process, although to some extent policy delivery systems could shape the actions of local agencies. In particular, even if the focus on national and regional development policy shifted to SMEs and their networking activities with universities, it was questionable whether local SMEs and universities could actively respond to the policies as expected. These two issues arising from Korean situations and literature review implies that there might be gaps between policy expectations and actions in Korean regional innovation policies.

Chapter 3 Interaction between agencies and innovation policy delivery systems

This research was concerned with agency interaction in innovation policies supporting SME (small and medium-sized enterprise) collaboration with universities in South Korea. The Korean government recently attempted to develop regional and national economies through facilitating SMEs' innovative activities and to change the national stage of economic development from an investment-driven one to an innovation-driven one (Kim, 2004; Hassink, 2001). In developed countries, this tendency has been observed since 1980. This resulted from the decline of large companies' branch plants in regions, the increasing autonomy of regions regarding economic and industrial development and the shift from old exogenous strategies centring on the acquisition of firms and investments and endogenous strategies focusing on stimulation of local start-ups and SME growth (Moulaert and Sekia, 2003; Rothwell and Dodgson, 1992). The role of SMEs was particularly stressed in urban regions which experienced industrial decline since it became acknowledged that SMEs networks contributed to economic development from some cases of 'industrial districts' such as the Third Italy and Silicon Valley. In addition, with the increasing importance of knowledge, theoretical discussions about modern approaches to explaining knowledge-based regional development stressed the importance of the network paradigm (Sternberg, 1999). Under these circumstances, policies focusing on enhancing the innovation activities of SMEs have tried to encourage collaboration between universities and SMEs (Rothwell and Dodgson, 1992).

In such innovation policies, the interaction between agencies in the policies became a significant issue. The Korean government also emphasised the importance of cooperative interaction between local agencies in the implementation process of the policies (PCBND, 2004b). Due to the emphasis of local agencies' role in the policies in the context of the emergence of a bottom-up policy approach, the agency interaction in the policies might include relations not only between SMEs and universities but also between them and other agencies (e.g. governments, deliverers). In particular, interaction between policy-makers and local agencies, which might be

more aware of regional problems, has been focused on in the implementation process (Kaufmann and Tödting, 2003). Moreover, given that synergies and complementarities among different agencies have been needed in order to build up a system of local interdependencies, the facilitation of co-ordination and coherence between different agencies and policies has been important (Oughton et al., 2002; Amin, 1999)

However, policy approaches in countries considerably differ according to their administrative set-ups, traditions and socio-cultural structures (Hertog et al., 1999) and the policy implementation process might be seen as being complicated due to diverse agencies and their divergent interests. Thus, interaction and co-ordinated activities between agencies in policy delivery systems might also be complex. In chapter 2, the actions of agency in policy delivery systems were explored in terms of the general implementation models of top-down and bottom-up approaches. However, this has not given enough insightful perspectives on the agency interaction in innovation policies, although the general relationship between agency interaction and policy delivery systems has been identified. In this respect, a more detailed discussion about agency interaction in innovation policy delivery systems is required. In addition, the Korean government attempted to carry out industry-academia collaboration policies in a user (i.e. firm)-oriented way, pursuing open and collaborative networks of agencies, and regional co-ordination of the programmes (PCBND, 2004b). In order to explore these diverse issues in the empirical study, there is a need to seek an empirical framework to analyse the complexities of agency interaction in the national policies for regional innovation. This chapter explores how interaction and co-ordinated actions between agencies occur in delivery systems of such innovation policies, constructing an analytical framework to understand diverse issues related to agency interaction. This chapter starts with the nature of SMEs and the meaning of their networking activities in regional innovation, before exploring how SMEs' collaboration with universities becomes an important issue in innovation policy in the context of the urban economy. It then discusses the relationship between agency interaction and innovation policy delivery systems and seeks to build an empirical framework to understand important issues related to agency interaction in the Korean IAC policy process.

3.1 SME, university and regional innovation

Since the 1980s, one aspect of the industrial structural changes that affected most developed countries was the growth in the number of small firms and the increase in their importance (Smallbone et al., 2003). In particular, such a trend appeared in the manufacturing sector in terms of employment because SME performance in terms of employment was shown to be relatively stable over the economic cycle in comparison with larger firms (Smallbone et al., 2003). In fact, the rapid economic growth of the 1960s relied mainly on the large company which was able to generate the drive effects on the rest of the regional production fabric (Maillat and Lecoq, 1992). However, in the 1980s the focus on regional economic development shifted toward the stimulation of innovation capacity in SMEs through technology transfer and networking programmes (Isaksen, 1999) because it became generally acknowledged that SMEs were more flexible and therefore capable of adapting quickly to fluctuations in demand and to the development of new technologies. However, SMEs sectors can be seen as being highly heterogeneous and there are different types of SMEs in terms of technology (e.g. technology-driven, technology-following and technology-indifferent SMEs). Thus, it might be difficult to say that all SMEs are flexible and capable of responding to economic and technological changes. In this respect, it is required to explore the characteristics of SMEs focusing on their strengths and weaknesses in more detail.

SMEs might have various characteristics compared to large firms. In particular, flexibility and innovative ability are frequently mentioned with respect to their strengths. At first, one of the most important advantages of SMEs is flexibility (Curran and Blackburn, 1994; Maillat and Lecoq, 1992). Flexibility could be understood as the “ability to do something other than that which was originally intended” (Evans, 1991, p.73). It became acknowledged that SMEs were capable of adapting quickly to fluctuations in demand and to the development of new technologies (Maillat and Lecoq, 1992) and able to respond readily to customers’ changing needs (Levy and Powell, 1998). Levy and Powell (1998) asserted that the following reasons were cited for SMEs flexibility: owners’ considerable knowledge about the firms’ capabilities; flat structures of management and an absence of bureaucracy due to small management teams; tight control over production processes

due to close management involvement; quick response to changes in demand due to small production runs. Secondly, SMEs might be highly innovative (Pavitt et al., 1987). Based on an analysis of the size distribution of innovating firms in the UK from 1945 to 1983, Pavitt et al. (1987) referred that small firms with fewer than 1000 employees were more likely to have innovative activities than large firms because they had less commitment to existing practices and products. Innovative SMEs could play an important role to develop new innovation radically through their contribution to maintaining technological diversity, while large firms have usually developed incrementally within existing technological paradigms (Smallbone et al., 2003). However, according to the second Community Innovation Survey conducted by the UK government (1998), large enterprises were more likely to innovate than SMEs in terms of an innovator which was defined as an enterprise that introduced any technologically new or improved products, processes or services. Also, it suggested that large firms were approximately three times more likely to be novel innovators than SMEs. From these points of debates, Smallbone et al. (2003) argued that there was no optimal firm size in terms of innovation because both large and small firms could play important roles in innovation. Thus, it may not be obvious that SMEs are more innovative than large firms. However, it might be clear that SMEs could play a strong role in the innovation process (Tödtling and Kaufmann, 2001), considering that they are able to react quickly to changing market demands, to do rapid decision-making and to learn fast, and to make more incremental innovations as a result of the niche role which they often perform (Storey, 1994).

Despite these strengths there might be some weaknesses of SMEs (compared to large firms): a limited resource; a distinctive organisational culture linked to the proximity between ownership and management; and a lower ability to shape their external environment (Smallbone et al., 2003; Nauwelaers and Wintjes, 2002, North et al., 2001). Firstly, SME owner-managers might experience a series of structural difficulties in obtaining knowledge in the market place, including the pressure on their own time, lack of staff resources, and restricted local networks (Bryson and Daniels, 1998). It therefore is not easy for traditional SMEs to gain the competence and resources needed to carry out their own R&D, introduce new technology and train employees (Isaksen, 1999). Secondly, a distinctive organisational culture linked to the proximity between ownership and management could affect management behaviour,

attitudes to risk, and the nature and extent of external financing (Smallbone et al., 2003). Thirdly, a lower ability to shape their external environment implies that “the smaller firm is typically faced with a more uncertain external environment than a large firm” (North et al., 2001, p. 304). These weaknesses have become serious problems within the context of the globalising economy because SMEs could not understand international technology and innovation trends well and often could not comprehensively participate in international regulation formation (Davenport and Bibby, 1999)

Such characteristics of SMEs can be seen as being important elements to understand the relationship between SMEs and regional innovation. According to most modern territorial innovation models such as Innovative Milieu (Camagni, 1991), Industrial District (Sengenberger and Pyke, 1992; Becattini, 1990), Regional Innovation system (Cooke et al., 1998) and Learning Region (Morgan 1997), regional innovation is generally shaped by interactions and networking activities between firms, and between firms and institutions through an institutional milieu characterised by embeddedness. In this respect, it became widely acknowledged that regional innovation might be understood as a socio-organisational learning process based on networks and interactions in the context of territorial dimensions (Moulaer and Sekia, 2003; Morgan, 1997). In particular, among these networks, much emphasis has been generally placed on networking activities related to SMEs. This might be due to their strong regional orientation and external resource-seeking characteristic.

Firstly, SMEs have been very often characterised by high adherence to regions. Crevoisier and Maillat (1991) argued that SMEs were one group of important protagonists in local milieu due to their generally more marked attachment to the region. In addition, Cooke et al. (1998) argued that SMEs were “capable of being defined in terms of high regional embeddedness” (p. 1569). In this respect, they might play a key role in enhancing regional interactive learning and stimulating tacit knowledge transfer in certain regions. That is, they tended to depend on tacit knowledge, benefit from complementarities in local networks, and local institutions and resources for growth (Malmberg and Maskell, 1999; Cooke and Morgan, 1998). Therefore, SMEs might be seen as an important actor to contribute to regional innovation process regarding incremental innovation (Tödtling and Kaufmann, 2001). Since SMEs were

more markedly attached to regions, the modern regional innovation models emphasising collective learning processes and inter-regional linkages seemed to be much more adapted to SMEs in territorially agglomerated networks (Asheim and Isaksen, 1997).

Secondly, SMEs have generally lacked the resource, the economies of scale and scope, and qualified technical specialists and thus they have needed to link up with resource pools of others to gain strategic options (Rothwell, 1991; Sengenberger and Pyke, 1991). That is, networks in SMEs might be important for material and information exchanges because a lack of business expertise, which SMEs frequently confront, might cause them to seek outside advice, and therefore joining an organisation might provide an avenue for garnering information (Curran and Blackburn, 1994). Moreover, companies have faced an increasing uncertainty and risk due to the rapid changing of new technologies (e.g. information and communication technology, new modes of production), the growing competition, and shortening of technology life cycle (Geenhuizen et al., 1997). They have tried to reduce the uncertainty and risk by sharing and collaborating (Keeble et al., 1999). That is, there has been a trend among companies to satisfy their knowledge needs by using external sources (Geenhuizen et al., 1997). Therefore, SMEs generally seemed to need other collaborators to help them, in particular, during different stages of the development of their innovations (Simmie, 2002). In this respect, it can be argued that networking might be an essential activity for SMEs to survive and innovate and thus such SMEs behaviours and activities might facilitate regional learning process and might lead to regional innovation. However, according to some empirical studies, there was a lack of inherent networking behaviours within some SMEs (Simmie and Hart, 1999). Also, as there might be some potential barriers to SMEs local networking activities, it can be argued that SMEs are not always willing to participate in networking activities or create them. This is discussed in more detail later.

In modern theoretical discussions about regional innovation, many researchers emphasised the role of institutions and dynamics in the process of innovation in the sense that institutional routines and social convention might shape innovation and institutions might provide the basis for localised social and economic network (Raco, 1999; Cooke, 1998; Morgan, 1997; Camagni, 1991). This perspective stressed not

only networks between SMEs but also networks between SMEs and regional institutions. Amin and Thrift (1995) argued that the presence of a variety of institutions and high levels of interaction amongst the network of institutions could influence 'local institutional thickness' that could have a decisive influence on economic development. That is, "the build-up of different local organisations to create 'institutional thickness' is emphasised as important in stimulating co-operation, interactive learning and innovative activity" (Asheim and Isaksen, 2003, p. 41). Tödting and Kaufmann (1999) suggested several factors that contributed to the regional dimension of firms' innovation processes: 1) industrial clusters were in many cases localised; 2) educational institutions and research organisations were tied to specific regions; 3) interaction between firms and knowledge providers, knowledge spillovers and spin-off were often localised; 4) a common technical and organisational culture might develop to support collective learning and innovation; and 5) regional public organisations were generally more active in supporting technology transfer and innovation activity in the past years. In this respect, external networking among a variety of SMEs network patterns can be seen as being important as much as networks between SMEs in the process of innovation in regions.

In particular, networking activities of SMEs with universities tended to gain importance in the knowledge-based economy era because it became generally acknowledged that universities played a central role in creating new knowledge. That is, many recognised that universities could provide technological advice and knowledge for SMEs, and thus innovation could be developed in the process of interaction between them (Hassink, 1996). Thus, universities might be seen as a key ingredient for regional innovation and economic development, and recently they became a component of regional development policy (Keane and Allison, 1999). This is closely related to their role in regional development. Universities have played an important role as large institutions that have generated significant support infrastructure (Garlick, 1998). Though their role in regional economy is slightly different according to scholars, it could be generally categorised as following: economic entities; commodified knowledge providers; shapers of human capital and institutional actors in networks (Boucher et al., 2003). Their role as economic actors has also been associated with regional employers and customers as well as suppliers of goods and services (Cooke, 2004). Among these roles, which Boucher et al. (ibid.)

suggested, the second role became increasingly important in regional innovation in the sense that it involved the commodification of knowledge produced in the university through intellectual property rights, technology transfer, science parks and spin-off firms (Charles et al., 1995; Oakey, 1995; Brett et al., 1991). In this respect, it became clear that university research activities and research spill-overs played a key role in regional innovation performance (Agrawal and Cockburn, 2003). Universities became significant contributors to the innovation and development of their regions (Keane and Allison, 1999), in the sense that such activities and spillovers could facilitate learning process which might be understood as a localised process in the context of current innovation concept. Due to these reasons, recently greater emphasis has been placed on the role of non-firm institutions or organisations, particularly universities, in shaping regional innovative capacity than on networking and the intensity of interaction between individual firms (Keeble et al., 1999). A number of SMEs policies have focused on enhancing collaboration and interaction between SMEs and universities in this respect.

However, despite the importance of network activities to SMEs and the emphasis of their role in regional innovation, there are some limitations in their local networking activities. According to Curran and Blackburn (1994), the assumption that owner-managers were eager for network participants required testing more rigorously because of two negative factors that mitigated networking activity in SMEs. One was that owner-managers might find difficult to find the time to be involved. The other was that since networks necessitated an open reliance on advice from others or other implicit admissions of dependence, the stress that owner-managers placed on autonomy and independence might impede network participation. This means that SMEs networks might not be natural activities in many cases. Also, even if it became normatively acknowledged that SMEs network contributed to local economic development through the creation and transfer of knowledge and the enhancement of innovation, it might not be clear that networking of SMEs were directly and strongly shown at the local level. Some researchers produced evidence that questioned this link between innovation and local networking (Smallbone, et al., 2003). Simmie and Hart (1999), arguing that “innovation among the cream of innovative firms in Hertfordshire was only enabled to a relatively minor extent by local production networks”, stressed that “local production networking is not a common practice among high-technology

innovative firms” (p. 460). Curran and Blackburn (1994), focusing on an increasing importance of interregional linkages in the globalisation of the economy, argued that it was increasingly difficult to achieve an integrated set of economic linkages and activities in local economy, defined in conventional arbitrary terms (travel-to-work areas, local labour markets, local authority areas etc). In particular, “the most successful small firms generally and those in the leading edge of sectors of the economy, knowledge-based and high-tech activities, were the least likely to contribute to local economic integration” because they would tend to trade over increasingly wider geographical areas (Curran and Blackburn, 1994, p. 165). Similarly, Dahlstrand (1999) indicated that while many technology-based SMEs were involved in national networks, direct local research collaboration was less frequent. Thus, firms in high technology sectors have been shown to rely on extensive linkages with a variety of external sources of knowledge and these have been shown to operate over a variety of spatial scales (Smallbone et al., 2003).

The networks between SMEs and other institutions in local areas seem to be more problematic. Curran and Blackburn (1994) suggested that such non-economic networks or extrafirm relations had limitations and were not frequent within local areas. They (ibid.) argued that local educational institutions might do less well than enterprise agencies as sources of advice, even if there was at least one and often several local institutions of further or higher education within each locality. SME owner-managers might require advisers who have sector-specific knowledge and could respond rapidly rather than who are geographically close to them or who did not have specific knowledge. Under these circumstances, although SMEs and universities concentrated in a specific area, the networking activities between SMEs and local educational institutions might be less frequent than between SMEs and business organisations (Tödting and Kaufmann, 2001). In particular, Geenhuizen et al. (1997) argued that there might be potential barriers to networking between universities and SMEs as follows: academics’ little interest in commercialization of knowledge; different aims and lead times of research activities between them; competition and missing links between knowledge sources and intermediaries; and lack of transparency and reliability of universities as a source of knowledge. In addition to these barriers, Tödting and Kaufmann (2001) indicated the lack of SMEs’ staff with

appropriate qualifications and inability of speaking the language of universities, and universities' lacking interest in the innovation problems of SMEs.

However, with respect to local networks of SMEs, there are different perspectives as opposed to these arguments. Many researchers argued that although the globalisation contributed to change firm's behaviour and thinking, local relations encompassing firms might still be important factors to firms' development and innovation. Dicken et al. (1994) argued that the assertion that as firms became increasingly transnational, they became placeless, was wrong because local socio-cultural milieu strongly influenced firms' evolution and behaviour. In addition, Keeble et al. (1998) stressed that even if high-tech SMEs achieved high levels of internationalisation, they showed above-average levels of local networking with respect to research collaboration and intra-industry links. The patterns of linkages between SMEs and universities seem to appear to be different according to the technological levels of SMEs. According to Keeble et al. (1998), the technological level of a firm was one of the most decisive factors that influenced linkage with science. In an empirical study about London, Tödting and Kaufmann (2001) also noted that "external assistance by higher education turns out to be much more often used by the higher-technology engineering firms than the lower-technology food processing SMEs" (p. 211). Furthermore, there were examples that active linkages between SMEs and universities occurred in some regions in which high technology SMEs aggregated, such as Silicon Valley and Route 128 in the USA (Saxenian, 1995), Cambridge region in the UK (Keeble et al., 1999), and the Helsinki region in Finland (Autio, 1997). Also, SMEs in the high tech sector could successfully grow within the local environment where they could be provided with very close market contact and technological expertise in a specific and important product niche (Aydalot and Keeble, 1988). In particular, in the sense that such firms tended to be established by spin-off of individuals, ideas or technologies from existing regional enterprises, universities or other institutions (Dahlstrand, 1999), linkages and informal and formal networking activities might be very important factors in stimulating their growth. Thus research-intensive or high-tech small firms tended to have dense interactions with neighbouring knowledge organisations (Asheim and Isaksen, 2003).

Basically, these arguments are based on the advantage of geographical proximity. Morgan (1997) argued that physical proximity facilitated the integration of multidisciplinary knowledge that was tacit. Similarly, Aydalot and Keeble (1988) noted that this made activities essential to competitive success in advanced-technology industry such as research and development activity that called for frequent research contacts and personal relationships. In this regard, Saxenian (1994), depicting the networks in Silicon Valley, argued that even if production became globally footloose in an era of market globalisation, geographic proximity enabled firms to extend their local production networks and to establish ties with universities in the region, so that regional networks created by firms could reinforce the technological dynamism of the regional economy.

Despite some evidence of high localised linkages of SMEs with other institutions, the assumption that SMEs might be willing to participate in local networking activities due to their strong regional orientation and external resource-seeking characteristics in a certain region seems to be problematic, given a variety of barriers that some researchers has pointed out above. Local networking activities do not seem to be inherent behaviours of SMEs and they could be limited to specific sectors, particularly high-tech or resourceful SMEs. This implies that SMEs with low-tech and limited resources might have difficulty in networking with other organisations, though SMEs networks with other organisations can be seen as being important to regional innovation. In this respect, Isaksen (1999) argued that an important target group for regional innovation policy was traditional SMEs.

3.2 Innovation policy for SMEs in urban economy

The increasing importance of SMEs in economic development has been closely related to a new urban economy which has emerged where SMEs have were networked by flows of goods and services on the basis of collaboration rather than competition (Lever, 2001). The most famous case of such new urban economies was the Third Italy and also, Silicon Valley and Route 128 in the United States were frequently regarded as similar cases (Curran and Blackburn, 1994; Lever, 2001). Curran and Blackburn (1994) argued that powerful economic networks between SMEs

spatially concentrated in such industrial districts were frequently emerging. Pyke (1992) described the industrial district as a industrial system which was composed of independent small firms organised on a local or regional basis. In industrial districts, each small firm had a tendency to specialise in one or two stages of the production process and firms often collaborate with each other sharing knowledge, instruments and even personnel (Curran and Blackburn, 1994). Furthermore, according to the industrial district approach, if SMEs could gain benefit from local and regional networks based on trust in local production system, they could be very innovative in an incremental mode through smaller changes of products and processes (Garofoli, 1991; Pyke and Sengenberger, 1992). These successful industrial districts seem to provide a basis for supporting the role of SMEs and their networking activities in urban economy. However, even though this new urban economy might be based on small units of production based on SMEs located in smaller urban centres (Lever, 2001), large firms also influenced local and regional economic development. In some regions, regional agglomerations were dominated by large firms (Cooke et al., 1998) and also, SMEs were directly and indirectly dependent on the activities of large firms (Curran and Blackburn, 1994).

Nevertheless, the relationship between large firms and localities became increasingly weakened. Curran and Blackburn (1994) suggested three reasons for this. First, global corporations which operated multinationally were growing. Lash and Urry (1987) argued that the attachment of such firms to the local economy became more tentative due to expansion of capital on the basis of a global basis. Second, the separation of ownership from locality was increasing in the sense that many large firms were foreign-owned. Third, the geographical mobility of local populations was increasing. In particular, as skilled workers were much more mobile than other workers, managers responsible for local large firms might come from outside the locality. However, despite globalisation and social and economic changes, the links between large firms and local economy might not necessarily be hampered. In many cases, large global firms tried to maintain the locational ties in regions for their R&D activities (Keeble and Wilkinson, 1999) such as SKF and Ericsson in Sweden (Dicken et al, 1994) and Siemens in Munich (Sternberg and Tamásy, 1999). In other words, technological activities of large global firms, in many cases, still remained concentrated in their home countries because of the advantages of physical and geographical proximity

(Morgan, 1997). Though, it is probably obvious that the role of large firms in the urban economy has been much weaker than in the past. According to Lever (2001)

“The location of large Fordist plants in large urban centres, or at their peripheries, was no longer the most profitable locus of production. The advantage of access to large workforces, large local markets and the range of positive externalities was being offset by the growth of diseconomies such as high wages, traffic congestion, negative externalities and high rents” (p. 276-77).

As a result, many cities, particularly in Western Europe, experienced industrial decline because large firms removed their excess capacity to rural areas or newly industrialising countries such as south-east Asia, India, China and Latin America (Lever, 2001, 2002). These phenomena have been identified not only in European countries but also in Asia, such as in Japan and South Korea. In Japan, even during a rapid growth period 1960-1990, some Japanese cities suffered from the effects of urban decline due to the transfer of large companies and main industries to lesser developed nations (Gilman, 2001). Also, large cities in South Korea such as Seoul, Busan, and Daegu were dominated by labour-intensive industries such as textiles and apparel and assembly of electrical and electronic goods. However, they became challenged by China and south-east Asian countries with their much lower wages and thus some firms relocated their production facilities to suburban areas or other countries with much cheaper production costs (Choe, 2005). Due to such large firms' moving and the emergence of the new urban economy, the role of SMEs in the urban economy became increasingly emphasised.

The link between SMEs and the urban economy also seems to be enhanced by the advantages provided by urban regions in the context of the knowledge-based economy. The growing importance of knowledge in the globalised economy has reinforced the role of cities as centres of knowledge (Knight, 1995). As it became acknowledged that knowledge contributed to creating new markets or cheapening the production of existing goods and services, thereby enhancing productivity (Lever, 2002), academics and policy-makers tried to seek the competitive advantage of the cities through the generation and application of knowledge-based activities. In fact, the growth of societies might differ with the degree of knowledge-intensity (Cooke and Leydesdorff, 2006) in the sense that the gap between rich and poor regions might be accelerating under 'knowledge

capitalism' where knowledge became the only economic resource that mattered (Burton-Jones, 1999). Thus, the core city might be different from the periphery in the intensity with which it accumulated knowledge-based activities (Cooke and Leydesdorff, 2006). Urban knowledge capacity could be understood in more depth by exploring the advantages that city regions have. In general, the economy of cities has been characterised by agglomeration economies and high knowledge intensity (Reichert, 2006). In urban areas agglomeration economies have been much higher than elsewhere (Capello and Veronelli, 2001) because they could provide the advantage of proximity, which has been a generic element of an urban environment, and the widespread density of networks (Lambooy, 2002) through the presence of advanced infrastructure (Capello, 2002). Agglomeration economies have been based on the fact that various economic and other activities have been located within the same region (Lambooy, 1997). Scott (1982) argued that agglomeration economies had two major effects:

“The first of these distinctive agglomeration effects comes about as a result of the simple reduction of transport and communications costs due to the clustering of firms and households within a small area. The second is the expression of external economies of scale in the strict sense, i.e. economies that accrue by reason of increases in the number of firms and the total quantity of output in any given area” (p.118).

Once these economies existed, the effects continued to attract new activities by 'path-dependency' (Krugman, 1995). In this respect, such an agglomeration economy has enabled an urban location to provide firms with particular advantages, namely accessibility to the following: infrastructure, and social capital in general; a vast input market; a vast output market; a vast supply of diversified business services; a vast and diversified labour market, highly skilled and qualified; and general information and know-how (Capello, 2001). The most important characteristic of the urban economy was high knowledge intensity derived from the location of many advanced service businesses, universities, and small firms with high technology and “the advantages of proximity and the prevailing density of networks” (Lambooy, 2002, p. 1029). Generally, there are many service businesses in urban areas and thus, the proportion of service sector was considerably high. For example, in typical metropolitan areas such as Paris and Milan, advanced services (e.g. monetary and financial services, computer

service, R&D activities) have specialised (Capello 2001) or there have been a concentration of tertiary activities in the realms of government and administration, finance (e.g. stock exchange, holdings, insurances, banks and their auxiliaries) (Cohen et al., 2001). Such advanced urban services could contribute to the creation of a convenient, environmental milieu and the increased prestige image of the region, compared to the areas on the outskirts of the metropolitan area (Frenkel, 2001). Simmie (2002) argued that as medium and large-sized urban regions could provide agglomeration economies in which innovative SMEs had chance to more easily collaborate with organisations having the different types of knowledge than rural or peripheral areas, they tended to be concentrated in these urban regions. In particular, there might be the spatial concentration of institutions of higher education such as university, technological research facilities in metropolitan area, and it could enable firms to access information (Frenkel, 2001). In this respect, Capello (2002) argued

“Dynamic urbanization economies, defined as knowledge production through traditional urban channels like universities and research centres, are very similar to scientific knowledge spillovers” (p. 183).

Under these circumstances, networking activities between SMEs and universities tended to be paid attention to in urban economic development. Urban agglomeration economies, in which universities, (public) R&D institutes, financial institutions, business service organisations and a variety of SMEs are concentrated, could provide external sources of technological, financial, managerial expertise and advice for SMEs. Networks between SMEs and such institutions could play a central role in the innovation in urban regions. In particular “universities were originally urban institutions with a vocational mission, though later some of them lost these categories” (Hall, 1997, p. 301). Thus, the importance of universities in the urban economy increased with the influence of the knowledge economy and policy makers and academics took a growing interest in collaboration between universities and local SMEs. In addition, the outstanding successful cases of university-industrial synergies in some urban regions in the USA such as Highway 128 around Boston, Silicon Valley in the San Francisco bay Area, and Los Angeles’ aerospace Alley (Hall, 1997), might have contributed to a justification for policy supporting the collaboration between universities and local SMEs. Accordingly, it can be assumed that the urban economy, which is characterised by the high level advantages of agglomeration

economies and advantages of geographical proximity, could provide more appropriate places and circumstances for local learning and knowledge transfer than larger regions. In the sense that industrial clusters tended to exist only in a limited geographical area where the human capital in each should be able to interact on a face-to-face basis more easily (Holbrook and Salazar, 2006), such characteristics could make urban regions hold more advantages to facilitate formation of cluster than larger regions. Thus, Holbrook (2004) argued “in Canada, given its geography, this means that any cluster, existing or putative, is almost always linked to a single city or metropolitan area” (p. 16). Moreover, as mentioned above, universities have mostly been urban (Hall, 1997). Due to these reasons, successful cases of SMEs networks with universities have been mainly found in urban regions as noted above. That is, due to the strong institutional presence, agglomeration economies and the relative easiness of networking activities in the urban areas, uncertainties encompassing SMEs such as financial and technological problems could be tackled by their networking activities with non-economic organisations.

Accordingly, among urban regeneration policies concentrating on attracting firms and private investment, enhancing local enterprise initiatives and creating new employment (Temple, 1994), one of the important characteristics has been the emphasis on knowledge-based activities. In particular, since innovation has been regarded as the single most important engine of long-term competitiveness, growth and employment (OECD, 2000), the focus of urban economic policies has shifted toward enhancing urban innovation. Innovation policies, which have ranked high on policy agendas (Nauwelaera and Wintjes, 2002), mainly have aimed at contributing knowledge activities including “the creation of new knowledge, the management of stocks of knowledge, the advancing of transfer of knowledge in view of technological innovations, education and training, and the commercial use of knowledge itself” (Geenhuizen et al., 1997, p. 370). In other words, they have been concerned with strengthening research and development, creating co-operation and technology transfer between research and industry, and also creating more technologically advanced- and competence-based industries. In particular these policies very often focused on local SMEs in the manufacturing sector. That is due to the pervasive importance of SMEs in economic development since 1980s and large firms’ moving from urban areas as mentioned above. These policy trends were also seen in the cities

of South Korea since the late 1990s, as mentioned in chapter 2. Given the higher share of SMEs in metropolitan regions of South Korea, these policies seemed to be important instruments for restructuring or regenerating the economy of the cities.

Urban economic regeneration policies, of course, are not always limited to enhancing knowledge creation and diffusion focusing on SMEs. The physical planning of improving the quality of living and business conditions for workers and firms, and the attraction of external investment and firms are also important elements of economic regeneration policies. Moreover, the policies for fostering knowledge activities have been stressed not only in city regions but also other regions. However, for city regions these policies have tended to become more important because of relatively high density of knowledge activities. In particular, given the characteristics of the urban economy, it has been important to derive competitive advantage from the presence of many institutions of governance in economic, political and cultural life for urban economic development (Amin and Thrift, 1995). In particular, in knowledge-based economies where knowledge generation and diffusion are perceived to be a major goal, urban development needs networked organisational structures, based on the presence of many institutions, such as interfirm co-operation, firm-government and firm-knowledge organisations (Lambooy, 2002). Accordingly, the policy related to knowledge activities focusing on SMEs has been regarded as a key instrument for urban economic regeneration in the era of the knowledge-based economies, and many policy-makers have tended to believe that this policy could contribute to tackling problems derived from industrial decline and improving urban competitiveness. However, it is still not clear why and how SMEs and their networking activities became important in urban or regional economic development policies.

It became widely acknowledged that the intervention of governments was mainly due to market failure. Market failure took place commonly because individual decisions by atomised agents might be collectively irrational and inefficient even though they were individually rational and efficient (Pike et al., 2006). Thus, in many cases, governments have tried to intervene in areas where market failures occur in order to correct the failures. Nauwelaer and Wintjes (2002) argued that with respect to knowledge and innovation, market mechanisms might not function very well because there were uncertainties attached to predicting the future, such as failures to predict

the economic value of new technologies, product, sources or firms. In addition to market failure, globalisation could be one of reasons for government intervention (Ahrens, 2005). Since globalisation did not automatically secure the economic growth of nations, nations tried to reap the benefits of globalisation as well as minimise its less desirable effects through strengthening their capacities to conduct innovation policies such as science, technology and innovation policies. In addition to these reasons, the rationale for SMEs innovation policy is based on regional context of innovation and SMEs characteristics.

As mentioned above, since the 1980s, SMEs became increasingly important to urban and regional economic development during industrial structural change. Also, the broad concept of innovation focusing on interactive learning processes extended players of innovation into SMEs (Asheim and Iasksen, 2003). Such changes influenced the shift of policy focus toward SMEs. Moreover, regional development policy shifted from exogenous strategy to endogenous strategy centring on the stimulation of local start-ups and SME growth. As a result, SMEs became a new target in regional policy (Hassink, 1993; Rothwell and Dodgson, 1992). SMEs networking activities were perceived as an important element to regional innovation based on some empirical cases such industrial districts, as noted above, and therefore SMEs and their networks became an important target in regional innovation policy. Furthermore, due to some theoretical contributions stressing the importance of institutions and non-economic organisations and their interactions with SMEs in regional innovation such as 'Regional innovation systems', 'Innovative milieu', and 'Learning regions', SMEs networks with such institutions have been strongly emphasised in the context of regional innovation policy. Such emphasis of SMEs and their networks on regional innovation policy might be based on two reasons: first, SMEs have weakness in their business operations; second, more importantly, networking activities in SMEs are not necessarily inherent to their behaviour.

The characteristics of SMEs (e.g. a limited resource, a distinctive organisational culture linked to the proximity between ownership and management, and a lower ability to shape their external environment) have affected enhancement of the importance of SMEs as policy target group (Nauwelaers and Wintjes, 2002). This is because "these characteristics have potential implications for the nature and extent of

the support needs, as well as effective delivery of external support to SMEs” (Smallbone et al., 2003, p.12). In other words, SMEs often needed help from intermediary organisations to acquire technological knowledge from research institutes, pointing to the need for local organisations and a regional innovation policy (Isaksen, 1999). This approach is to increase SMEs capacity and therefore many SMEs policies have focused on low-tech and resourceless SMEs. Furthermore, most territorial innovation models have sought a solution for regional economic problems in internal factors within the regions such as collective or interactive learning process between a variety of regional agents and socio-economic factors (e.g. cognitive, social, cultural and institutional factors) (Moulaert and Sekia, 2003).

From their perspectives, innovation was created and developed in the local networks and interactions process and this could be a driving force for urban and regional economic development. This implies that emphasis has been placed on networking activities between actors in urban and regional economic development. This perspective was strongly related to the endogenous economic model where focused on the stimulation of innovative activities and capabilities of local firms. In particular, since learning, into which knowledge was transformed, could be understood as a localised process and innovation was conceptualised as an interactive learning process (Asheim and Isaksen, 2003), networks between firms and between firms and other organisations and their capacity to organising knowledge by participating in such networks became increasingly important to urban and regional economic development. However, the formal and informal networks of individuals, research organisations and innovative firms might simply not exist in urban and regional context (Ahrens, 2005) due to the barriers and limitations (as explored above). For SMEs even though their networking activities were an important way to acquire knowledge and information, as explored above there might some barriers to hinder their networks and thus they might not participate in local networks in many cases (Cooke et al., 2000), especially to SMEs with low technology and insufficient resources (staff and finance). In particular, SMEs networks with universities at the local level seem to be more difficult than with business organisations including other firms, given their cultural gaps as mentioned earlier. Thus policy makers have attempted to facilitate these networks or collaborations with public instruments. In other words, there might be certain kinds of

market-failure or the existence of some problems in the context of regional innovation and thus public intervention occurs.

Such regional innovation policies have been still dependent on national initiatives in many cases. National level policy remained the most important factor to enhance regional innovation, even though this might vary according to national political systems and administrative set-ups. In particular, in many developing countries the central government also seemed to have strong power in policy process. Thus, national programmes were still dominant in these countries. Moreover, the national policy level might in many cases (e.g. traditional firms' R&D subsidies, co-operative schemes high educational institution-industry) be more relevant than the regional policy level, especially if the support were needed at firm level and the lack of (internal or external) resources for innovation is not region-specific (Nauwelaers and Wintjes, 2002). This phenomenon also resulted from substantial regional problems in terms of innovation potential. That is, some regions were lacking in systemic natures (Bateir and Ferreir, 2002). According to Asheim and Isaksen (2003), there might be deficits in a regional innovation system that might act as barriers in SMEs' innovation activity as followed:

“First, a regional innovation system may not exist due to a lack of relevant regional actors... Second, a regional innovation system may not exist due to a lack of innovation collaboration between players in the region... Third, a regional innovation system exists, but the system is too closed and the networks too rigid resulting in a ‘lock-in’ situation” (p. 42).

For these reasons, national initiatives were, to a large degree, justified in regional innovation policy and thus innovation policies were mainly operated at the national-level applying the same measures and criteria for all types of region in many countries (Fritsch and Stephan, 2005). In particular, in South Korea, national policies for promoting regional innovation were still important. Although the national development paradigm shifted from nationally-led growth to regionally-led growth under the political devolution process in South Korea, this did not mean that the initiatives for regional innovation shifted from the national to the regional. Of course, due to the influence of the devolution process, the regional initiatives tended to gain important and some local authorities, which had sufficient budgets, could finance

some local innovation policy measures (Hassink, 2001). Yet, a majority of local authorities were largely dependent on the central government in terms of financial resources, so that the national programmes were regarded as important opportunities for promoting regional innovation. Under these circumstances, many regions in South Korea tried to attract the policies of the central government to stimulate regional innovation activities.

3.3 Interaction in implementation of innovation policies

Local dimensions can be seen as decisive factors to regional innovation activities and thus, many argued that these factors needed to be taken into account in innovation policies from a normative perspective. However, as Howells (2005, p. 1231) argued, “there has been little or no discussion of trying to stimulate demand and consumption to foster innovative activity for urban growth and development”. This means that traditional public actions were mainly based on the interest or expertise of policy providers without considering the local dimensions. More specifically, since such public actions did not properly match the needs of local firms, low service take-up of firms was very often caused (Morgan and Nauwelaers, 1999). In this respect, the need for more strategically informed and tailored modes of support to SMEs emerged and therefore this could be seen in the light of the shift towards more demand-led innovation policies for SMEs (Lagendijk, 2000). Rosenfeld (1999) argued that “the best technology and innovation strategies are governed by industry, including SMEs and driven by the needs of business and workers” (p.198).

However, pure demand-led policies were impossible because regional innovation strategies were, in most cases, built on the basis of a path-dependent process (Nauwelaers and Morgan, 1999). Similarly Howells (2005) argued that it might not be easy to make policies seek to involve closer relationships with the target groups and the policy delivery process in the sense that a more ‘demand side’ perspective in relation to innovation policy would be an unfamiliar area for most policymakers. In addition, Rosenfeld (1999) argued SMEs’ behaviour may make customer-driven solutions difficult. SMEs tended to only marginally engage in strategic planning and governance because of little time and resources of SMEs owners and managers to

commit to public processes, their distrust toward public sectors, and few regional associations that could represent their technical needs and interests. Furthermore, since the heterogeneity that existed within the SMEs sector might be a barrier to achieve pure demand-led policies, it might not be easy for policies, particularly national innovation policies, to meet the diverse needs of local firms effectively.

From these reasons, Howells (2005) stressed that there was a need for effort to accommodate supply-led and demand-led considerations. This raises a significant question of how to accommodate them in practice. In relation to this issue, many suggested 'interactive support systems' which focused on interactions between agencies (Garofoli and Musyck, 2003; Kaufmann and Tödting, 2003; Morgan and Nauwelaers, 1999; Nauwelaers and Morgan, 1999). The basic assumption upon which this approach was premised was that regional agencies could play a role as the downstream delivery system because they were generally better able to reach target groups and find out specific innovation problems of the target groups (Christensen et al., 2003). In particular, given that modern innovation theorists saw innovation as an interactive learning and the approach to policy making and delivery systems for local economic development changed, interactions between agencies seemed to be important in implementation process of national policies. According to Morgan and Nauwelaers (1999), high-quality services of policy were achieved by constant interaction between supply and demand rather than a simply demand-led or supply-driven mode. In particular, this interactive support seemed to be more realistic than pure demand-led policies (Nauwelaers and Morgan, 1999). In fact, the traditional hierarchical model of politics, which intervened in the other social systems in order to obtain predictable outcomes, was no longer adequate because mutual interaction of social systems globally codetermined the evolution on each one, and of the social totality of which they were part (Bateira and Ferreir, 2002). A traditional non-interactive approach might cause communication failures between local actors, and hamper the quality of transorganisational relations and their ability to harmonise their vision of the community's future (Bateira and Ferreir, 2002). In such a non-interactive approach, policies might fail to respond to the needs of the firms and regions properly. As a result, an interactive approach in the policy process has become increasingly important.

In the context of regional innovation policy, the interactive support system focused on interaction between agencies involved in the process of designing and implementing innovation policy. Interaction has been usually used as social interaction. According to Hinde (1979) interactions mean as “individual A shows behaviour X to individual B, or A shows X to B and B responds with Y. In this view this interaction is understood in term of mutuality” (p. 15). Rummel (1976) explained such mutuality in more detail, defining social interactions as “the acts, actions, or practices of two or more people mutually oriented towards each other’s selves, that is, any behaviour that tries to affect or take account of each other’s subjective experiences or intentions”. He, further, argued that the parties in the interaction must know each other in the sense that interaction was a matter of a mutual subjective orientation toward each other. Thus, many argued that interaction created some mutual obligation and hence led to some degree of cohesion among the actors (Bogason, 2000). Such mutual subjective orientation involved not only cooperation but also competition. That is, in the sense that interaction can be generally regarded as the foundation for cooperative and competitive behaviour in agents (Rueda, et al., 2003), interaction can be in most cases understood in terms of power and/or exchange-of-goods relations (Bogason, 2000). Therefore, interaction can be carried out through dialogues among agents, and the set of dialogues generated inside the same negotiation process conform a conversation (Rueda, et al., 2003). From these views on interaction, even though agency interaction in the policy implementation process is seen as a sort of social interaction, the interaction is seen as cooperative and negotiative rather than competitive behaviour. If a policy implementation process is understood as what happens between policy expectation and policy results (Ferman, 1990) and agency involved in the implementation process might seek to put policy into effect (Barrett and Fudge, 1981), the competitive action of the agency might be rare, albeit there might be some competitive interactions in decision-making or in attracting government benefits from policies.

With respect to interaction between agencies involved in national policies for regional innovation, there might be two different types of interactions: vertical and horizontal. Vertical interactions depicted relationships between different layers of agencies for example, between ministries and regional agencies including local governments and target groups (OECD, 2005). In this respect, the interactive support system tended to

stress direct and frequent contact of suppliers with local bodies, particularly firms. Such an interactive approach could enable policies to respond to regional needs because the provider could be informed about the expressed needs of firms and regions (Garofoli and Musyck, 2003; Kaufmann and Tödting, 2003). In particular, Nauwelaers (1999) argued that the most important element of interactive support instruments was the personal communicative interactions with agencies involved, because the communicative interaction might help to find out the needs of firms. According to Nauwelaers and Morgan (1999), an interactive support instrument could be developed in a proactive approach where the policy actors developed policies on the basis of their needs and then submitted plans to the government. They argued that in this way, government funds might respond to an expressed demand and be reoriented according to strategic plans instead of following the interests of policymakers (*ibid.*). Since each region could implement the specific concept of policy mainly developed by regional agencies in such way, the policy could be regionalised and region-specific (Fritsch and Stephan, 2005). Thus, vertical interactions were typically very important for policy implementation (OECD, 2005). The concept of a horizontal interaction was essential as it accentuated the need to co-ordinate and govern many policy domains to achieve better innovation policy (OECD, 2005). If policy initiatives were fragmented and not co-ordinated very well, it could lead to inefficiency (waste of scarce resources) and loss of policy credibility (GDI, 2000). In this respect, the facilitation of co-operation between the different agencies and policies for building up an integrated innovation policy was an important issue (Oughton et al., 2002; Cooke et al., 2000). If policy initiatives and instruments deriving from various ministries were well co-ordinated and they strengthened each other, innovation policies could be ultimately horizontalised (Hertog and Groot, 2006). Thus, horizontal interaction in the innovation policies can be often understood as the co-ordination of departments or ministries at the central level. However, horizontal interaction does not mean just the co-ordination among the departments responsible for the policies. According to Lundvall (1997), horizontal forms of co-operation between firms and universities expanded in the last couple of decades in the policies for supporting technology transfer between them. Thus horizontal relations seem to include interactions between local agencies such as local government, firms and universities when the policies are implemented at the local level.

In this regard, the interactive support system, in which cooperative interactions between agencies could be fostered, might contribute to effective delivery of innovation policy to firms and regions as well as to inter-regional policy co-ordination. For example, this might make firms play an active role because they themselves realised that they were at the centre of the problem and the solution (Nauwelaers and Morgan, 1999). In addition, it could bring about an increase in 'social capital' such as trust (Putnam, 2000). Furthermore, according to Mayer et al. (2005), such an approach could give local agencies more direct influence on policy-making and lead to greater support and enrich policy. However, it was questionable whether local bodies were really very eager to interact with providers or suppliers, and the suppliers or policy-makers might not have the time to become involved in interaction with the demand-side (Mayer et al., 2005). In this respect, this was easier said than done (Mayer et al., 2005; Morgan and Nauwelaers, 1999). Nevertheless, this approach is quite meaningful in the sense that the interactive view of innovation support matches with a broad concept of innovation, that is, an interactive learning process. In particular, the South Korean government attempted to enhance cooperative networks of agencies and regional coordination of programmes in the context of the IAC policies through the CUIAC carried out by the cooperation of two ministries and the IACF establishment in universities for synthetic management of IAC affairs. In this respect, these vertical and horizontal interactions are also important issues in the current regional innovation policies in South Korea.

Even if interactions between agencies in the process of innovation policies were increasingly stressed and the role of the state shifted from government to governance, the degree of these interactions might vary from country to country due to differences in innovation policy strategies and approaches. Chapter 2 identified that the actions of agency in the policy process might be considerably influenced by policy delivery systems, comparing two different delivery systems based on top-down and bottom-up approaches. This section more specifically deals with agency interactions in innovation policy delivery systems focusing on the typology of regional innovation support systems and significant factors that influence agency interaction in innovation policy are drawn out.

The typology was developed from the perspective of 'regional innovation system' (Cooke, 1998). However, in the sense that the typology might help to illuminate the scale of policy involvement (namely, from mainly national to mainly local) and clarify the relationship between national and regional innovation support systems (Hassink, 2001), the typology might be widely used to understand differences of innovation policy strategies and support systems in different countries. Hassink argued there were three regional innovation support systems, adopting Cooke's regional innovation systems' governance structure: grassroots systems, integrated systems and dirigiste systems (ibid.). In grassroots systems, the body who played a key role in policy was local authorities. Thus the initiation process was locally organised. The need for technological transfer or innovation support was first expressed by individual organisations, such as a firm, and research and support were therefore applied and near-market (Hassink, 2001). The degree of co-ordination was relatively low due to the localised nature of initiation (Cooke, 1998). However, if regional authorities started to play a role in guiding the system, coordination could be increased (Hassink, 2001). The Italian industrial districts were one of examples of a grassroots system. According to Hassink (2001) integrated systems were a mixture type of nationally, regionally and locally funded and initiated initiatives and agencies. Since the integrated systems were characterised by more strategic guidance and direction from above, co-ordination in this system was better than in the grassroot systems (ibid.). Research and support were mixed with both basic and applied (Cooke, 1998). In particular, in integrated systems, there were extensive and well co-ordinated interactions between regionally embedded agencies. The German state of Baden-Württemberg was a typical example of an integrated system. In contrast, *dirigiste* systems were nationally initiated and funded and therefore local interaction and 'systemness' were not high (ibid.). Central government was a key player. Thus, although the agencies were decentralised in regions, funding was largely dependent on the central government (Cooke, 1998). Hassink (2001, p. 1378) argued that in such systems "there is little initiative from below or the initiative is considered inadequate by powerful national authorities". Also, due to strong initiatives of central government, intraregional co-operation among agencies and between agencies and local firms tended to be low. Basic or fundamental research, which might be related to the needs of larger firms (e.g. state-owned firms), was more dominant in *dirigiste* systems (Cooke, 1998). With respect to co-ordination, Hassink (ibid.) argued that it was

potentially high due to national authorities' guidance and planning, but in reality was often weak, because of a lack of coordination between national and local initiatives at the regional level and competition and conflict between different national ministries.

In the typology, grassroots systems are likely to be closed related to the extreme type of a 'bottom-up' approach, while *dirigiste* systems seem to be associated with the top-down approach. On the other hand, in integrated systems both top-down and bottom-up approaches seem to be mixed. In grassroots systems, the degree of interactions between local agencies might be high, but relationships between the national and local levels seem to be relatively weak. In *dirigiste* systems, both local interactions and vertical interactions might be weak due to strong central government's involvement (Hassink, 2001). In integrated systems, it can be possible to observe more extensive interactions between levels of government, and between local agencies.

From this typology, power or initiative to control innovation policies can be seen as one of the most important determinants to the degree of interaction between agencies. For example grassroots systems, in which the initiation process of innovation policies was locally organised, were characterised by strong interrelationships at the local level (Cokes, 1998). In contrast, in *dirigiste* systems, local interaction was not high due to strong national initiatives (Hassink, 2001). In particular, given that interactive relationship between policy actors was generally based on sharing power and control (Kettunen et al., 2002) and co-operation was not encouraged where one party dominated (Pressey and Mathews, 2000), the interaction between the national and the local level might not occur actively in *dirigiste* systems where the central government had strong power. As explored in chapter 2, according to the stucturation theory, structure can be conceptualised as not simply placing constraints on human agency, but as enabling (Giddens, 1979). From this point of view, grassroots systems or integrated systems might have structure to encourage interactions between agencies, while *dirigiste* systems might have structure to constrain the interactions. In this respect, if the delivery system of innovation policies is strongly based on the *dirigiste* systems, interactions between agencies might not occur effectively and frequently. Policy instruments in such systems might hardly be designed and implemented in a user-oriented mode and take both expressed and latent needs of users into account (Nauwelares and Wintjes, 2002) and thus this structure could hamper the interactions

of target groups with other agencies such as governments and policy deliverers. On the other hand, in the delivery system of innovation policies relying on grassroots systems or integrated systems, the agencies might interact with other agencies because their needs could be taken in to consideration in innovation policies and they could share power and control to design and implement the policies to a large degree.

From these points of views policy delivery systems seem to be significant factor to shape agency interaction even in the area of innovation policy. However, Nauwelaers and Morgan (1999) argued that even though the regional authorities were empowered and thus it was assumed that they could facilitate regional interactions, the intended effects might not be produced if there was a lack of an innovative spirit of the regional authorities and they did not perceive themselves as cooperative partners. They further argued that one of the reasons for a mismatch between the type of support offered and the real needs of companies was probably due to the problem of the absorptive capacity of firms. Similarly, Oyelaran-Oyeyinka (2006) argued that lack of institutional capacity prevented horizontal interactions among key stakeholders in the system. Cohen and Levinthal (1990) argued that a precondition for successful interactive learning was a developed and constantly developing 'absorptive capacity'. Since interaction could be a matter of a mutual subjective orientation toward each other, SMEs' capacity to respond to interactions might be important in order to foster interactions in policy process at the local level. Thus, if they do not have ability and willingness to participate in co-operative interaction, their interaction might not occur as intended even in the policy delivery system based on the grassroots systems or integrated systems.

Turok and Raco (2000) suggested several negative SME owner-managers' behaviours or attitudes toward policy instruments. Many SME owner-managers were either unaware that such policy instruments existed, critical of their value, or confused what was available from whom. In addition, many were unwilling or unable to afford the time required to participate, or to contribute towards the cost, partly because of the risk involved. Some also had questions about the basic quality of such instruments and their relevance to their specific needs. Others were basically reluctant to expose themselves and their business to outside scrutiny and risk possible loss of control. This might be because "government is seen as the tax collector, steeped in bureaucracy,

and the (over)regulator of business” (Curran and Blackburn, 1994, p. 101). Moreover, many found it difficult to set aside their day-to-day pressures and problems in order to think more strategically. In addition, Smallbone et al. (2003) asserted that they might perceive that a preference for autonomy was threatened by the use of external advice. These behavioural characteristics of small firms led to a greater use of informal rather than formal channels of support, in cases where the professional management resources were not sufficient (Smallbone et al., 2003). It had significant implications for the effective delivery of support by formal support agencies because of the importance of trust-based relationships in relation to advice and consultancy in particular (Smallbone et al., 2003). Such behaviours of SMEs could weaken their absorptive capacity to respond to local interactions in the policy process.

Recently, regional economists applied this concept of absorptive capacity into regional innovation systems, and many stressed the importance of ‘regional absorptive capacity’ in the context of regional innovation (Roper and Love, 2006; Vang and Asheim, 2006; Azagra Caro et al., 2005; Niosi and Bellon, 2002;). Regional absorptive capacity was simply defined as:

“the ability of a region to evaluate knowledge, to assimilate that knowledge through either rent or pure knowledge spillovers, and then apply that knowledge commercially” (Roper and Love, 2006, p. 438).

The concept of regional absorptive capacity focused not only on individual firms in a region but also on other knowledge creating or mediating organisations and the extent of association between organisations (Roper and Love, 2006). In this respect, Vang and Asheim (2006) noted that the regional absorptive capacity was not simply an aggregate of the individual firms’ absorptive capacity, stressing the importance of human capital (referring to the skills, education, health and training of individuals) and social capital (referring to the institutions, relationships, and norms that shape the quality and quantity of a society’s social interactions). In regions where regional absorptive capacity is weak, multi-lateral interactions might not occur frequently and effectively, even though policy delivery systems are structured to enable local agencies to interact with other agencies.

Through these discussions, it has been identified that innovation policy delivery systems are significant factors in determining agency interaction. There are some factors that need to be taken into account such as agency's innovative capacity and attitude toward policy instruments in order to understand agency interaction in the innovation policy delivery system. This implies that in the empirical study, it might be difficult to explore agency interaction simply with the relationship between agency and the systems. In particular, as mentioned above, there were the diverse issues related to agency interaction in the IAC programmes such as a user-oriented approach, cooperative networks of agencies and regional coordination of the programmes which the Korean government intended to achieve. Therefore, it is necessary to discuss an empirical framework suitable to analyse agency interaction including these issues, since this research addressed the gaps between policy expectations and policy actions in South Korean IAC programmes.

3.4 Policy coherence and agency interaction

Kaufmann and Tödting (2003) argued that the delivery mechanism of innovation policies were easier to organise in the interactive way at the local or regional than at the national level. This does not mean that national initiatives are not justified in regional innovation policy. Instead, if national policies seeking to promote regional innovation are designed and implemented at the local level, the policies should be integrated at a local level and be offered there in a coherent way in order to enhance their effectiveness and substantial innovation activities (Kaufmann and Tödting, 2003). From this point of view, the emphasis of interaction between agencies in the national policies might be related to coherent implementation of the policies.

Many researchers used coherence as a key concept to assess policy programmes, but coherence was not a well-defined in standard textbooks or reference documents (Christensen, et al. 2003, Picciotto, 2004). According to dictionaries, coherence was defined as "integration of diverse elements, relationships, or value" (Encyclopedia Britannica, 1999) or "the action of sticking together" (The New Shorter Oxford English Dictionary, 1993). In general, the concept of coherence was slightly

differently referred to in different disciplines and sectors. For example, in physics, the term meant the “constant phase relationship” of the viscosity of a substance. Also, in philosophy, coherence theory stressed that “the truth of a proposition consists in the coherence of that proposition with all other true propositions” (Picciotto, 2004, p.4). In a study on corporate coherence, Teece et al. (1994) noted that firms were coherent to the extent that their constituent businesses were linked to one another. Thus, “a firm exhibits coherence when its lines of business are related, in the sense that there are certain technological and market characteristics common to each” (Teece et al., 1994, p.4). In this respect, they argued that if common characteristics were assigned randomly across a firm’s lines of business, it might be difficult to find coherence in the firm (ibid.). From these definitions of coherence across different disciplines, coherence could be briefly depicted as links between different elements, working together properly and constituting a holistic unit (Christensen, et al. 2003).

However, unlike business studies, it was hard to trace the presence of this concept in reviews and directories of public planning (Christensen et al., 2003) and to find out the concept of coherence because there were diverse interests and multiple goals surrounding public affairs (Picciotto, 2004). Recently, several researchers have tried to define coherence in policy areas. Rhodes (1997) defined coherence in terms of “logically and consistently related policies and capacity as ‘the ability to produce that coherence’” (p.222). Picciotto (2004) argued that “absolute policy coherence implies that the preference functions of diverse groups can be aggregated without ambiguity” (p.5). Winters (2001) asserted that “coherence is loosely a situation in which different policies are all pulling in the same direction, or at least, not pulling in different directions” (p.2). Also according to OECD (1996), it broadly meant “overall state of mutual consistency among different policies” (p. 6). From these definitions, it can be inferred that policy coherence is likely to focus on relationships among different or related policies and stress mutually complementary and cooperative state of these policies. Like the general meaning of coherence, policy coherence means logical and consistent links between different individual policies, pulling the same policy objective. In other words, this concept has focused on the systematic promotion of mutual cooperation and complement in policy actions across government departments and agencies towards common policy objectives (OECD, 2003).

Coherence has several important meanings in the policy areas. Mazmanian and Sabatier (1983) suggested that coherence was an important condition for successful policy implementation because clear signals from policy principals could make implementers know what was desired. Very often, the importance of policy coherence has been approached by exploring the problems caused by the lack of coherence or incoherence. Picciotto (2004, p.6) asserted that incoherence in government decision-making undermined public trust, created uncertainty and contributed to social tensions. Also, according to GDI (2002), incoherence might result in ineffectiveness (failure to achieve objectives), inefficiency (waste of scarce resources) and loss of policy credibility. In fact, if diverse policies were implemented without being linked, in many cases, it might not be easy to achieve policy objectives successfully and effectively. Moreover, in the case that policies were lacking in coherence, some policy instruments could be duplicated. This might cause insufficient resources to be wasted, and thus taxpayers and consumers bore the costs of policy incoherence (OECD, 2003). However, to achieve policy coherence completely was not feasible because there were always different actors who had different objectives and different views in policy areas (Picciotto, 2004; Winters, 2001). Accordingly, policy incoherence might occur frequently despite governments' big efforts for coherence. However, since policy incoherence caused various problems as noted above, governments tried to enhance policy coherence.

In general, policy coherence can be seen as the matter of co-ordination between government departments. Of course, in terms of basic meaning, policy coherence in regional innovation policy is not different from general policy coherence. In other words, coherence of regional innovation policies have also stressed co-ordination between existing departments or ministries to avoid the conflicting demands of other department' activities. Thus, governments paid greater attention to the need for coordinating structures and systematic implementation, with responsibility for innovation policy often shared or disputed between diverse departments (CORDIS, 2003). However, Christensen et al. (2003) approached coherence more broadly and tried to include the demand-side perspective and the regional dimension. They argued

“the essence of the concept is that a coherent innovation policy provides solutions on specific issues in an integrated way (supply-side coherence) and that customers or the target groups perceive them as coherent (demand-side coherence)” (p. 170).

While general policy coherence, focusing on mutual cooperation and complement in policy actions across government departments and agencies, was mainly understood in supply-side perspective, this concept extended the conceptual range of coherence into the demand-side. That is, besides the integration between programmes, this concept stressed that a programme should match the needs perceived by the targeted client group (ibid.). Coherence might be conceptualised in two other dimensions of internal coherence and external coherence. The former was related to the integration and scope of individual programmes in isolation, while the latter was related to the cross-sectional integration of different programmes aiming at the same target group (see Table 3.1).

Table 3.1 The intersection of two dimensions of coherence

	Internal coherence	External coherence
Supply-side coherence	Coherence inside individual programmes (or support schemes)	Coherence across programmes of ministries and relevant planning bodies
Demand-side coherence	Scope and integration of individual programmes is appreciated by targeted actors	Programmes are found by the target groups to be well co-ordinated and tailored to current needs and context

Source: Christensen et al., 2003, p. 170

The reason for such widened conceptualisation of coherence might be closely related to dynamic characteristics of modern innovation theory stressing interactive learning process and the changing role of governments in governing local economic development in which a bottom-up policy and governance structure were increasingly emphasised. Due to these factors, the role and interaction of local agencies and the needs of regions and firms became increasingly more important in innovation policy than linear instruments focusing on direct R&D support and transfer of research-based knowledge to firms. Under these circumstances, the needs and context of target groups might increasingly become important elements to policy coherence. This tendency was also identified in the implementation models which were explored in chapter 2. As Pülzl and Trieb (2006) argued, recently in implementation studies, the preferences of local agencies and the negotiations within implementation networks tended to be taken into account to the same extent as centrally defined policy goals and efforts at hierarchical control. In this respect, Christensen et al. (2003) argued that if policy was designed and

implemented with a lack of awareness of clients needs, their contextual constraints or simply by a sole supply-side perspective, policy implementation would fail.

However, Christensen et al. (ibid.) stressed supply-side coherence in the sense that weak supply-side coherence could cause organisational slack and misuse of resources due to a lack of programme coordination and competing programmes in the business development system. Thus the notion of coherence needs to be understood from the demand-side as well as the supply-side perspective. Christensen et al. (ibid.) argued that for a high level coherence in regional innovation policy of national government, the national supporting programmes were highly coordinated and they created spatial diversification and responsiveness to local needs through interaction and dialogue with regional agencies in the implementation process. Yet, supply-side coherence might have limitations to approaching the diversity and complexity of the implementation process derived from diverse participants because it was mainly about a matter of programmes' coherence. Of course, coherence across programmes of ministries might lead to regionally integrated actions of local agencies responsible for performing the programmes, but although coherence of policies has been secured ex-ante, this could not be guaranteed ex-post due to a variety of barriers at the local level (Picciotto, 2004). In addition, the approach to coherence by solely supply-side perspective might make it difficult to capture the practical aspects of agency interactions which occur at the local level.

In contrast, demand-side coherence focused on the perceptions of customers or target groups toward the integration of individual programmes and the fulfilment of their needs in the implementation process of policies (see Table 3.1). Demand-side coherence meant that customers or the target groups perceived policy instruments as coherent. Thus it implied that the demand-side recognised them to be integrated, coordinated and tailored to needs and context (Christensen et al., ibid.). Although central government believes that it secure policy co-ordination and considers local needs sufficiently, it might be difficult to achieve demand side coherence if the target groups do not perceive policies to be well co-ordinated and tailored to their needs in the implementation process. Supply-side coherence might be associated with the stage of policy design while demand-side coherence might be, by and large, related to the policy implementation process. In this respect, interactions between agencies might be

much more emphasised in the context of demand-side coherence than supply-side coherence. In other words, the construct of demand-side coherence could contribute to the approach to the practical aspects of local agency interaction which occurs when the policy instruments are implemented at the local level. In particular, demand-side coherence is a more adequate framework to investigate the gaps between policy expectation and policy actions because the Korean government intended to achieve factors which were emphasised in the context of demand-side coherence in the implementation of the IAC policies. The Korean government tried to implement the IAC programmes in a user-oriented approach by pursuing collaborative networks of agencies and local coordination of the programme. These might be connected with the same ingredients as for achieving demand-side coherence.

3.5 Issues for empirical study

The literature review on networking activities between SMEs and universities in regional innovation and agency interaction in innovation policy delivery systems have raised some issues and questions for the empirical study. The first issue is whether collaborative interaction between SMEs and universities can be fostered by policy instruments. As discussed above, networking activities between them in local areas had a variety of problems such as the absence of universities which did not have specific knowledge which SMEs wanted, the cultural gaps between them and the universities' lacking interest in the innovation problems of SMEs. Moreover, networking activities in SMEs were not necessarily inherent to their behaviour. In this respect, even though government tried to support their interactions by policy instruments and funding, there might some limitations in enhancing the interactions because above barriers might still exist in the implementation process. Thus, there is a need to address barriers to their interactions in the implementation process in order to understand agency interaction in a policy delivery system.

The second issue is about the problems of *dirigiste* systems which were nationally initiated and funded in regional innovation policy. As noted above, in the *dirigiste* systems, the cooperative interactions between local agencies and the policy

coordination at the local level basically tended to be low and weak. Even though political devolution was under way in South Korea, the central government's power was strong and most regions were still dependent on national initiatives in terms of regional innovation policies. Thus, it can be assumed that there might be many problems to interaction between agencies and policy coordination in national policies for promoting regional innovation in South Korea. However, it is still unclear what barriers existed and how the barriers occurred in a policy delivery system.

The third issue is about the problem of agency capacity in interactions. As mentioned previously, the lack of capacity or an innovative spirit of agency could prevent interactions between agencies in policy delivery systems even though they were empowered by the central government. In particular, as there might be negative SME owner-managers' behaviours or attitudes toward policy instruments, interaction between agencies might not occur as expected although a policy delivery system had instruments or tools that could foster their interactions. In this respect, it is necessary to explore to what extent agency capacity was a significant factor to interaction in policy delivery systems.

The fourth issue is the relationship between demand-side coherence and policy delivery systems. This chapter drew out demand-side coherence for an empirical framework to understand interaction between local agencies in policy delivery systems, particularly to explore some important issues related to national policies for regional innovation in South Korea. The literature review on the agency-structure relations and the typology of innovation support systems identified that a policy delivery system was one of the most important factors that influenced agency interaction. If so, it can be assumed that demand-side coherence could be affected by policy delivery systems. In this respect, there is a need to identify to what extent demand-side coherence was dependent on policy delivery systems through the empirical study.

Chapter 4 Research Methodology

Marshall and Rossman (1999) argued that research was a process of trying to gain a better understanding of the complexities of human experiences. In this regard, there was a need to design empirical procedures appropriately and to select proper methods in order to collect detailed empirical data which were used for analysing research problems. Research methodology referred to the procedural framework within which research was conducted (Remenyi et al., 1998). The primary concern in this research was agency interaction in the policy delivery system. However, as discussed in previous chapters, there were the complexities of agency interaction, particularly in the context of South Korean national programmes for seeking to promote regional innovation. Thus, in order to analyse such complexities of agency interaction in a more operational framework, the concept of demand-side coherence was drawn out. In order to proceed with research design and method, devising measures of the concept of demand-side coherence was important. This process can be often referred to as operationalisation, in which concepts are constructed in terms of the operations to be carried out when measuring them (Bryman, 2004). In this respect, this chapter starts with a discussion about the conceptualisation of the notion of demand-side coherence to be applied to the empirical study, before dealing with research approaches, strategies and methodological issues. It then provides an explanation of the methods used for the data collection, including different methods used for the analysis of the empirical data. It concludes with a discussion of validity and reliability.

4.1 Demand-side coherence as an operational framework

4.1.1 Demand-side coherence of national programmes

The concept of demand-side coherence, perceived from the perspective of demand-side, was drawn out as an operational construct to understand agency interaction in policy delivery systems, particularly in the context of South Korean regional innovation policy. Christensen et al. (2003) argued that conceptualising coherence required a programme as well as an organisational perspective. As noted, in academic research on coherence, the concept has been discussed as a matter of programme

coherence, namely integration and co-ordination among related programmes. On the other hand, according to Christensen et al. (2003), an organisational perspective referred to the structure of organisational set-up, linking policy formulation with delivery and implementation. They further argued

“...in a dynamic setting, the ability to maintain coherence between the programme building and the organizing of programme implementation according to the changing needs of the target groups of the programme is the core essence of a responsive and interactive system of innovation policy” (ibid., p. 171).

This organisational perspective stressed that interaction between processes and between agencies has been relatively neglected or has not been deliberately dealt with in the area of policy, compared to programme coherence. However, programme coherence and organisational coherence might be seen as being linked to each other. This new concept of coherence could also be discussed with reference to spatial scale, namely at national, regional or local level. The coherence at the national level of policy formulation mainly implies programme coherence. However, in the sense that coherent functions and operations of different ministries could increase the integration and co-ordination of related programmes (Christensen et al., 2003), this coherence might include organisational coherence at the national level. Such coherence at the national level might be gained from horizontally co-ordinated interaction between various strands of policy and thus it was called ‘Horizontal coherence’ (Hertog and Groot, 2005). If horizontal coherence was enhanced, individual or sectoral policies could build on each other and minimise inconsistencies in the case of conflicting goals (OECD, 2005). Accordingly, the cooperative interaction between ministries responsible for various policies and the policy co-ordination, which could result from their interaction, are important to coherence at the national level. These are supply side issues and thus coherence at the national level mainly refers to supply-side coherence. However, efforts made to increase this coherence might influence the degree of policy co-ordination perceived by the demand-side at the local level. Also, such efforts by ministries at the central level could be structured into policy instruments or an institutional set-up able to enhance policy co-ordination at the local level. Therefore it can be assumed that that can lead to co-ordinated actions of agencies at the local level, given Giddens’s view on agency-structure relations that

structure can constrain and enable the action of the individual agency. That is, the horizontal coherence at the national level can affect demand-side coherence referring to the perceptions of target groups toward the integration of government programmes implemented at the local level. Of course, this could not always be guaranteed as long as there are a variety of obstacles in the implementation process. However, this horizontal coherence at the central level, which can refer to cooperative interaction between ministries and policy co-ordination, might be also one of the important factors for understanding agency interaction at the local level. In particular given that in South Korea the central government recently tried to increase co-ordination of the programmes (see chapter 5), this issue needs to be taken into account in the analysis of agency interaction, even though the coherence from the demand-side perspective was taken on in this research.

The coherence at the local level, also known as spatial coherence, is more closely connected with demand-side coherence. According to Christensen et al. (ibid.) spatial coherence was achieved when emphasis shifted to the regional dimension and contexts, and thus the problems of co-ordination of the innovation policy delivery system were added. They further argued that that “co-ordinated action at the regional level is, by and large, conditioned by a co-ordinated delivery organization at the regional level” (ibid., p. 172). Thus the role of local agency might be important to increase coherence at the local level. Local agencies often played a key role as the downstream delivery system in proximity of target groups, and thus their local responsiveness in the policy delivery process tended to gain importance (Kaufmann and Tödtling, 2003). In this respect, Christensen et al. (ibid.) argued that a vertical interaction concerning programme deliveries responsive to local needs was a key to coherence of national policy at the local level. That is, when local needs are delivered to agencies at the central level through vertical interaction between the national and the local in policy delivery process, the coherence at the local level could be enhanced. Also, in the coherence at the local level, interaction between local agencies was important because the interaction helped to find out firm needs (Landabaso, 1997). As this spatial coherence stressed the vertical relationship, this referred to vertical coherence (Hertog and Groot, 2005). Vertical coherence implied a coherent framework and relationship between different levels of governance or government at national, regional and local levels (OECD, 2005; Fresco, 2004). Multi-agency participation in the policy delivery process, therefore, might

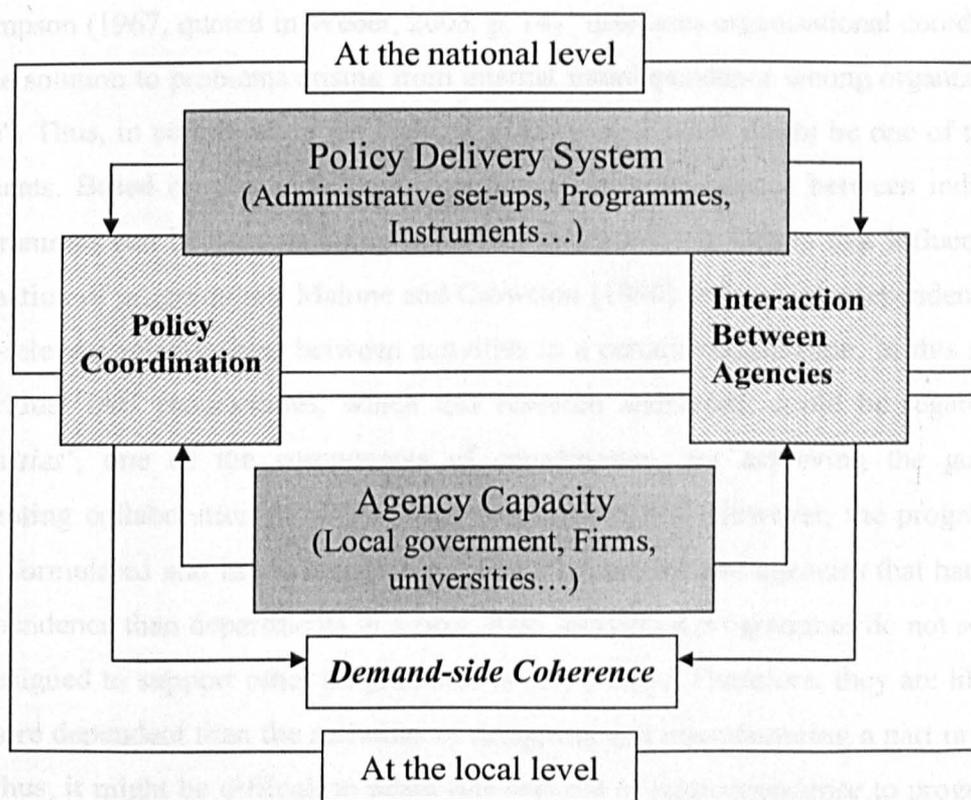
guarantee policy coherence at the local level (Fresco, 2004). Since demand-side coherence in the policy process refers to the target groups towards the integration of individual programmes and the fulfilment of their needs, the enhancement of multi-agency participation conducive to the vertical relationship between agencies level can increase the degree of demand-side coherence. In this respect, the coherence of national policies at the local level seems to be basically a matter of demand-side coherence. In particular, given that the role of local agency in the implementation process of local economic development policies as discussed in the previous chapters has been increasingly stressed, this coherence at the local level tended to become important. Also, as the South Korean government emphasised the needs of users and cooperative interaction between agencies in industry-academia collaboration (IAC) policy under the process of political devolution, this demand-side coherence seemed to be an important issue in South Korea.

This discussion in the wider context of coherence at the national and local level has helped to draw out the basic factors to determine demand-side coherence focusing on the target groups' perceptions of the integration of programmes and the reflection of their needs in the policy process. Demand-side coherence can be basically affected by two factors: policy co-ordination including co-operative activities between national ministries; and diverse interaction between local agencies influencing the delivery and articulation of local needs.

However, there is a need to consider two important contextual factors which have been constantly discussed in previous chapters. One is a policy delivery system including the institutional or organisational set-up related to providing policies. The other is agency capacity to respond to interaction in the policy delivery system. In particular, according to Christensen et al. (2003), spatial coherence consisted of organisational set-up at the local level, related to a construct that carried programmes downstream to final users targeted. This construct might imply a policy delivery system because as discussed in chapter 2, the policy delivery system can be understood as the set or mix of instrument, institutions, processes, rules and values used in providing policy (Sandiford and Rossmiller, 1996; Parsons, 1995). From this point of view, it can be argued that if the policy delivery system is designed and operated to foster interaction between policy formulation and implementation including interaction between agencies, the spatial

coherence can be increased. Also, Christensen et al. (2003) argued that the regions varied with respect to their organisational capacity to implement innovation policy programmes. Thus, it can be assumed that the degree of demand-side coherence at the local level may vary according to the capacity of local agencies involved in the policy delivery process. As discussed considerably in previous chapters, even though local agencies were well empowered and had enough authority to foster interaction in the policy delivery system the weakness in capacity of agencies might prevent the interaction between agencies at the local level (Oyelaran-Oyeyinka, 2006; Nauwelaers and Morgan, 1999). In this respect, the policy delivery system and agency capacity can be contextual factors in the understanding of demand-side coherence at the local level. Consequently, there is a need to investigate these four factors to affect demand-side coherence at the local level in order to understand complex issues related to the attempts of the Korean government to achieve demand-side coherence in the national policies for regional innovation. This conceptualisation of demand-side coherence at the regional level can be put into the form of the following diagram.

Figure 4.1 The conceptualisation of demand-side coherence at the local level



Source: Compiled by the author

4.1.2 Conceptualisation of demand-side coherence

Policy Coordination

As discussed above, when individual programmes implemented at the local level are well co-ordinated, demand-side coherence can be enhanced. According to Malone and Crowston's coordination theory (1999), there were four components in coordination; 'goals', 'activities', 'actors' and 'interdependencies'. Among the components they stressed the importance of interdependence, arguing "if there is no interdependence, there is nothing to coordinate" (Malone and Crowston, 1990, p. 362). Also, they noted that such interdependence between activities could be resolved in terms of common objects that were involved in some way in both actions. Regarding common objects in a firm, they suggested a following example:

... the activities of designing and manufacturing a part both involve the detailed design of the part: the design activity creates the design and the manufacturing activity uses it (Malone and Crowston, 1990, p. 362).

Malone and Crowston (1990) defined coordination as "the act of managing interdependencies between activities performed to achieve a goal" (p. 361). Also, Thompson (1967, quoted in Weber, 2005, p. 14) "discusses organisational coordination as the solution to problems arising from internal interdependence among organizational units". Thus, in coordination the concept of interdependence might be one of the key elements. Based on this idea, how to approach interdependence between individual programmes can be seen as being important in identifying factors that influence coordination of programmes. Malone and Crowston (1990) defined interdependencies as goal-relevant relationships between activities in a certain organisation. In this regard, individual IAC programmes, which this research addressed, could be regarded as 'activities', one of the components of coordination, for achieving the goals of promoting collaboration between SMEs and universities. However, the programmes were formulated and implemented by different ministries and agencies that had more independence than departments in a firm. Also individual programmes do not seem to be designed to support other programmes in some ways. Therefore, they are likely to be more dependent than the activities of designing and manufacturing a part in a firm and thus, it might be difficult to adapt this concept of interdependence to programme coordination directly. Based on the basic concept of interdependence, this research

approached policy co-ordination in terms of the following criteria: linkages between programmes; duplication of programmes; and fulfilment of programmes toward needs.

First, in relation to linkages between programmes, since coordination was the act of managing interdependencies between activities, programmes needed to be mutually dependent upon other programmes to some extent for securing policy coordination (Malone and Crowston, 1990; Powell, 1990). Uglund and Veggeland (2005) argued that in the context of policy, interdependence meant that “various policy components are inter-linked” (p. 4). Christensen et al. (2003) argued that in order to increase policy coordination, policy programmes must be linked to other policy measures. When activities and programmes are not inter-linked, it might be very difficult to increase coordination. Consequently, the policy programmes that are not mutually linked might decrease policy co-ordination. The second criterion is duplication of programmes, which is related to the linkages between programmes. Peters (1998) explained that co-ordinated policies were characterised by minimal redundancy and lacunae. According to a study of Industry-Academia Collaboration (IAC) policies in South Korea (Lee and Oh, 1999) the policies had similar functions such as support for business establishment, collective R&D equipment utilisation, education and training, and information interchange and provision in the projects, so that there were rarely distinct differences between them. Thus, if the programmes are overlapped in terms of functions and instruments, it might be difficult for them to tackle target groups’ diverse problems and therefore there might be some limitations to enhancing synergy and complementarities of the programmes. In such cases, local agencies might not perceive the programmes to be well-coordinated. The third is whether a variety of needs of firms and regions in terms of local IAC activities could be fulfilled in diverse programmes. As seen above, demand-side coherence means that “programmes are found by target groups to be well co-ordinated and tailed to current needs and context” (Christensen et al., 2003, p.170). That is, target groups might consider the programmes coherent when they could meet their needs. In fact, the needs of SMEs might appear to be diverse depending on their specific types and their industrial specialisations. Also, even in universities their needs about policy programmes might vary according to their scale and specialised sectors. In this respect, if these diverse needs are not taken into account properly, the degree of policy co-ordination perceived by local agencies might be low.

Interaction

The literature review has provided the meanings and consequences of interaction in the policy process. Even though many academic studies have stressed interaction in the policy process, the substantial aspects, patterns and features of interaction have not been explored sufficiently and appropriately. Moreover, there has been little conceptual information and knowledge to be used in measuring 'bad' or 'good' interaction and 'quality' or 'quantity' of interaction. Thus, it might be difficult to measure the interaction in the real world. However, in the area of innovation policy in South Korea, many people very often used the term, 'interaction' or 'network' when they expressed a certain close relationship between agencies, even though the patterns and features of network of individual agencies varied. In particular, the new government in Korea argued that 'network activation' or 'collaborative networks' between local agencies (e.g. firms, universities, research institutes, and local governments) were important to local economy development (MOCIE, 2004; PCBND, 2004a). In this respect, the practical meaning of network or interaction seems to be perceived to be collaborative or cooperative in the area of policy in Korea. The objective of this research was not to measure interaction directly but to identify barriers to interaction which agencies perceived in the policy process in South Korea. Thus, the issues related to the substance of interaction were not important in the conceptualisation of interaction in this research. Rather, what is needed here is how to draw out significant factors to affect interaction and how to understand their practical meanings. There might be a variety of factors that could influence interaction between agencies and thus it might be difficult to operationalise the factors appropriately. However, through some concepts such as business networks, policy networks, public-private partnerships (PPPs), some factors to influence interactions can be drawn out in the sense that they have been conceptualised in order to explain different types of relationships between public and private actors or between social actors. Due to this reason, interaction, relationship and network were synonymously used throughout this research.

This section discusses their meanings and characteristics in more detail in order to understand significant factors to affect a series of interactions between agencies. At first, in social-economics, network of social actors can be defined as sets of connected exchange relations (Cook and Emerson, 1978). However, the concept of the network has been used differently depending on different areas and sectors. According to

Yeung (1994), “a business network can be defined as an integrated and co-ordinated set of ongoing economic and non-economic relations embedded within, among and outside business firms” (p.476). Also, Håkansson and Johnson (1993) defined “industrial networks as sets of connected exchanged relations among actors performing industrial activities” (p. 40). Grabher (1993a) argued that the network forms shared the following four basic features: reciprocity; interdependence; loose coupling; power. Unlike Grabher’s view, Yeung (1994) asserted that atmosphere, trust, co-operation and social order/cohesion (power) were basic ingredients of network. However, all these ingredients of networks could not be directly applied to conceptualisation of interaction between the agencies in the government programmes. For example, ‘interdependence’ was formulated in a long-term perspective and ‘loose coupling’ might be seen as being informal and natural (Grabher, 1993a). Thus, the direct application of these elements to interaction in the policy process might make it difficult to explore the nature of the interaction because policies might be basically formulated and implemented from a short-term perspective and in a formal way. Nevertheless, some factors such as trust and power can also be important features to understand basic relationships between agencies. In relation to policy networks, Rhodes (1997) defined them as the sets of interacting interdependent organisations operating within the power-dependency framework. According to Klijn et al. (1995), policy networks were “...more or less stable patterns of social relations between mutually dependent actors which form themselves around policy problems or clusters of resources” (p. 439). In fact, the network concept has been differently used within various sectors and disciplines. However, Börzel (1998), arguing they that all shared a common understanding, provided a common definition of a policy network as follows:

“...as a set of relatively stable relationships which are of non-hierarchical and interdependent nature linking a variety of actors, who share common interests with regard to a policy and who exchange resources to pursue these shared interests acknowledging that co-operation is the best way to achieve common goals” (p. 254).

Similarly, public-private partnerships (PPPs) imply a form of structured cooperation between public and private parties (Koppenjan, 2005). Since PPPs have been generally sustained by the close interaction between public and private parties, in some senses, the interactions between government and clients in this study can be seen as being similar to

PPPs. Generally, some studies stressed the importance of communication and trust in PPP (Koppenjan, 2005; UNF, 2003). This is because communication could help to strengthen the partnership and allow participants to approach information about partnership activities easily and thus, minimize misunderstandings and disagreements which might occur from all parties having different characteristics (USAID and CED, 2006). Also trust could contribute to the bridging of cultural differences (UNF, 2003). From the definitions and features of these concepts, it can be possible to draw out essential ingredients for understanding interaction between agencies in the policy process such as communication and trust, sharing common interests and power, articulation of needs and exchange of information.

First, communication and trust can be seen as important factors to interaction. As noted above, according to the concept of policy networks, networks provided redundant possibilities for interaction and communication. Thus, if there was no communication between agencies, there would be no policy network. Also, frequent contact among agencies could be the basis for active communication and thus, rare communication and contact between agencies could hinder to the enhancement of interaction. Communication might be seen as being considerably related to trust. Trust could be defined as “the expectation that some others in our social relationships have moral obligations and responsibility to demonstrate a special concern for other’s interests above their own” (Barber, 1983, quoted in Porras and Glegg, 2004, p. 345). Trust might be the coordinating mechanism which bound relationships together, so that without trust the relationship in network activities would fail to be sustained (Smith and Holmes, 1997). Trust could be increased by considering other participants’ points of view and their interests as well as discussion and consultation between actors (Porras and Glegg, 2004). Given this point of view, communication and contact between agencies might be of importance to build trust.

Second, sharing common interests and power can be viewed as a necessary ingredient in fostering interaction. In the concept of policy networks, ‘common interests’ might be seen as a significant element to form policy networks because the common interests could bind activities of different agencies which had inherently different ideas and characteristics. That is, when agencies realise common interests and share them with regard to policies, networks can start to be built up. Even if the Industry-Academia

Collaboration (IAC) programmes aimed to improve collaboration and cooperation between universities and industries it might be difficult to build up collaborative interaction between them if they had difficulties in sharing the common goal in the programmes. Furthermore in the sense that interactive relationships between agencies might be generally based on sharing power and control (Kettunen et al., 2002) because co-operation could not be encouraged where one party dominated (Pressey and Mathews, 2000), power sharing between agencies in the programmes might be an essential ingredient for enhancing interactions. According to Yeung (1994), power relations were common in all forms of network relations. He (ibid.) asserted that the notion of power and power relations must be taken into account in any understanding of the nature and dynamics of network relations in the socio-spatial organisation of business. In power relations many stressed the notion of asymmetry (Grabher, 1993a; Yeung, 1994). Grabher (1993a) argued that in the network the gap of power between actors made exploitation of independencies possible. This exploitation of independencies might be asymmetrical because more powerful economic actors could make decisions affecting the constraints and opportunities of their exchange partners (ibid.). Accordingly, in terms of policy networks there must be the gap of power between participants in order to form effective policy networks. In general, “government is the most powerful actor in the policy network capable of changing the rules of the game unilaterally” (Blom-Hansen, 1997, p. 687), particularly in national policies. However, extreme power asymmetry could cause problems, although unequal distribution and possession of power are distinguishing features of power relations. This is because agencies might not be interested in playing the game due to extreme power asymmetry and thus it could impede the proper operation of the play (Blom-Hansen, 1997). Accordingly, to explore power relations between agencies can be seen as being important to understanding agency interaction, particularly in policy delivery systems.

The third issue is a matter of articulation of participants’ needs and exchange of information. According to the theory of policy networks, it was very important that agencies exchanged their resources in forming networks. Thus, information and needs, should be exchanged and expressed properly to foster interactions. Otherwise agencies might be reluctant to attend networking activities. Knowledge was generated through various kinds of interaction, and thus networking was essential to advance knowledge transfer and improve integration of knowledge actors in local society (Geenhuizen et

al., 1997; Malmberg et al., 1996). Also, in various interactions, actors might try to share and exchange knowledge they want to have for successful operation. However, information and knowledge might be different. Many stressed that information was one form of knowledge and might be transformed into knowledge (Choo et al., 2000; Kogut and Zander, 1992). Thus, Davenport (1997) defined information as data with relevance and purpose and knowledge as valuable information from the human mind. However, since knowledge has been often used to derive information, it might be said that information has influenced knowledge and vice versa (Stenmark, 2001). In any case, information can be seen as an indispensable factor in knowledge building and accumulation. Thus, if agencies think that there is little attractive knowledge in interactions or information is not sufficiently circulated in the programmes, they are reluctant to sustain the interactions. In particular, with respect to interaction between university and industry in IAC programmes, information about partners' working systems and characteristics and partners' needs were important, given that the cultural differences between them could hamper their networking activities (Tödting and Kaufmann, 2001; Geenhuizen et al., 1997). Accordingly, if they have enough information to understand each other, their interaction might be enhanced.

Policy delivery systems and agency capacity

In previous chapters, it has been identified that policy delivery systems and agency capacity were two important contextual factors that influenced demand-side coherence at the local level. They were not centrally measured in the empirical study, compared to two factors such as policy co-ordination and agency interaction, but they were decisive factors to the policy co-ordination and agency interaction. Thus, the discussion of the practical scale to be used to investigate them is required.

As mentioned in chapter 2, the policy delivery system is understood as the set of institutions, individuals, instruments, processes and rules which are used in delivering public policy to a target group (Sandiford and Rossmiller, 1996; Pearson, 1995). Thus the policy delivery system included legitimate roles or authority of agencies, programme guidelines, implementation styles, and funding initiatives. Countries differed in important ways regarding institutional set-ups, traditions, socio-economic systems and innovation culture approaches (Isaksen, 2003; Hertog et al., 1999) and

thus these variations might lead to differences in the delivery system of innovation policy. As explored in chapter 3, in terms of innovation policies three different types of policy delivery systems have been discussed: 'Grassroots'; 'Integrated'; and 'Dirigiste'. In each delivery system, fundamental elements for the construction of systems such as the role of agencies, funding structure for innovation policy, policy types and processes was discussed in chapter 3.

Agency capacity has been related to 'regional absorptive capacity' as discussed in chapter 3. Thus, some conceptual ideas of agency capacity might overlap with the regional absorptive capacity. In relation to agency capacity in the Industry-Academia Collaboration (IAC) programmes in South Korea, there seem to be two factors to be taken into account. The first is about the capacity of local governments in relation to response to the programmes and interactions in the programmes. As explored in the previous chapter, Nauwelaers and Morgan (1999) argued that even though they had empowerment in the policies to facilitate interaction with other actors, this might not be enough to stimulate interaction if they were lacking an innovative spirit or capacity (*ibid.*). Thus, the innovative spirit and capacity of local governments to support collaboration between firms and universities and respond to the programmes need to be taken into account in the issue of agency capacity. The second issue is related to networks between local firms and universities outside the programmes. As the IAC programmes aimed to enhance collaborative activities between firms and universities, experiences of local firms and universities in voluntary and social networking activities could influence their interactions in the programmes. If there is a lack of their capacity to establish networks, it might not be easy to construct co-operative interaction between them. This capacity includes collaborative R&D activities between them as well as their human resources. Since socio-economic environment and agencies' competencies differed with regions as noted above, the degree and features of interactions between local actors might vary a great deal. Thus, while the programmes might be successfully performed in certain regions that had constant active interactions between actors, their effectiveness might be fairly limited in other regions that did not have. As mentioned in chapter 3, generally there were three types of barriers in SMEs' innovative networking activities. These were organisational thinness, fragmented regional systems, and the lock-in situation (Isaksen, 2003).

1. Regions may be organisationally thin. In that situation a regional innovation system does not exist due to a lack of relevant players such as local, specialised knowledge organisations and/or too few firms in the region....
2. Regions may have fragmented regional systems. Then the relevant players may be present without forming a regional system due to a lack of innovation collaboration. Geographical proximity only creates a potential for interaction, without necessarily leading to dense local interaction.
3. A regional innovation system exists, but the system is too closed and the networks too rigid resulting in a lock-in situation as is often the case in old industrial areas (p.30).

These barriers could hinder regional and local networking activities, so it is useful to understand them when looking at the issues related to local networking activities between firms and universities.

4.2 Research approach and methodological issues

The main interest of this research was to expand knowledge about gaps between policy expectations and actions by understanding agency interaction in policy delivery systems in the context of regional innovation policies in South Korea. For this aim, this research focused on the questions of what local agencies perceived as barriers to interaction and policy co-ordination in the implementation process and how the perceived barriers occurred in the delivery system of Industry-Academia Collaboration (IAC) policies within the Daegu City region. That is, through empirical studies, this research tried to identify data that described the barriers that influenced agency interaction and then to explain patterns related to the barriers to agency interaction. Thus, the purpose of this research could be described as descriptive and explanatory. In order to reach these purposes, this research used quantitative and qualitative methods together. Choosing research methods depends on the definition of the problem and the nature of the information being sought (Denzin and Lincoln, 2000). As presented above, the problems of primary concern in this research focusing on agency interaction in policy delivery systems were: What did local agencies perceive as barriers to interaction and policy co-ordination in the implementation process?; How did the perceived barriers occur in the IAC policy delivery system within the Daegu City region? A quantitative method was appropriate to address the first question because it was useful in

investigating the perceptions of local agencies toward the barriers to interaction and policy co-ordination in the policy delivery systems. In particular, the literature review has identified potential barriers to agency interaction in different policy delivery systems. Thus, a quantitative method based on questionnaires could help to verify whether the potential barriers occurred in the policy delivery system related to particular policy (the IAC policy) in a particular place (the Daegu City region in South Korea).

However, this quantitative method had some limitations for answering the second question. The second question was to address more fundamental issues related to the events that shaped these barriers and how these barriers occurred in the context of the policy delivery system and the locality. This question could not be answered and measured in terms of quantity, amount or frequency. It might be difficult to understand the story behind their experiences and to identify possible relationships shaping the barriers in the specific contexts of policies and locality by the data gained from surveys. In this respect, it was found that the qualitative method suited the second question. In general, there are various qualitative methods such as interviewing, observation, conversation analysis, and focus group. They all help researchers obtain in-depth information, but they have slightly different advantages and disadvantages. In observation research the researchers can gather data on daily life in the group or setting under study (Murphy et al., 1998). However, the findings by observation might be local or specific and thus it might be difficult to generalise to wider contexts. In particular, this problem is important for a study over a large region which addresses national policies. Also, observation method makes relatively heavy demands on resources such as time (Murphy et al., 1998). The use of focus group, which are discussions designed to obtain perceptions on a defined area of interest, is another measure to collect in-depth information about a small group of topic (Elmendorf and Luloff., 2001). Yet, it is not easy to pick group members and the results of focus groups may not easily generalised (Elmendorf and Luloff, 2001). Interviewing can be used for getting the story behind a participant's experience and thus can pursue in-depth information around topic (McNamana, 1999). Interviewing is also criticised because interviewees might provide indirect information filtered through their views (Creswell, 2003). Also interviews, particularly more structured and standardised interviews, cannot be treated as uniform presentations of same stimuli to all respondents (Murphy et al., 1998). However, interviewing may be useful as follow-up to certain respondents to questionnaire, e.g., to further investigate their responses (McNamana,

1999). Therefore, this research selected interviewing as a qualitative method, given this advantage of interviewing and the disadvantages of other alternative approaches. In particular, since disadvantages of interviewing are essentially related to problems faced in more structured interview, this research selected a semi-structured interview. The qualitative interview enabled the analysis of complex processes and contexts related to agency interaction, not only to understand the characteristics and actions of agencies in a policy delivery system, but also to search for the hidden and practical meaning of the barriers. Accordingly, to be able to address these questions, this research adopted a mixed method approach in which quantitative surveys based on questionnaires and qualitative interviews could complement each other.

There are several methodological issues related to the analysis of agency interaction in the delivery systems of the national policies in South Korea within the framework of demand-side coherence. These issues are important considerations to design research methods. The first issue is the unit of analysis. Sullivan (2001) explained that “units of analysis are the specific objects or elements whose characteristics we wish to describe or explain and about which data will be collected” (p. 94-5). Units of analysis could also be events or entities that were less well defined than a single individual (e.g., decisions, implementation processes, and organizational change (Yin, 2003)). Although this research basically addressed gaps between policy expectation and actions by understanding agency interaction in the policy delivery system, the research problem and questions of this research were focused on the barriers to agency interaction. The literature review has identified that the national policy for supporting local collaboration between firms and universities might not be operated as expected, given a variety of potential obstacles such as the normative construct of the policy delivery system, the lack of agency capacity, and the cultural differences between agencies. Thus, the analysis of the barriers to agency interaction would help to understand the complex aspects of agency interaction at the local level in more detail and also the gaps between policy expectation and actions. In particular, in the sense that demand-side coherence was drawn out as an empirical framework in understanding the interactions between local agencies, the primary unit of analysis was the barriers to the interactions and policy co-ordination in the implementation process.

How to define the demand-side in the IAC programmes is the second important issue. The main participants of the programmes were the central government (mainly ministries), local government, universities and firms. Among them the positions of the central government and SMEs were clear. That is, the central government was a main supplier, while firms were final users in the programmes. However, the positions of local government and universities were complex. At first, local government was a supplier to universities and firms because it supported its budget for implementation of the programmes. However, in terms of relations with the central government it became a user of the programme in some cases in the sense that it usually attempted to attract the programmes provided by the central government to its administrative boundary. Also universities were suppliers to firms because they supported innovation activities of firms on the basis of government funding. However, since they were supported by the central and local governments they were also important users of the programmes. Accordingly, the demand-side in this research, generally, implied firms and universities, but according to the type of relations it also included the local government in some cases.

Thirdly, types of interactions between agencies need to be taken into account because factors and constructs required in investigating interactions might vary according to interaction types. This issue could also affect the types and structures of questionnaires. As mentioned above, main target groups in the IAC programmes were firms and universities. In this respect, there were two types of interactions in the programmes: between the government and the target groups (e.g. universities and firms); and between universities and firms. In relation to interaction between the government and the target groups, interaction between the government and universities and interaction between the government and firms might be slightly different in the sense that the roles of firms and universities might be different in the IAC programmes. As noted, while firms were final users, universities were suppliers in terms of relations with firms. In this respect, their responses to interaction with the government might be different to some extent. In relation to interaction between universities and firms in the programmes, local voluntary networking activities between universities and firms should be also taken into account because they were an important issue in understanding agency capacity, even though they were not one of the interactions identified in the policy process.

Lastly, as discussed in chapter 2, this research approached the concept of agency in a broad way, including not only human actors but also non-humans (e.g. organisations). Thus, its analysis covered the behaviours of both human actors and organisations. However, in terms of feasibility of the research, the data collection in the field study was carried out on the basis of individual actors because organisations could not become direct interviewees and respondents to questionnaires. In the sense that in many cases the behaviours and perception of individual actors might be regarded as those of organisations this research attempted to understand the actions of organisations through the behaviours and perception of individual actors. However, in some cases actions as individual actors could be different from actions as organisations even though individuals might act on the basis of organisational belonging. Also, the actions of individual actors might be shaped by organisational structures. These points are addressed in analysing the empirical data.

4.3 Research Methods

4.3.1 Selection of national programmes for regional innovation

This research was concerned with national policies seeking to promote regional innovation in South Korea. Many modern regional innovation policies tended to focus on supporting industry-academia collaboration (IAC). Also, in South Korea, a variety of national programmes for supporting collaboration between industry and university were formulated and implemented by various ministries (PCBND, 2004b). These programmes could be categorised into four areas, those of human resources cultivation, technology development, technology guidance, and business establishment. First, with respect to human resource development, the Ministry of Education and Human Resources Development (MOEHRD), the Ministry of Commerce, Industry and Energy (MOCIE), the Ministry of Information and Communication (MOIC), the Ministry of Science and Technology (MOST), and the Ministry of Construction and Transportation (MOCT), implemented a variety of programmes aiming to support local universities, to cultivate industrial engineers, to train new researchers, and to expand information technology faculties. Secondly, with respect to technology development, MOCIE, MOST and Small and Medium Business Administration (SMBA) established the

Regional Research Centre and the Science Research Centre and carried out the programme of establishing University IT Centres and the programme of University, Industry, and Research Institution Consortiums in order to support collaborative R&D. Thirdly, in technology transfer and technology guidance, MOCIE, MOST, and SMBA launched several programmes for establishing Techno Parks and Technology Innovation Centres, supporting the utilisation of research achievement and operating the University for Technology Guidance programme. For supporting the creation of new businesses, the Technology Business Incubator by MOCIE, the Business Incubator by SMBA and the Soft ware Support Centre by MOIC were implemented.

However, these programmes did not always aim to support SME' collaboration with universities and to promote regional innovation. Some of them focused on large firms and some were aimed at supporting basic science and technology. These programmes were designed to improve national R&D capacity rather than to promote regional innovation or further local economic development. In this respect, local government, one of the important local agencies, did not participate in such programmes. Thus, even if the programmes were implemented through specific regions, there might be limitations in understanding diverse interactions between local agencies in such programmes. Under these circumstances, it was important to select programmes in which local government was involved and which aimed to promote regional innovation. Among the current national IAC programmes, the following programmes could fulfil these criteria: Techno Park (TP), Technology Innovation Centre (TIC), Regional Research Centre (RRC), University, Industry and Research Institution Consortium (UIRIC), Business Incubator (BI) and Central University for IAC (CUIAC). These programmes were operated by three ministries; MOEHRD, MOCIE, and SMBA (see Table 4.1).

Table 4.1 The national IAC programmes selected

Programme	Ministry	The year it began
TP	MOCIE	1998
TIC	MOCIE	1995
RRC	MOCIE	1995
UIRIC	SMBA	1993
BI	SMBA	1998
CUIAC	MOEHRD & MOCIE	2004

Source: author

These programmes were national programmes to promote regional IAC, but they were implemented through regions with local authorities' participation to develop regional economies and enhance regional technology capacity. In this respect they were much more localised than other national IAC programmes. Their specific objectives, functions and procedures are discussed in the next chapter.

4.3.2 Selection of the study region

In order to proceed with an investigation of research interests, it is necessary to identify a local area in which detailed empirical data can be obtained. Christensen et al. (1999) argued that the territorial industrial foundation was greatly divided and the dynamics at work in regional industrial systems might vary considerably. Thus it might be hard to select the study region. Since socio-cultural structure and the distinctive characteristics of locality could influence agencies' economic and social behaviours (Keating et al., 2003), this research selected the local level in which agencies might share more similar socio-cultural environments than at the regional level. Although the socio-cultural factors were not the main focus of this research, formal interactions in the policy processes might be affected to some extent by specific behaviours of the agencies shaped by the socio-cultural structure and the distinctive characteristics of locality. The social and cultural characters forming localities were so specific that the region's size and institutional framework might be too distant and inadequate to capture the distinctive characteristics of the innovative process and to lay out the most suitable policy for innovation (Rolfo and Vitali, 1999). Thus, some argued that regions were not a proper place for understanding socio-cultural structures (Muscio, 2006; Lagendijk, 2005). In addition, among diverse local levels, urban regions were selected because the urban regions seemed to be generally characterised by agglomeration economies and the prevailing density of networks (Lambooy, 2002) and therefore agency interaction might be more easily identified in the empirical study. However, in South Korea as in other countries there were many different scales and types of urban regions, so in order to select a proper research area some important elements of this research such as policy and SMEs need to be taken into account.

As this research dealt with the national programmes implemented at the local level, boundaries which the programmes targeted were considered. Basically the programmes

were performed and implemented on the basis of administrative areas. In terms of administrative regions, South Korea adopted a two-tier local authority system and thus there were 16 upper-level local authorities and also 232 lower level local governments under central government. The 16 upper-level authorities could be broken down into three types; the capital city, 6 metropolitan cities, and 9 provinces. The basic regional units in the implementation of the selected programmes were the administrative areas of 16 upper local authorities because the central government limited the level of local authority involved in these programmes to upper local authorities. That is, the implementation areas of the programmes were determined by the administrative areas of 16 upper local authorities. Thus, this study centred on a city region among upper local authorities. However, there could be an issue as to whether these cities could act as functional industrial region. Christensen et al. (1999) argued that the dynamics at work in regional industrial systems might differ remarkably and these dynamics rarely met the administrative regional borders. However, 7 cities in upper local authorities were regarded as functional industrial regions compared to general cities because they were metropolitan areas. According to National Geography Society (1994), a typical functional region is metropolitan. They have to some extent their own labour and consumption markets. Furthermore, as the SME was one of the important agencies in this research, the role of SMEs in local economic development (LED) was also considered in the selection of the study area. Recently, many city governments in South Korea tended to regard SMEs as important policy target groups. In particular, the higher the share of SMEs in local economic structure, the more important SMEs may be considered in LED. That is, if the share of SMEs in local economy is high, it can be assumed that the activities of SMEs, including their interaction with other agencies, might be an important issue in LED. Thus, such region would allow to collection of detailed empirical data related to the activities of SMEs. Daegu City was selected as the study area because the share of its SMEs in local economic structure was the highest of the 7 large cities (see Table 5.8).

The study region selected was marked by a number of key factors. Firstly, Daegu's economy was strongly influenced by traditional textile industries (KIET, 1998; DGI, 2005) such as the production and weaving of chemical fibres. Secondly, the proportion of small sized sub-contractors producing simple components according to the order of large firms in regional economy was very high (KIET, 1998). Thirdly, there were few key industrial sectors and firms which could facilitate regional innovation and

knowledge activities. Such characteristics of the urban economy were of high relevance to this study in terms of agency capacity. As discussed above, the lack of agency capacity might prevent interactions between agencies (Oyelaran-Oyeyinka, 2006; Nauwelaers and Morgan, 1999). Given Daegu City's economic conditions led by the textile industry and small sized sub-contractors lacking in R&D and innovation activities, there might be some problems with the capacity of agencies to respond to innovative networking activities, particularly in the firm sector. Therefore, the region chosen could provide an appropriate locus for in-depth an analysis of tensions and barriers arising from agency interaction.

4.3.3 The time period and the definitions of SME and university

Policy delivery systems which are an important factor for shaping agency interaction could be changing because the form of the state for local economic development and the relationship between governments could be changing under the transition of political and economic environments. Thus, the time period of this research took into account the basis of such changes of political and economic environments surrounding regional innovation policies in Korea. In the late 1990s Korea experienced rapid changes politically and economically. Local council members and governors or mayors were directly elected by local citizens in 1991 and 1995 respectively. Also, since the Asian financial crisis in 1997 local SMEs and regional innovation strategies were paid attention to in economic development. In particular, the new government inaugurated in 2003 stressed decentralisation and regional innovation much more than the previous governments. For such political agenda, the government attempted to improve Industry-Academia Collaboration (IAC) programmes and to launch new policy instruments to foster IAC activities (see chapter 2). Accordingly, the time period of this research was basically set between 1997 when regional innovation strategies started to be focused on within the national development paradigm to 2005 when the empirical study was conducted. However, before 1997 some IAC programmes were launched and these programmes were also selected for this research. Thus the period before 1997 was regarded as a background context.

In relation to SMEs, how to define them is another issue in this research. The definition of SMEs has varied slightly among countries and researchers. Some of the commonly used

criteria were the number of employees, total net assets, sales and investment level (Ayyagari et al, 2003). The European Commission (2003) defined SMEs as “enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding EUR 50 million (£34 million), and/or an annual balance sheet total not exceeding EUR 43 million (£29.5 million)”. In South Korea, SMBA (2006a) defined SME as firms which employed fewer than 300 persons or which had an annual turnover not exceeding WON 8 billion (WON 30 billion in service sector). In general, in the literature on SMEs, many researchers defined SMEs mainly by employment. Thus, considering Korean criteria and the general definitions in the literature on SME, SME in this study was defined as a firm with less than 300 employees. With respect to the definition of university, there were three types of higher education institute in South Korea: university; industrial university; and junior college. Of those, the industrial university aimed to improve technology in the education system, while junior colleges aimed to provide professional technicians for industry. Even though these two higher education institutes were different from the general universities in terms of objective, function, and educational system, they were generally called ‘university’ in practice. They also participated in the selected IAC programmes. In this respect, the term ‘university’ in this research included general universities as well as industrial universities and junior colleges.

4.3.4 Surveys

As noted above, this research adopted the quantitative survey as one of the research strategies. Thus, in this section some important issues such as survey type, structure, sampling and procedure are discussed. First, data collection in surveys was generally based on questionnaires. Considering the number of samples, it was not economical or time-efficient to select personal or telephone interviews. Thus, the surveys in this study were conducted by postal questionnaires in which respondents answered questions by completing the questionnaires themselves.

The second issue is questionnaire structure and the main categories of questions. As the main target groups (i.e. the demand-side) were firms and universities in the programmes, two different questionnaires (i.e. firm and university questionnaires) were used to identify what the target groups perceived to be the barriers to interaction in the policy process. The reason for using two questionnaires was that their roles in

policy process were different and therefore they might have different perceptions toward similar issues. Thus, there were slightly different questions arising from their different roles in the programmes, even though the structure and the individual questions of each questionnaire were similar (see Appendices A and B for detailed questions). On the basis of the conceptualisation of demand-side coherence and the types of interactions between agencies which were discussed above, the questionnaires had four categories: (1) networking activities between industry and university in the Daegu City region; (2) interactions between firms and universities in the policy process; (3) interactions between firms or universities and government in the policy process; (4) coordination of IAC programmes. In each category, respondents were asked to choose what the important factors were and to indicate to what extent suggested factors were barriers to agency interaction and policy coordination in the IAC programmes and to networking activities between firms and universities. For these questions, based on the conceptualisation of demand-side coherence a variety of potentially important factors and barriers were selected from relevant literature and previous similar studies. Multiple-choice questions were used to identify important factors, while the question of identifying barriers consisted of three scales (i.e., strong barrier, weak barrier, and not a barrier) rather than a Likert-scale in order to avoid complexity in responding to a variety of suggested barriers.

The third issue is about survey sampling. The target population of firms in this study was comprised of the firms located in the Daegu City region with experience of participating in the selected programmes. Thus, the firm samples needed to be selected on the basis of the selected programmes. The sample in the RRC, TIC and CUIAC programmes was the same as the target population because all firms participating in these programmes, when the programmes were launched, were continuously taking part in the programmes. The sample in the UIRIC, BI, and TP programmes was different from the target population in these programmes because it was difficult to trace the addresses of all firms that had participated in these programmes. However, this research sought to generate a representative sample in three programmes. For the UIRIC programme which was launched in 1993 in the Daegu City region, carried out every year, this research selected firms participating in the programmes for six years from 2000, when the number of participating firms had begun to increase, to 2005 as the sample for this programme. According to a white book of Daegu City (2006), the share of participating firms in the

programme between 2000 and 2005 was 63% of the total number of firms participating in this programme from 1993 to 2005. This was to increase the number of the target firm sample. For the BI and TP centres established in universities for start-ups, the firms that were currently occupying the facilities were selected. The number of firms that were occupying the facilities in 2005 was more than the number of firms graduated from the facilities until 2005 (Daegu Techno-Park, 2006). The first number of firms that were sent questionnaires was 779, but some questionnaires were returned and some respondents were firms that did not have experiences of participating in the programmes. The final number of samples for firms was 597 (see Table 4.2).

Table 4.2 Firm sample by programmes

Programmes	BI	TP	RRC	TIC	CUPIAC	UIRIC	Total
Sample	129	66	44	44	80	234	597

Source: author

The target university population was the managing departments of universities that took responsibility for the selected programmes in the Daegu City region. However, the total number of departments was just 24. Thus, the centres of universities for supporting firms and the Industry-Academia Collaboration Foundations (IACFs) were added. Although they were not carrying out IAC programmes, they might have broad information and knowledge about IAC activities. However, since some academic members were in charge of two different programmes at the same time, duplicated numbers were deducted from the whole population. Thus the final number of samples for the university population was 49 (see Table 4.3).

Table 4.3 University sample by programmes

Programmes	BI	TP	RRC	TIC	CUPIAC	UIRIC	IACF	Others	Total
Population	7	2	5	3	1	7	9	16	49

Source: author

The questionnaires were administrated by three mailing waves to firms and universities (April-June 2006). The number of respondents, received after three mailing waves, was 132 from firms and 34 from universities. Thus response rates were 22.1% in firms and 69.4% in universities (see Table 4.4).

Table 4.4 Response rates

	Firms	Universities
Total size of sample	597	49
Number of respondents	132	34
Response rates	22.1%	69.4%

The structure and features of the responding firms and universities are briefly described below. Regarding the year of firm being established and the various industrial sectors, the structure of the respondents is shown in Table 4.5. Around 80% of firms were established after 1990. Half of the respondents were founded after 2000, 29.5% in the 1990s, 12.9% in the 1980s, and 7.6% before 1979. Most of the firms belonged to manufacturing and the share of firms in the service sector was only 17.4%. In the manufacturing sector, the industries of the firms were very different. The share of machinery firms (22.0%) was the largest, followed by computers and electrical machinery (15.2%) and motor vehicles (12.9%).

Table 4.5 Year of firm establishment and industrial structures

o Year of firm establishment		N	%
Before 1979		10	7.6
1980-1989		17	12.9
1990-1999		39	29.5
After 2000		66	50.0
Total		132	100.0
o Industrial structures		N	%
Manufacturing	Textiles	1	0.8
	Chemicals	11	8.3
	Metals	6	4.5
	Machinery	29	22.0
	Computers and Electrical machinery	20	15.2
	Medical, Precision & Optical equipment	11	8.3
	Motor vehicles	17	12.9
	Other	14	10.6
	Sub-total	109	82.6
Service	Information & Communication, S/W development, internet	13	9.8
	Other	10	7.6
	Sub-total	23	17.4
Total		132	100.0

Source: The survey about barriers to IAC programmes

In terms of number of employees, most of the respondents were SMEs with less than 300 employees, while only 4.6% were large firms with over 300 employees (see Table 4.6). 47.3% were firms with 10-49 workers, 21.4% with 5-9 workers and 13.7% with 1-

4 employees. Accordingly, over 80% of respondents were very small firms employing fewer than 50 workers. Regarding the number of R&D employees the share of firms employing 1-4 R&D workers (45.5%) was the highest, followed by firms with 5-9 R&D workers (27.3%). Only 3 firms (2.5%) did not have any R&D workers at all, but there was a considerable share of firms (10.7%) employing over 30 R&D workers.

Table 4.6 Employment and R&D employment size

Employment size	N	%	R&D employment size	N	%
1 - 4	18	13.7	0	3	2.5
5 - 9	28	21.4	1 - 4	55	45.5
10 - 49	62	47.3	5 - 9	33	27.3
50 - 99	9	6.9	10 - 19	10	8.3
100 - 299	8	6.1	20 - 29	7	5.8
Over 300	6	4.6	Over 30	13	10.7
Total	131	100.0	Total	121	100.0
Missing	1		Missing	11	

Source: The survey about barriers to IAC programmes

Concerning annual turnover (see Table 4.7) firms were relatively well-distributed. 31.0% of firms belonged in the category of 2 hundred million to a billion won, 24.0% in more than 5 billion won and 20.2% in 1.1 billion to 2 billion won. Firms with a turnover of less than a million made up 8.5% of the respondents. Since most of the respondents were SMEs, the size of their turnovers did not seem to be high. With respect to R&D expenditure as a ratio of the turnover of firms, 12.7% of the respondents spent less than 1% of turnover on R&D, but around 30% of firms spent over 10% of turnover on R&D activities. R&D expenditure as a ratio of turnover of samples seemed to be relatively high, given that in Korea the average R&D expenditure ratios of turnover of SMEs and venture firms were 2.18% and 7.7% respectively in 2003.

Table 4.7 Annual turnover (won) and R&D expenditure ratio of turnover

Annual turnover	N	%	R&D expenditure of turnover	N	%
Less than 100 million won	11	8.5	Less than 1%	16	12.7
200 million -1 billion	40	31.0	2-3%	26	20.6
1.1 billion-2 billion	26	20.2	4-5%	21	16.7
2.1 -5 billion	21	16.3	6-9	25	19.8
More than 5 billion	31	24.0	More than 10%	38	30.2
Total	129	100.0	Total	126	100.0
Missing	3		Missing	6	

Source: The survey about barriers to IAC programmes

Note: 1pound = 1863won (31/12/2007)

From among 34 responding academic members 19 respondents (55.9%) belonged to universities and 15 worked for junior colleges. In terms of the post of the respondents, the share of professors (52.9%) was the largest, followed by associate professor (17.6%) and assistant professor (17.6%). In this respect, it seemed that the university respondents had many academic experiences. The shares of full-time lecturers and support staff were relatively small. Their subjects varied. However, the shares of 'mechanical and material engineering' and 'electronics, electrical and computer engineering' were relatively high (see Table 4.8).

Table 4.8 Characteristics of university respondents

○ Classification of educational institute	N	%
University	19	55.9
Junior College	15	44.1
Total	34	100.0
○ Posts of respondents	N	%
Professor	18	52.9
Associate professor	6	17.6
Assistant professor	6	17.6
Full-time lecturer	2	5.9
Support staff	2	5.9
Total	34	100.0
○ Subjects of respondents	N	%
Electronics, Electrical and Computer engineering	7	20.6
Chemical engineering and Bioengineering	4	11.8
Civil, Architectural and Environmental engineering	2	5.9
Mechanical and Material engineering	8	23.5
Natural Science	5	14.7
Business and Law	3	8.8
Other	5	14.7
Total	34	100.0

Source: The survey about barriers to IAC programmes

4.3.5 Interviews

There are several issues to be discussed in qualitative interviewing. These include sampling, method, type, and procedure. With respect to sampling, interviewees were categorised into participants and non participants in the programmes. In relation to participants, the purpose of qualitative interviewing was to understand the story behind respondents' experiences and to identify possible relationships shaping the barriers by further investigating respondents' responses to questionnaires. Thus, firm owners and academics participating in the selected programmes who were respondents

to the questionnaires, were important relevant groups for interviewing. Among respondents to the questionnaires, eight firm owners and staff were selected. They generally participated in more than two programmes, so that it was to be expected that in-depth information about their interactions with other agencies, particularly universities could be gained. In particular, by interviewing firms, namely final users participating in diverse programmes, this research could explore the concrete and practical meaning of various barriers to interactions which occurred at the local level. In addition, five academics participating in different programmes in different universities were selected. As they were heads of the programmes, they might interact with firms which had different characteristics. In this respect, it was possible to obtain broad information about the behaviours of firms in the implementation process of the programme. Also, since they had responsibility for implementing the programmes at the local level, they might be more aware of a variety of problems or issues arising from the implementation process than other agencies. It was useful to know about these problems to understand the complexities of interactions between agencies.

Nine government officers were also interviewed: three from central government; two who were in public institutes responsible for evaluating and managing the programmes supporting the central government; and four from local government. They were all directly involved in the programmes as suppliers, so their perceptions may have been different from those of the demand-side. However, they were engaged in a variety of interactions which occurred in the implementation process and they may also have had a more broad knowledge about the programmes. In this respect, it was to be expected that this research could obtain diverse information from them such as about the relationship between the national and the local and between ministries, the institutional set-ups of the programmes and the behaviours of firms and universities in the programmes, all of which was useful to understand agency interaction in the policy delivery system.

In addition to these participants in the programmes, three non-participants were also interviewed. These were a member of the Daegu Techno-Park Foundation; the director of a centre for supporting industry in university; and the director of the Daegu Regional Innovation Agency. Even if they were not involved in the programmes, they might have general and broad information about local networking activities between firms and universities and diverse innovation policies initiated by the central and local

governments. The Daegu Techno-Park Foundation was established in order to construct cooperation between universities, industries, and government as well as to support new and advanced technologies of firms and to upgrade local industries, especially by supporting high-tech small firms. The Daegu Regional Innovation Agency was also a non-profit organisation to manage and evaluate a variety of R&D programmes of central and local governments. Thus, they might have enough information about the economic cultures and structures of the Daegu City region and the behaviours of firms, universities, and government officers in innovation policies. The selected interviewees are presented in Table 4.9 (see Appendix C for detailed list).

Table 4.9 Interviewees selected

	Group	Sample
Total		25
Participants	Owners and staff of firms	8
	Heads of programmes in universities	5
	Central government officers	3
	Public institute officers	2
	Local government officers	4
Non-participants	Daegu Techno-Park Foundation	1
	Centres for supporting industry in universities	1
	Daegu Regional Innovation Agency	1

Source: author

Face-to-face interviews were conducted with the selected interviewees. Creswell (2003) argued that although face-to-face interviews provided indirect information filtered through the views of interviewees, they allowed researcher control over the line of questioning and particularly, historical information could be provided by interviewees through them. This method enabled the interviewer to explore a few general topics through discovering the interviewee's view (Marshall and Rossman, 1999). This helped to identify the specific and practical meanings of the barriers used in the questionnaires and a variety of issues affecting agency interaction at the local level from the point of view of agencies. The interview in this study was mainly for further investigation of respondents' responses to the questionnaires. That is, this research attempted to explore how the perceived barriers which were identified from the questionnaires occurred through the interview. In this respect, interview questions were closely related to the questions which were used in the questionnaires and thus main questions and script were to a large degree fixed. However, for flexible interview processes a semi-

structured interview was selected (see Appendix D). Furthermore, each interview began with general questions such as interviewee's experience of the programmes and moved to more specific questions regarding agency interaction and barriers. The interviews were conducted during May 2006. They took between one and two hours to complete. The interviews were audio-taped and note-takings were also made during the interviews.

4.3.6 Secondary sources

In this research, a variety of documents were used as the second source of data. Firstly, the documents related to the selected programmes were important sources to understand policy objectives and functions, instruments, institutional set-ups and funding systems in the delivery system of South Korean innovation policies. Isaksen (1999) argued that the analysis of policy document could provide a programme monitoring system and report information about service provision, clients served, revenues and expenditures. Also this might enable problem diagnosis, project definition and aims and methods of projects to be understood. Government documents were mainly collected from central government bodies such as PCBND, MOCIE, MOEHRD, and SMBA which were involved in the IAC programmes. They were mainly retrieved from the official websites of the bodies, but some sources were collected during fieldwork. The sources included the guidelines of individual programmes, the plans and announcements of programmes, the annual year books and the assessment reports. Secondly, in order to understand R&D and business activities, and industrial structures of the Daegu City region, some relevant statistics were used. The statistics provided important data to explore agency capacity indirectly. They were mainly retrieved from the online database of the National Statistical Office. Also, some reports published were used to explore strengths and weaknesses of the Daegu City region in terms of economic structure such as 'Substances and Development Measures of Industrial Clusters in the Daegu Metropolitan Area' (Daegu City, 2003) and 'Development Measures of Venture Enhancement District in the Daegu Region (Daegu Techno-Park, 2003).

4.3.7 Data analysis

This research adopted a mixed method approach – quantitative surveys and qualitative interviews. Thus, in relation to the data collected from the empirical study, this

research used both quantitative and qualitative methods to analyse the data. First, the quantitative data were processed using the Statistical Package of the Social Science (SPSS). As mentioned above, there were four categories of questions. Each category consisted of questions identifying important factors and barriers which influenced the activities of each category. In order to identify the barriers that firms and universities perceived as, this research used simple frequency analysis. Also, some data which showed outstanding figures were analysed by cross-tabulations. In order to test whether the results of cross-tabulations were significant or not, a chi-square test was used. With respect to the analysis of qualitative data, according to Yin (2003), one of the strategies to analyse qualitative data was to follow the theoretical proposition (the research questions and the review of literature). In this respect, this research considered the research questions and the literature review as important in the analysis of the qualitative data. Based on the findings from the analysis of the survey data, the analysis of the qualitative data focused on the research question of how the perceived barriers occurred in the IAC policy delivery system within Daegu City. The behaviours and perceptions of agencies and the specific contextual factors, which influence the barriers, were explored on the basis of the theoretical construct from the literature review. Moreover, the analysis was devoted to understanding the relationship between agency behaviours and the contextual factors, and between individual barriers. In particular, the implementation of the programmes had a series of processes: a scheme establishment; submission and selection of proposals; and performance of the programmes. As the characteristics and types of interaction and the main issues arising from each process might vary, the analysis was developed on the basis of the implementation process of the programmes.

4.4 Validity and reliability

Research results are of no value if the methods by which they are derived have no legitimacy (Newman and Benz, 1998). There have been four tests used to establish the quality of the empirical social science study: construct validity, internal validity, external validity and reliability (Yin, 2003)

Construct validity implies establishing correct operational measures for the concepts being studied (Yin, 2003). For construct validity, an analytical construct in this

research was developed on the basis of integration of different conceptual approaches, such as the agency-structure relation based on structuration theory, the typology of innovation support systems and the notion of demand-side coherence. Moreover, in order to conceptualise the barriers to impeding interaction, this research explored some related concepts such as policy network, public-private partnerships (PPPs), and network theory.

Internal validity refers to establishing casual relationships, whereby certain conditions are shown to lead to other conditions, as distinguished from spurious relationships (Yin, 2003). Thus, internal validity is a concern for explanatory studies, where causal relationships between variables are studied. In order to understand relationships between agency interaction and policy delivery systems, this research explored the agency-structure relations and the typology of innovation support systems which explained the relationships. Through the literature review, it was possible to draw out potential factors and barriers which might influence agency interaction in policy delivery systems. Moreover, most factors and barriers used in the questionnaires have been used in previous studies.

External validity means establishing the domain to which a study's findings could be generalised (Yin, 2003). This has particularly been an important issue in quantitative research. According to Bryman (2004) in order to be able to generalise research findings, the sample must be representative. Given firm and university sampling as explained above, the representativeness in the sample of the population was seen as being relatively high. With respect to generalisation of research findings, Yin (2003) stressed the importance of analytical generalisation, in which empirical data were compared with a theoretical template. In this study, through stucturation theory and the typology of innovation support system, it can be assumed that the degree of interaction between local agencies would not be fostered in policy delivery system in a highly centralised country like South Korea. Therefore, there would be many barriers to the interaction when national innovation policies for regional innovation in Korea were implemented. This assumption was analysed through the empirical data.

Reliability is satisfactory if another researcher could conduct the same research and draw the same conclusions (Bell, 1993). Black (1999) argued that there were three

aspects in the reliability concept: consistency over time (or stability), internal consistency, and consistency between observers. Among them, one measure which has been often used in quantitative survey research is internal consistency. Internal consistency means that the individual items or indicators of the scale should be measuring the same construct, and should therefore be highly intercorrelated (Hair et al., 1998). One common method to measure internal reliability has been Cronbach's alpha. Hair et al. (2003) argued that Coefficient alpha ranged between zero (no internal reliability) and 1 (perfect internal reliability), and an alpha of 0.7 was generally considered the minimum acceptable value (Hair et al., 2003). Moreover, in internal reliability, "the item analysis requires a sample size of about 100 to 200 respondents" (Spector, 1992, p. 29). In this respect, the reliability for this study was assessed in the firm questionnaire, in which the number of respondents was over 100, using Cronbach's alpha. Since the questions used in the university questionnaire were very similar, there might be no problem in assessing the construct of the questions in the university questionnaire with the Cronbach's alpha of the firm questionnaire. All values were above the generally accepted level of 0.7 (see Table 4.10).

Table 4.10 Analysis of reliability in the firm questionnaire

Construct	Cronbach's Alpha	No. of Items
Interaction between firm and university	0.808	9
Interaction between firm and government	0.856	12
Co-ordination of programmes	0.821	8
Local networking activities	0.743	12

Source: author

Also, the items in questionnaire construction, which other researchers used, were used and an effort to design a clear and easy questionnaire was made. Moreover, before being sent out, the questionnaire was pre-tested by some experts and two firm owners. Also, two more mailing waves were conducted to increase response rate and thus, more completed surveys (49 from firms and 14 from universities) were received. These efforts would also increase the reliability and reduce possible problems affecting the reliability.

Chapter 5 The characteristics of the national programmes and the study region selected

Policy delivery systems and agency capacity can be seen as important factors that influence agency interaction. Parsons (1995) argued that a policy delivery system was the mix of instruments, institutions, and values which were used in delivering policy. Keating et al. (2003) stressed that the behaviour of economic actors were locally shaped by institutional incentives, learned behaviour of routines and cultural values and norms. The characteristics of the selected programmes including instruments, institutions and rules and the profile of the selected study area can provide background information in understanding the delivery system of the programmes and agency capacity to respond to policies in the empirical study.

In the previous chapter, several national IAC programmes and the Daegu City region for the empirical study were selected. In this respect, this chapter deals with rationales for the selected programmes, aims, contents, implementation structure and procedure of the programmes, and discusses the industrial structure, IAC activities, problems of local economy and innovation policies in the Daegu City region. Based on these discussions, this chapter concludes by drawing out some issues which the features of the programmes and the study area implicate in terms of demand-side coherence.

5.1 The main features of the national IAC programmes

In Korea, the Ministry of Education and Human Resources Development (2003) defined industry-academia collaboration (IAC) as interaction between firms and universities to prompt R&D and technological development, to cultivate human resources, to commercialise technology transfer and to establish business. More formally, the act for industry-academia collaboration defined it more inclusively. According to Industrial Education Promotion and Industry-Education Institute Collaboration Facilitation Act, IAC was defined a series of activities which education institutes, government, local authorities, public research institutes and industry were to conduct collaboratively. The activities were: 1) to cultivate human resources in

respond to the demand of industry and future industrial development; 2) R&D for creating and diffusing new knowledge and technology; 3) technology transfer toward industry and industrial consultation. In this respect, the following national programmes that aimed to promote such activities at the local level were selected for this research: 1) Techno-Parks; 2) Technology Innovation Centres; 3) Regional Research Centres; 4) University, Industry and Research Institution Consortia; 5) Business Incubators; and 6) the Central University Programme for IAC.

5.1.1 Rationales, aims and contents of the selected programmes

Techno-Park (TP) programme

The techno park programme was designed to establish complexes in regions in order to develop technological innovation and technology-intensive industry through collaboration of university, firms and research institutions at the local level (Lee and Oh, 1999). Unlike an large industrial complex in which many large companies were located, this programme aimed to build specific space and infrastructure in order to gather R&D capacities of industry, university, and research institution and to facilitate their networking activities and collaborative R&D. Also, it aimed to support business establishment of venture enterprises with high technology for LED and national competitiveness (Lee and Oh, 1999). Its functions were research and development, technology business incubation, training and education, information interchange, and test laboratory for commercialising research outcomes. The Korean government launched this programme in 1998, designating six regions as a model. In 2000, TPs in two regions solely financed by the private sector (i.e. universities and firms) and local authorities were established. Also, in 2003 TPs were additionally built in four regions. The central government, local government and university co-financed this programme. Central government funds were used for establishing main facilities and purchasing equipment and local government and private sector funds were used for securing offices and managing TPs. The six early established TPs were funded from 1998 to 2002 by central government and local governments. Also, unlike other programmes where private sector was an applicant, the applicant for a TP programme was a local authority.

Technology Innovation Centre (TIC) and Regional Research Centre (RRC)

The Technology Innovation Centre (TIC) and the Regional Research Centre (RRC) programmes began in the same year and for similar purposes. The TIC was for supporting SMEs which could not afford to buy expensive research equipment due to lack of financial resources and thus, it mainly focused on constructing shared research equipment (Kim, 2002). In particular, in accordance with regionalisation, the government began with this programme in order to concentrate R&D resources in regions where SMEs were lacking in technology development and the function of regional technology support institutions was insufficient. This programme was designed to promote local IAC through the joint use of R&D facilities and equipments, and to share information for the commercialisation of advanced technologies. This aimed to enhance the capacity of SMEs' technology development by establishing a research centre armed with expensive R&D equipment in universities. Its main operations were: collective research between university and industry; education and training for engineers; information circulation and provision; business establishment support; and research equipment management. Each centre was supported by central government and local government for five years. University, firms and local government co-financed the cost used in establishing and managing the centre, and the central government supported the cost for purchasing research equipment. Between 1995 and 2002, MOCIE designated and supported 39 centres throughout the whole country. In Daegu City, a TIC for mechanics and electronics at Kyungbuk National University operated between 1996 and 2000. Also, in 2002 another TIC for the metalworking industry was established at Youngjin Junior college.

The Regional Research Centres (RRCs) were established in order to facilitate regional specialised industries and to enhance research capacities of local universities and connect them with regional industry. The RRC programme provided an opportunity for universities, local governments, and industries to collaborate with each other, by establishing a research centre at a regional university to perform basic or applied research conducive to the regional specialised industry. In addition, RRCs contributed to the development of regional communities and reinforced the competitiveness of regional industries by transferring research results and by training and providing high quality specialised human resources. The RRC programme was similar to the TIC in the sense that they all were established at university for reinforcing the

competitiveness of regional industry with utilising regional research resources. However, while TIC aimed to establish expensive research equipment, the RRC focused on basic R&D performance. This programme could last at most 9 years. Between 1995 and 2005, 65 RRCs were established throughout whole regions. Four RRCs operated in the Daegu City region.

University, Industry and Research Institute Consortium (UIRIC) programme

This programme was designed to tackle regional SMEs' practical bottlenecks. In general high quality researchers and research equipments were concentrated in universities or research institutions rather than SMEs. Thus, to support SMEs which had weak technology infrastructures, the strategy supporting universities and research institutes to develop technology collectively with SMEs was needed (SMBA, 2006). This programme aimed to build a collaborative system for collective technology development between industry and university through constructing R&D consortia. Also, this focused on tackling regional SMEs' practical bottlenecks which emerged from the scene of production process by utilising research resources of universities and research institutes. For taking part in this programme, a university or a research institutes had to construct a consortium with more than 7 SMEs located in a region. The fund for this project was composed of central government (50%), local authority (25%), and SMEs (25%). The support period of this programme was a year, so that participating firms generally changed every year. Consortia were operated by agreements between university and SMEs. University drew out individual research subjects through discussion with participant SMEs. The number of consortiums and subjects differed with regions. In Daegu City, 7 consortiums with participation of 99 regional SMEs operated in 2004, and 99 R&D subjects were conducted.

Business Incubator (BI) programme

The Business Incubator (BI) programme strongly reflected the particular situation of South Korea in the late 1990s. Since 1997, when South Korea experienced a finance crisis, there had been a need of conversion of economic structure from traditional industries to knowledge-based industries. At the same time massive unemployment which had resulted from the economic crisis was a crucial social problem. On the basis of these social and economic changes, government began support for

establishing Business Incubators in order to promote a knowledge-based economy and job creation since 1998 (SMBA, 2005). Thus, the BI programme aimed to provide preliminary founders and start-ups with synthetic supports, for example, providing business spaces, supervising management and technology, and providing information in order to increase successful business establishment. This programme focused on facilitating business creation by reducing the uncertainty of business establishment, providing the firms in the early stage of business with technology and management resources. Applicants for this programme had to prepare a series of conditions such as the space and building for start-ups, collaboration equipments, and more than three experts for management. The BI appointed by SMBA could be given government fund for building, maintaining, and renting a centre. Also, SMBA supported the expenses for managing the centre. Unlike other IAC programmes above, local authority's participation in this project was not always required, but generally local governments financed local BI centres. There were 242 BI centres throughout country in 2005, and the majority of centres were located in a university (83%). In the Daegu City there were 11 BI centres occupied by 155 start-ups. Among these, eight BI centres were operated by educational institutions.

Central University for Industry-Academia Collaboration (CUIAC) programme

This programme was launched to overcome the problems of existing IAC projects and to facilitate linkages between universities and industrial complexes (MOEHRD and MOCIE, 2004). There were around 500 industrial complexes which played an important role in national economic development. However, they generally function as simple manufacture and production without R&D bodies such as universities and research institutions in them. Thus, they had difficulties in facilitating regional technology development. In this respect, there was a need to enhance R&D function of industrial complexes through universities that were provided with collective research equipments and facilities by government. Therefore, this programme aimed to expand research function and network capacity in industrial complex by supporting synthetic measures for technology innovation, such as technology development, human resources cultivation, infrastructure establishment through university which could collaborate with industrial complexes. Its functions were R&D support for firms, technology and management guidance for tackling firms' problems, establishment and

operation of a support centre for collaboration research equipments, establishment and provision of infrastructure for enhancing networks between university and firm and between firms, and cultivation and provision of human resources to meet demands of local firms. This programme was collectively designed and implemented by two ministries, MOEHRD and MOCIE. Government integrated 16 upper governments' administrative areas into 8 large areas, and then selected one university in each large area and supported the university for five years. The Daegu City was combined with Kyungbuk Province, which was an adjacent upper government, and then Kyungbuk University in the Daegu City was selected in the combined area in 2004.

The six selected IAC programmes for this study are summarised in Table 5.1. Although their main objectives were slightly different, they shared a common aim to enhance regional R&D capacity in combination with measures to tackle SMEs' difficulties. They had similar functions such as collective R&D, information exchange, technology transfer, and business incubation. However, the BI programme aiming to support business establishment did not have a R&D support function. Also, most applicants were the departments of universities and these became the main programme implementing organisations. However, for the TP programme, local governments were applicants and the programme was managed by a TP foundation established by a joint investment of the central and local government and universities. In addition, the central government required local governments to participate in the programmes and also the central government induced applicants' plans to meet regional industrial development strategy. This was probably because they were designed to develop regional R&D capacity and economy. However, the share of local government's funding in total expenses differed with programmes. Unlike the UIRIC and CUPIA, local governments' funding ratios in other programmes were not fixed because they were determined by the agreement between applicants and local governments. In terms of time period of support, most programmes were carried out on the basis of long-term investment. In particular RRC lasted at most for 9 years because it focused on basic research, but the UIRIC aiming to tackle SMEs' practical difficulties of production process was carried out every year.

Table 5.1 The summary of the selected national IAC programmes

Programmes	TP	TIC	RRC	UIRIC	BI	CUIAC
Ministry	MOCIE	MOCIE	MOCIE	SMBA	SMBA	MOEHRD/ MOCIE
Main Objective	To establish R&D complexes	To establish R&D centres with expensive research equipment	To establish research centres for fundamental or applied science and technology	To construct consortia for collective research for SMEs	To provide start-ups with synthetic support	To support industrial complex through universities
Applicant	LG	University, Public research Institute	University	University, Public research institute	University, Public research institution, LG	University
Managing Organisation	TP Foundation	University, Public research Institute	University	University, Public research institute	University, Public research institution LG	University
Main Functions	R&D, Business incubation, Education/training, Information interchange, Test laboratory	Collective research, Education/training, Information circulation and provision, Equipment utilisation	Research for regional industry, Technology transfer of research results, Education /training	Collective research	Business space, Management and technology guidance, Information provision	R&C centre, Technology and management guidance, Human resources cultivation
Main Targeting Firm	Ventures	General firms	General firms	General firms	Small start-ups	General firms
LG's Participation	Requisite	Requisite	Requisite	Requisite	Not requisite	Requisite
Proportion of LG's Funding in total expenses	15-65%	5-10%	5-10%	25%	N.A	5%
Time period of support	5 years	5 years	9 years	1 year	1 year	5 years

LG: Local government

Source: compiled by the author

5.1.2 Implementation structure and procedure

The procedures of the programmes were mostly similar, but their organisational set-ups to carry out the programmes were slightly different. Thus, it is necessary to explore the organisational set-ups in accordance with the procedures to investigate how and what agencies were involved in each procedure. The general procedure can be divided into nine stages; (i) a scheme establishment and a public notice; (ii) submission and acceptance of proposals; (iii) deliberation and assessment of proposals; (iv) selection of programme implementing organisation; (v) amendment

and complement of proposals; (vi) agreement; (vii) performance of programme; (viii) evaluation; and (ix) calculation of fund used.

In these stages, from a scheme establishment and a public notice to submission and acceptance of proposals the procedure in each programme was nearly the same. Ministries announced publicly their plans about individual programmes. After a public announcement, qualified applicants could apply for the projects, preparing proposals in accordance with the ministries' guidelines. Also, when they submitted their proposals to government, they had to meet conditions set by government such as the agreements of participation and the funding schemes of local governments and firms. After receiving proposals across regions, government processed the procedure of project selection as explained below. Mostly ministries had slightly different procedures and structures for selecting proposals and carrying out the programmes.

First, every ministry established certain type of committee such as 'Deliberation or Management Committee' to select programme implementing organisations among applicants through deliberation and coordination. As they were primary committees, important affairs regarding programmes were decided by the committees. The committees were generally composed of experts from industry and university, and senior government officers. Also in some programmes there were sub-committees for supporting deliberation committees or evaluation committees. However, the compositions of these committees differed with programmes and their official titles were different.

Second, most of the ministries designated some public institutes for effective evaluation and management of the programmes. These institutes were generally responsible for practical affairs such as the first investigation of applicants' proposals, the support of the committees, the first evaluation of performance, and the calculation of programme funds. They were public institutes established pursuant to special laws in order to deal with government-funded industrial and technological development programmes. Currently, the Korea Industrial Technology Foundation (KOTEF) was in charge of the CUPIA programme, and the Korea Institute of Industrial Technology Evaluation and Planning (ITEP) was responsible for the TP, RRC and TIC

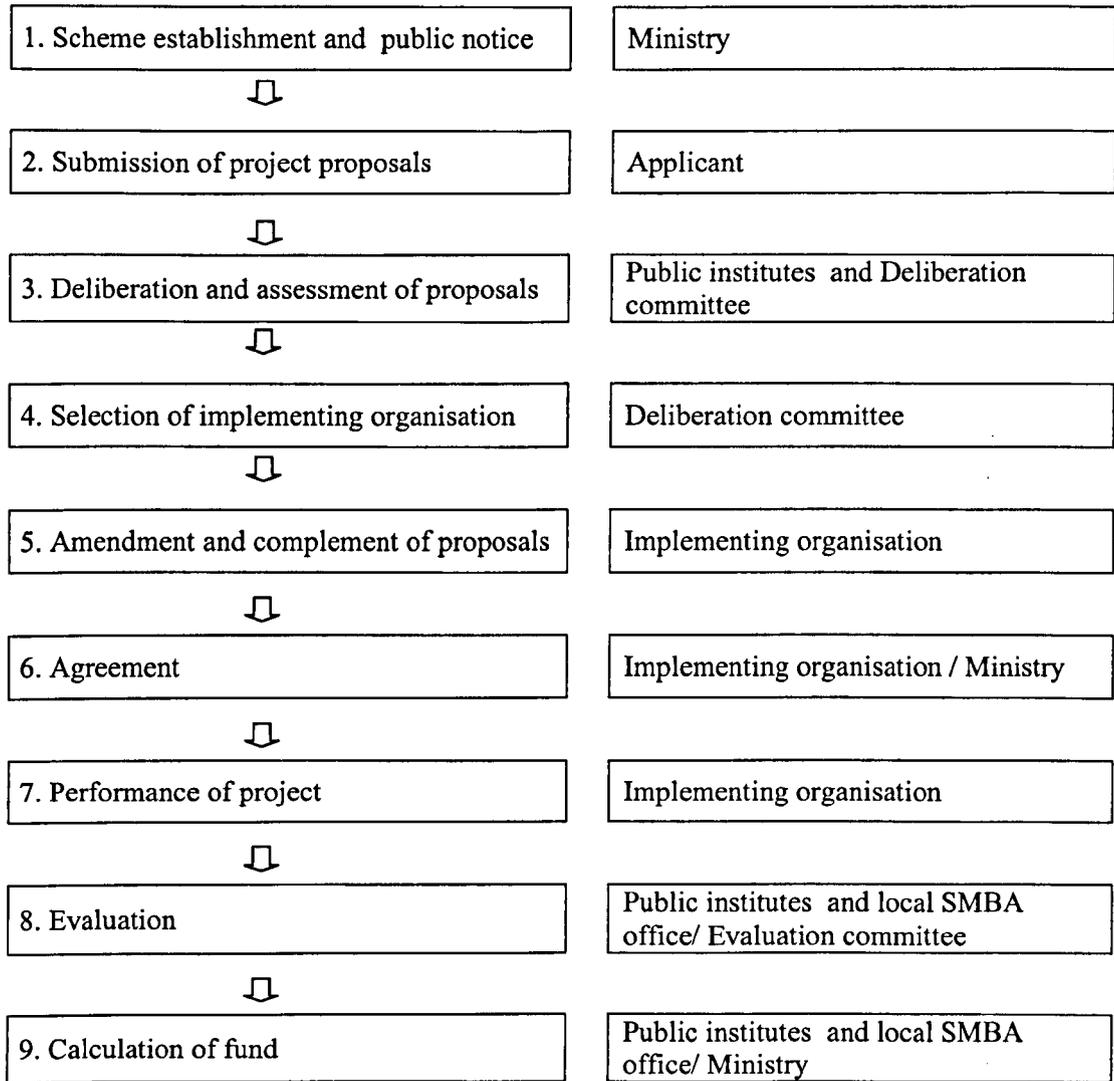
programmes. However, in the UIRIC and BI programmes carried out by SMBA, local SMBA offices carried out these practical affairs.

Third, if an implementing organisation was selected by deliberation committee and ministries, the budgets of the central government and local government were invested in individual programmes. Thus, the implementing organisation responsible for programme performance at the local level carries out the programme on the basis of the plan proposed to government. During the implementation process, if there was a need to amend the plan, the implementing organisation could change the plan under a permit by the central government.

Fourth, every programme had an evaluation system for securing the appropriateness and efficiency of programme performance. Thus, in most programmes evaluation committees were established to evaluate the middle and final performances of individual programmes, and to investigate and coordinate funds of programmes. In general, for effective deliberation of the evaluation committees, the public institutes firstly evaluated the performance and the result of the programmes. However, in the UIRIC and BI programmes, local SMBA offices evaluated individual consortiums and centres without an evaluation committee. In particular, unlike other programmes in the UIRIC programme local government had an authority to evaluate the performances of consortiums with a local SMBA office.

Consequently, the general procedure for those projects can be summarised as Figure 5.1. Also, general organisational set-ups of the programmes can be largely divided into three types. The TP, TIC, RRC and CUPIA programmes had similar the organisational set-ups, but the BI and UIRIC programmes showed different types (see Appendix B).

Figure 5.1 General implementation procedures of the programmes



Note: public institutes are ITEP and KOTEF
Source: author

5.1.3 Instruments used in the programmes

Individual policy instruments in the programmes were similar in the sense that most programmes were operated by programme guidelines, support funds, and sanctions. First, there was guideline in each programme set up by ministry for effective performance and systemic management. In general, it included the objective of the programme, the procedure and method of selecting programme implementing organisation, the operating system of the programme, the contents of support, the amendment of agreements, and the report and evaluation of results, etc. These acted as

basic rules and regulations to restrain the ministry, the implementing organisation, and participating organisations.

Second, the supporting fund was the most important instrument. This could be an instrument to enable the implementing organisations to perform programmes, and for central government and local government, this was one of public financial activities. In the programmes, the share of central government's fund was the highest in the sense that they were basically national projects operated by the central government. However, the individual share of central government's funding differed with programmes. It was less than 50% in the UIRIC and TP programmes, at most 75% in the CUPIA, TIC and RRC programmes. The notable point in funding structure was that the funding of central government was generally supported by cash, but for implementing and participating organisations investment in kind was possible. Thus, the central government wanted the implementing and participating organisations to secure spaces for the programmes with their budgets.

Third, the sanctions in the programmes were essential methods for the regulation by the central government with reports and evaluations of performance and results. If there were agreement contraventions, poor performance or the submission of false reports, central government could cancel the programmes, and suspend and withdraw funding. Also, in some cases, the central government could prevent participants from applying for government programmes for some period. These kinds of punishments were similar in the programmes, and the punishments were carried out on the basis of the reports and evaluations in the middle or the end of performance.

5.1.4 Local government's engagement in the programmes

As the main interest of this research was agency interaction in the delivery system of the programmes, it is necessary to explore the legitimate role of local government, one of the important local agencies, in the programmes. In particular, in order to understand diverse interactions between local agencies, the national IAC programmes in which local governments participated were selected. Thus, investigating local government's engagement in the programmes on the basis of programme guidelines can provide background information for the empirical study. As mentioned above,

local government's participation in the programmes was a prerequisite. Ministries required applicants to attach a confirmation letter of the local government's participation and funding scheme when they submitted proposals to government. In this regard, in some cases local government's intention could determine whether the programmes could be implemented or not in the region.

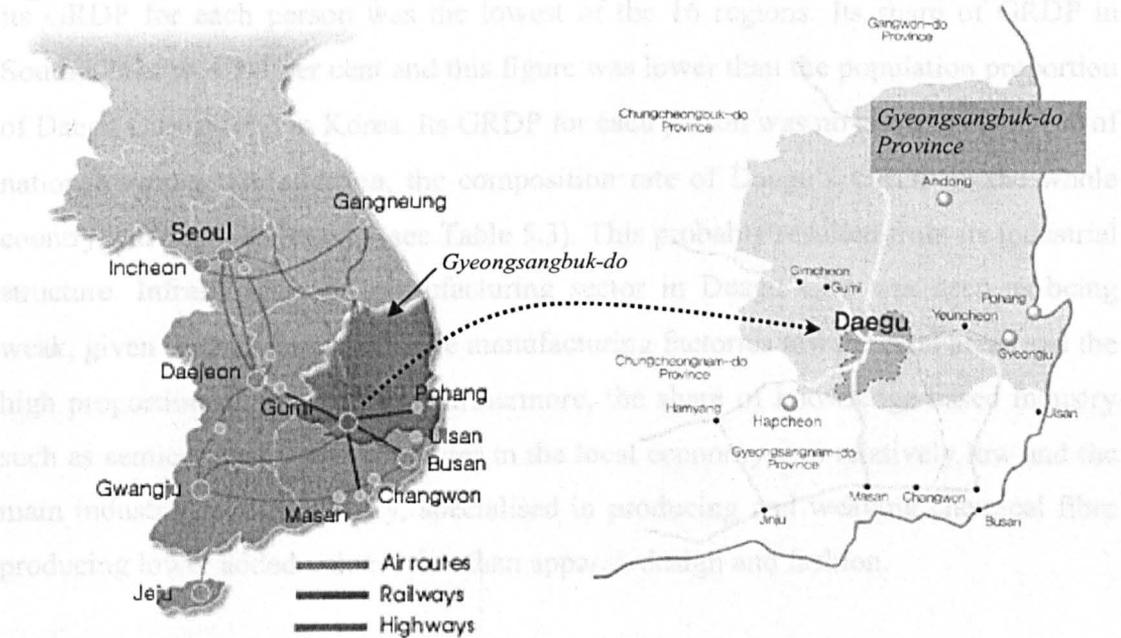
However, although local government's participation was essential, local governments did not seem to play a key role in the implementation process of the programme. According to programme guidelines of the TIC, RRC, CUPIA local governments just took part in these programmes as one of participants, so that they did not seem to have an authority to guide, supervise, evaluate, and design the programmes at the local level. They just supported the fund which was normally allocated by central government. However, they seemed to play a greater role in the TP and UIRIC programmes. In the TP programmes local governments could have duties and authorities to manage and supervise the fund which they invested in the project, and also a mayor or a governor of local government played an important role in operating TP foundation as the chairman of a board of directors. In addition, in the UIRIC programme local governments could attend Local Consortium Operation Committee as a member, and could evaluate this programme. However, even so, there might be limits to local governments' role in dealing with the implementation process of these two programmes in the sense that as explored above, the central government seemed to decide the majority of important contents in operating the programmes and the programme guidelines and crucial decision made by the central government seemed to constrain the activities of the local government in the programmes.

5.2 Local economy in Daegu City

Daegu was situated in the centre of the south-eastern industrial regions of Gumi (electronics), Pohang (steel), Ulsan (automobile, ship building, petrochemistry), Changwon (machinery), and Masan (free trade). Daegu was geographically located in Gyeongsangbuk-do province, one of 16 upper local governments because Daegu had belonged to Gyeongsangbuk-do. Until 1980 the governor of Gyeongsangbuk-do controlled Daegu City. However, in 1981, Daegu was raised to a city under the direct

control of central government, taking many bordering regions into its territory. In 1988, this area became a new district, Dalseo-gu, and made up of 7 gu offices throughout the city. In January 1995, Daegu was renamed again to Daegu Metropolitan City, a self-governing city, and in March 1995, was constituted as 8 administrative districts, 7 gus and 1 gun, Dalseong-gun). The City of Daegu contained 5.2% of the national population of 47,041,434, having a population of 2,456,016 and a population density of 2,866 people per square kilometre in 2005. Population growth as a yearly percentage had slowed considerably for the last 10 years, compared with earlier period of the 1960s, 1970s and 1980s.

Figure 5.2 Location of Daegu City



Source: compiled by author

Daegu has a typical urban industrial structure showing the high proportion of service business. As indicated in table 6.2, Daegu’s GRDP (Gross Regional Domestic Product) consisted of 0.5% of primary industry (agriculture), 19.3% of secondary industry (manufacturing), and 80.2% of tertiary industry (service business). Like other metropolitan cities, the proportion of manufacturing industry in Daegu’s economy had been declining. This was likely to result from urbanisation, increase of land price and difficulties in establishing industrial complexes. On the other hand, service industry

was continuously increasing (see the Table 5.2). Its share in Daegu's GRDP accounted for 64.9% of in 1986, but it grew to occupy 80.2% in 2005

Table 5.2 Industrial structure by GRDP in Daegu City

Industry	Primary (%)	Secondary (%)	Tertiary (%)
1986	1.1	34.0	64.9
1997	0.9	23.6	75.5
2005	0.5	19.3	80.2

Source: Korea National Statistic Office

Daegu's GRDP (2005) was ranked eleventh of the 16 upper level local authorities, and its GRDP for each person was the lowest of the 16 regions. Its share of GRDP in South Korea was 3.3 per cent and this figure was lower than the population proportion of Daegu City (5.4%) in Korea. Its GRDP for each person was no more than 62.4 % of national average. In addition, the composition rate of Daegu's GRDP in the whole country had been decreasing (see Table 5.3). This probably resulted from its industrial structure. Infrastructure of manufacturing sector in Daegu City was seen as being weak, given the movement of large manufacturing factories toward rural areas and the high proportion of small firms. Furthermore, the share of knowledge-based industry such as semiconductor and computer in the local economy was relatively low and the main industry, textile industry, specialised in producing and weaving chemical fibre producing lower added value rather than apparel, design and fashion.

Table 5.3 Composition ratio of Daegu's GRDP in the whole country

1985	1990	1995	2000	2005
4.3%	4.4	3.8	3.6	3.3

Source: Korea National Statistic Office

In terms of the manufacturing sector in Daegu city, the number of firms with over 5 employees was 6,928 in 2005, occupying 5.9 per cent of the whole country. Also the employees of the firms was 121,785, accounting for 4.2 per cent of the whole country. Even if there were diverse industries in manufacturing sector, textile, machinery and metal industries were the main industries. As indicated in the table 6.4, they accounted for 25.4 %, 17.9% and 20.4% of the employment in manufacturing sector of the local economy respectively. In particular, since the textile industry had traditionally been

the largest segment of manufacturing in Daegu, it was known as a textile city in Korea. In 2002 Daegu's textile industry accounted for 11.0% of total establishments in Korea's textile industry, 12.3% of total textile employment, 14.5% of total textile production, and 8.3% of total textile exports of Korea. However, the proportion of the textile industry was gradually decreasing because of rising labour cost and global market competition while the share of machinery and metal industry in Daegu's industrial structure were incrementally increasing. The share of the textile industry showed a dramatic drop of 20% points between 1995 and 2005 (Table 5.4).

Table 5.4 The composition of main industries in Daegu's manufacturing sector

	1995		2001		2005	
	Number of works	Value-added	Number of works	Value-added	Number of works	Value-added
Whole Manufacturing	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Textile	42.3	37.6	38.2	31.3	25.4	17.5
Metal	10.9	11.2	12.8	12.8	17.9	17.3
Machinery	19.4	18.5	19.4	19.4	20.4	21.1
Electronics	1.1	0.8	1.9	1.8	4.2	6.6
Motor Vehicles	9.6	10.1	10.2	12.4	11.2	13.7
Others	16.6	21.7	17.6	22.4	20.9	23.8

Source: Korea National Statistical Office

In addition, large firms with over 300 employees accounted for only 0.2% of all manufacturing firms of Daegu City. Thus, the proportion of SMEs with below 300 employees was reaching at 99.8%. In particular, the share of firms with 5-9 employees was the highest occupying 57.2% (Table 5.5). That is, Daegu was one of the cities where the share of SMEs was very high.

Table 5.5 The composition rate of manufacturing by employment size in Daegu (2003)

5-9 employees	10-19	20-49	50-99	100-199	200-299	300-499	Over 500
57.2%	23.1	13.9	3.8	1.3	0.3	0.1	0.1

Source: Korea National Statistical Office

Since there were few large companies leading to technological innovation of local SMEs, the regional production structure was quite weak. This is one of the reasons why Daegu's GRDP was low. Furthermore, a more important problem was that production systems of dominant industries such as textile, metal, and machinery industries were mainly focusing on working by simple assembly without improving technology (MOST & Daegu City, 2004). That is, R&D intensity and value-added

production of most regional SMEs were relatively low. Table 5.6 shows figures regarding amount of value-added production per each worker by metropolitan cities. According to this figure, Daegu's amount of value-added production per each worker was considerably low, being no more than 77.5 per cent of national average.

Table 5.6 Amount of value-added production per each worker by metropolitan city

	Comparison rate of national average (%)
National average	100.0
Seoul	82.3
Busan	70.9
Daegu	77.5
Incheon	94.2
Gwangju	84.7
Daejeon	122.4
Ulsan	181.6

Source: Korea National Statistical Office

This research was concerned with R&D activities. As mentioned above, one of research interests was interaction between firms and universities and the selected programmes aimed to promote local collaboration between them. Although there are a variety of types of interactions between them, collaborative R&D activities can be seen as a common type. Thus, the exploration of R&D activities and capacities of local firms and universities helps to obtain background information to understand collaborative R&D between them.

Despite a spread of knowledge-based economy a proportion of knowledge-based industries such as computer, semi-conductor, high-tech electronics and communication machinery were quite low in Daegu's SMEs (Daegu City Government, 2004). In other words, the local industrial structure was still dominated by traditional industries and it was not properly restructured toward knowledge-based economy. Such situations seemed to more clearly appear in R&D activities of the Daegu City. The level of R&D activities in the Daegu City was relatively low because it occupied 1.4% of R&D organisations in Korea, 2.9% of R&D human resources, and 1.6% of R&D expenditure in 2002 (see Table 5.7). These shares were much lower than the composition rate (5.3%) of Daegu's population in Korea.

Table 5.7 R&D activities in Daegu (2002)

		Total	Public R&D Institute	Educational Institute	Industry
R&D Organisation (Each)	Whole Country	7,554	211	389	6,954
	Daegu City	214	7	16	191
	Composition Rate in Daegu (%)	100.0%	3.3	7.5	89.3
	Composition Rate in Korea (%)	2.8%	3.3%	4.1%	2.7%
R&D Human Resource (Person)	Whole Country	279,806	21,702	111,083	147,021
	Daegu City	8,052	351	5,488	2,213
	Composition Rate in Daegu (%)	100.0%	4.4	68.2	27.5
	Composition Rate in Korea (%)	2.9%	1.6%	4.9%	1.5%
R&D Expenditure (Million Pounds)	Whole Country	9,365.0	1,380.0	971.4	7,013.7
	Daegu City	146.4	6.8	81.4	58.3
	Composition Rate in Daegu (%)	100.0%	4.6	55.6	39.8
	Composition Rate in Korea (%)	1.6%	0.5%	8.4%	0.8%

Source: Report on the survey of R&D in science and technology (MOST & KISTEP, 2003)

In particular, R&D activities of public R&D institutes and industry seemed to be relatively weak. This might be partly because Daegu's industrial structure consisted of textile and metal industries whose R&D intensities were relatively low and the proportion of SMEs in Daegu was higher than other regions (MOST & Daegu City, 2003). Korea was one of nations which have high proportion of SMEs. In particular a proportion of SMEs was slightly higher in metropolitan area than province area (see Table 5.8). The proportion of SMEs investigated in terms of number of firms in metropolitan areas was 99.6%, while the figures in province areas were 99.2%. Also, the average proportion of SMEs in metropolitan areas, which was investigated in terms of number of workers who are working in SMEs with below 300 employees, was higher than that of province areas.

Table 5.8 The Share of SMEs by regions in South Korea (2004)

		Number of firms			Number of workers		
		Total	SMEs	%	Total	SMEs	%
Whole country		113310	112610	99.4	2798192	2120583	75.8
Metro-politan	Sub total	50577	50383	99.6	1002880	787593	78.5
	Seoul	19264	19212	99.7	266917	234799	88.0
	Busan	9256	9228	99.7	170557	147111	86.3
	Daegu	7068	7052	99.8	124439	115106	92.5
	Incheon	10094	10056	99.6	206834	175069	84.6
	Gwangju	2073	2057	99.2	58514	36667	62.7
	Daejeon	1265	1255	99.2	34979	26376	75.4
	Ulsan	1557	1523	97.8	140640	52465	37.3
Province	Sub total	62733	62227	99.2	1795312	1332990	74.2
	Gyeonggi-do	34766	34598	99.5	823031	660521	80.3
	Gangwon-do	1613	1600	99.2	33622	26820	79.8
	Chungcheongbuk-do	2882	2840	98.5	112120	79157	70.6
	Chungcheongnam-do	3820	3768	98.6	157850	111328	70.5
	Jeollabuk-do	2368	2346	99.1	72422	53229	73.5
	Jeollanam-do	2549	2531	99.3	68629	46044	67.1
	Gyeongsangbuk-do	5838	5743	98.4	226021	144380	63.9
	Gyeongsangnam-do	8560	8464	98.9	297089	206983	69.7
	Jeju-do	337	337	100.0	4528	4528	100.0

Source: Korea National Statistical Office

According to the Table 5.8, Daegu was a region where a proportion of SMEs was the highest throughout Korea. In particular, in terms of the proportion of SMEs by number of worker who were working in SMEs with below 300 employees Daegu' figure was even higher than other metropolitan cities. This economic structure was probably one of reasons for weak R&D activities of industry in Daegu City. However, the proportion of R&D activities of educational institutes was even higher than other sectors. 68.2% of R&D human resources and 55.6% of R&D expenditure in Daegu concentrated in educational institutions (see Table 5.7). In particular, R&D expenditure of educational institute in Daegu City accounted for 8.4% of that of whole country. In this respect it was likely that R&D activities in Daegu were mainly carried out in educational institutions. In South Korea there were 339 high educational institutes; 161 universities, 20 industrial universities and 158 junior colleges. As indicated in table 6.8, more than a third of them concentrated in the national capital region (Seoul, Incheon, and Gyeonggi-do) like other national resources such as industry, finance, politics etc. Also, these universities in the national capital region, generally, had better reputation than those in other regions. In Daegu City there were

three universities and seven junior colleges. However, one of three universities was an education university whose mission was to foster teachers of elementary school. Thus, there were nine higher education institutes which had capabilities of R&D. However, in general, universities were bigger and have more R&D facilities and resources than junior colleges, so that it was likely that two universities led regional R&D activities in higher education institutes sector. As presented in Table 5.9, a number of students in Daegu's higher education institutes were 86,977 occupying 4.6% of whole country and academic staffs are 2,433 accounting for 4.3%. These figures were even higher than the proportion (0.2%) of the number of Daegu's higher education institutes in the whole country. This was because the sizes of two universities were relatively big. In particular the level of their R&D expenditure seemed to be quite high, given the scale of the total R&D expenditure of higher education institutes in Daegu.

Table 5.9 Higher education institutes by regions in South Korea

Region	Number of educational institutes				Number of students	Number of academic staffs	R&D expenditure of educational institutes (£Million)
	Total	U	IU	JC			
Total	350	181	20	158	1,891,017	56,738	971.4
Seoul	55	40	2	13	367,331	13,247	323.1
Busan	25	12	1	12	173,013	5,028	47.7
Daegu	10	3	0	7	86,977	2,433	81.4
Incheon	10	5	0	5	49,515	1,635	23.7
Gwangju	16	8	1	7	89,375	2,605	46.7
Daejeon	14	7	2	5	93,668	2,535	94.4
Ulsan	2	1	0	1	18,090	793	12.2
Gyeonggi-do	56	23	2	31	281,590	6,921	118.7
Gangwon-do	19	9	1	9	84,750	2,839	18.8
Chungcheongbuk-do	16	9	1	6	80,247	2,421	17.1
Chungcheongnam-do	23	12	2	9	119,659	3,654	25.8
Jeollabuk-do	21	9	1	11	101,323	3,150	27.4
Jeollanam-do	23	10	2	11	64,005	1,951	24.1
Gyeongsangbuk-do	36	16	2	18	161,335	4,265	84.0
Gyeongsangnam-do	18	5	1	10	97,734	2,544	23.9
Jeju-do	6	3	0	3	22,405	717	63.6

Source: Regional Science & Technology Yearbook (MOST, 2001), Report on the survey of R&D in science and technology (MOST & KISTEP, 2003)

U: University, IU: Industrial University, JC: Junior Colledge

There were some impediments to the development of local economy in the knowledge-based economy era. First, even though recently the metal and motor

vehicle component industry in regional economy were growing, Daegu' economy had strongly been influenced by the textile industry (KIET, 1998; DGI, 2005). However, the local textile industry was losing its international competitiveness because of a specialisation in the narrow low-value added and low-tech middle stream such as the production and weaving of chemical fibres (Hassink, 2005). This was also affected by rising labour costs, and the competitiveness of low-cost neighbouring countries (e.g. China). The regional economy was, to a large degree, led by a textile industry lacking in R&D and innovation activities, and the regional economy was faced with problems in securing growth engine in knowledge-based economy (DGI, 2005). Second, the proportion of small sized sub-contractors in regional economy was very high (KIET, 1998). Although the share of SMEs in Korea's economy was, generally, high, SMEs in Daegu City were mostly sub-contractors producing simple components according to the order of large firms (KIET, 1998). These firms were lacking in independent marketing and R&D abilities, so that they, generally, could not flexibly and rapidly respond to the changing needs of the market. Accordingly, due to sub-contractor-oriented industrial structure R&D activities in regional economy might be weak. Third, there were few key industrial sectors and firms leading regional economy in knowledge-based economy. Recently, information technology (IT) and bio technology (BT) industries were emerging, but they had not grown as key industrial sectors in the Deagu City region. Thus, Deagu economy was still likely to rely on old traditional industries such as textile, metal and machinery industries in which R&D activities were lower. Also, as the number of large firms in regional economy was small and they also belong to traditional industrial sectors, they did not seem to be key firms leading and expanding regional R&D and innovation activities. Along with such problems, there was no public institution in emerging sectors such as information technology (IT) and bio technology (BT), so that it might be difficult to develop knowledge-based industry in regional economy (DGI, 2005).

Local government tried to overcome such problems in the local economy. In particular, after the beginning of local autonomy in 1995, citizens and local government had attempted to grow more interest in LED than in the past. In the mid 1990s Daegu City government tried to focus on establishing hard infrastructure through large-scale investment projects such as a construction of a subway, a convention centre, and large industrial estates. Even when local autonomy was launched, regional capacity for

designing and performing regional economic development effectively was still weak (Kang, 2000). Thus, the regional economic policy centred on the acquisition of firms and investments based on exogenous strategies rather than endogenous strategies. However, in the late 1990s, in line with the national policy focusing on high-tech SMEs, policies for supporting business start-up of firms with high technology including business incubators in universities and the Daegu Techno-park, were launched with support of the central government. Also, in response to decline of main textile industry, the city launched a large project called the 'Milano Project' (1998-2003) promoting the present middle-stream textile of Daegu into a high value added down-stream textile comprising apparel, design and fashion by the initiative of the central government (Hassink, 2005). Although this project was initiated by the central government, and more than half of the financial input for this project came from the central government, local government played a key role in implementing the project by investing its own budget. Despite these efforts, Daegu's economy did not take a turn for the better and did not become restructured into a high value added industry.

In the 2000s, the City government shifted focus from industrial policy to innovation policy to some degree, in line with the emphasis of the central government on innovation policy and the worldwide spread of knowledge-based economy. In this respect, the City government tried to promote high-tech industries and local R&D activities for the revitalisation of regional economy. After inauguration of a new mayor in 2002, the city aimed at being a science & technology hub in the southeast area in South Korea, and the city government formulated and drove forward a new large project, 'Daegu Techno Polis', for attracting national institutes of science and technology and a variety of private institutes and high-tech companies. In addition, in 2003, a 'Science and Technology Bureau' was established to take responsibility for coordinating regional science and technology policies, building the infrastructure of regional science and technology, and supporting high-tech SMEs in an attempt to support knowledge-based industry (e.g. nano-part industry, mobile-phone industry, etc) and innovative activities of local firms. In this respect, the city government tried to facilitate IAC for enhancing regional knowledge capacity and inducing innovation (Daegu City, 2005). Considering the high proportion of SMEs in regional economy and potential R&D capability of regional educational institutes, IAC in Daegu seemed

to be important to local economy development. Thus, the city government and universities endeavoured to attract diverse national IAC (see Table 5.10).

Table 5.10 The number of the selected IAC programme by metropolitan cities (2005)

	TP	TIC	RRC	UIRIC	BI	CUIAC
Seoul		3		18	34	
Busan	1	3	5	12	18	1
Daegu	1	2	4	7	8	1
Incheon	1	3	4	7	5	
Gwangju	1	2	4	4	14	
Daejeon		2	4	7	17	
Ulsan		2	2	2	3	

Source: MOCIE

5.3 Issues

This chapter has drawn out several issues related to agency interaction and policy co-ordination at the local level which might be important to demand-side coherence. These issues should be taken into account with other factors, which are discussed through the conceptualisation of interaction and policy co-ordination in the analysis of the empirical data.

First, as the selected programmes were carried out by three different ministries such as MOEHRD, MOCIE and SMBA, there might be some potential problems on integration or co-ordination of the programmes at the local level. As mentioned above, the central government tried to enhance co-ordination of the programmes. For example, MOEHRD and MOCIE collectively formulated and implemented the CUIAC programme. Also, the RRC programme, which MOST had responsibility for, was transferred to MOCIE for effective linkage between the TIC and RRC programmes. In addition, MOEHRD encouraged universities to establish IACF for synthetic and systemic management of IAC programmes implemented in the universities. However, if the programmes were carried out by different operating systems and structures of different ministries, there might be limits to co-ordinating the programmes at the local level despite the efforts for policy co-ordination at the central level. Thus, it is necessary to explore to what extent the programmes were co-ordinated at the local level under these circumstances.

The second issue is whether the delivery system of the programmes can foster interaction between firms and universities in the implementation process. In most of the programmes, universities seemed to be a main agency at the local level, considering that they submitted programme proposals to the central government and managed the programmes. In addition, the majority of centres in the programmes were established in universities. In this respect, the role of universities in the IAC programmes seemed to be much more emphasised. However, given that power sharing was one of necessary ingredients to foster interaction as explored in the previous chapter, such implementing structure might cause some barriers constraining interaction between firms and universities. In this respect, there is a need to explore how this implementation structure influences interaction between them in practice. Also, as mentioned in the previous chapter, there might be a variety of factors to influence the interaction between them in the policy process such as their cultures, previous experiences of networking activities, communication, and trust, etc. Thus, these factors should be taken into account together in order to understand the nature of their interaction.

The third is about the role of the central and local governments in the programmes. To some extent, the local government was seen as an important agency in the programmes in the sense that most of the programmes require applicants to attach a letter confirming local government participation and funding in proposals. However, in some programmes the local government did not seem to have legitimate authority to be able to guide, supervise, evaluate and design the programmes. As mentioned in the previous chapters, the degree of local government's empowerment could influence fostering local interaction. Thus, it is necessary to explore to what extent local government is involved in the programmes at the local level in the context of such policy structure. On the contrary, in the programmes the central government was still seen as being the most powerful agency in the sense that the central government seemed to have a majority of authority to design and implement the programmes. As constantly discussed in the previous chapters, such policy delivery system based on strong national initiatives can cause some barriers to agency interaction. Accordingly, there is a need to investigate this issue through specific examples obtained from the empirical studies.

The fourth is about the problems of the industrial structure in the Daegu City region. As noted above, Daegu City's economy was led by the textile industry lacking in R&D and innovative activities and the small sub-contracting firms lacking in independent marketing and R&D abilities for a long time. Thus, there may be some deficits that might act as barriers to voluntary and social networking activities between firms and universities such as organisational thinness, fragmented regional system, and lock-in situation, which are discussed in the previous chapter. Thus, it is assumed that many local firms were lacking in capacity to establish networks with universities. In this respect, it is necessary to investigate to what extent these deficits existed in the issue of local voluntary networking activities between firms and universities in the Daegu City region and to what extent these problems influenced the interaction between them in the policy process.

Chapter 6 Perceived barriers to interaction and policy co-ordination

One of the primary concerns in this research was: what did local agencies perceive as barriers to interaction and policy co-ordination in the implementation process? Many previous studies have indicated such barriers, and in the previous chapter the analysis of the operating system of the Korean IAC programmes and the economic characteristics of the Daegu City region drew out potential problems with agency interaction and policy co-ordination. However, it has not been clear what factors and barriers local firms and universities perceived to be significant and serious in the implementation process. Moreover, it is difficult to understand how the perception of firms and universities, as different organisations with different roles in the policy process, varied. In order to proceed with this research question, this research employed quantitative surveys. This approach had the advantage that local agencies (i.e. firms and universities) could be asked about their perceptions of actual factors and barriers that influenced and impeded interaction and policy co-ordination.

Based on data and results collected in the quantitative surveys, the purpose of this chapter is to identify significant factors and serious barriers to interaction and policy co-ordination perceived by firms and universities, and to explore their different perceptions toward interaction and policy co-ordination. It also discusses possible reasons for any significant survey results, considering the issues drawn out from the selected national programmes and the study region. In section 1 the respondents' experiences of the IAC programme are briefly described. Section 2 presents important factors and barriers to interactions between agencies. Section 3 and 4 present the co-ordination of the IAC programmes and the local networking activities between industry and university in the Daegu City region respectively, discussing outstanding important factors and barriers. Finally a short summary of the results and some limitations of the surveys are provided.

6.1 The respondents' experience of the selected programmes

Among the selected programmes, the share of firms who experienced the University, Industry and Research Institute Consortium (UIRIC) programme was the largest, followed by firms participating in the Central University for Industry Academia Collaboration (CUPIAC) and firms occupying the BI centre (see Table 6.1). As explained in the Chapter 5, in order to increase firm sample size this research selected firms participating in the UIRIC programme for six years from 2000 to 2005. Also, this programme was carried out every year with over 70 firms participating in the programme each year. As a result, around 60% of the firm respondents had experiences of participation in the UIRIC. For the university respondents, the share of university members who experienced the UIRIC programme was also the highest, followed by the TP and the BI centres. Since several university members, who previously experienced some programmes, participated in other programmes, the university respondents' experiences about programme participation were different from the university sample shown in Table 4.3.

Table 6.1 The programmes which the respondents participated in

		Respondents	TP	BI	TIC	RRC	UIRIC	CUPIAC	Other
Firm	N	132	25	27	20	23	76	41	-
	%		18.9	20.5	15.2	17.4	57.6	31.0	-
University	N	34	12	10	5	5	14	5	8
	%		35.3	29.4	14.7	14.7	41.2	14.7	23.5

Source: The survey about barriers to the IAC programmes

In terms of the number of respondents' participation in the programmes, 58.3% of firms participated in only one programme and 26.5% of firms experienced two programmes (see Table 6.2). Also, 15.2% of firms participated in over three programmes. The proportion of university members, who participated in only one programme, was 44.1%, while 35.3% of university members experienced more than two programmes. 20.6% of university members did not experience the selected IAC programmes. Although they did not take part in the programmes, they might have broad and general information and knowledge about the behaviours of firms and

universities in local collaboration activities between them because they were involved in other government programmes (see Section 4.3.4).

Table 6.2 The number of respondents' participation in the IAC programmes

		0	1	2	3	4	5	6	Total
Firm	N	-	77	35	12	6	1	1	132
	%	-	58.3	26.5	9.1	4.5	0.8	0.8	100.0
University	N	7	15	6	2	2	2	-	34
	%	20.6	44.1	17.6	5.9	5.9	5.9	-	100.0

Source: The survey about barriers to the IAC programmes

Of the BI and TP centres established in universities for start-ups, most firms occupied the facilities for below 2 years (see Table 6.3). 92.6% of firms in the BI centers occupied the facilities for below 2 years. Since these facilities were to provide business space for start-ups, the firms were not likely to occupy the centres for a long time.

Table 6.3 Occupying years of firms in the TP and BI centres

	TP		BI	
	N	%	N	%
1 year	12	48.0	11	40.7
2 years	3	12.0	14	51.9
3 years	6	24.0	0	0.0
Over 4 years	4	16.0	2	7.4
Total	25	100.0	27	100.0

Source: The survey about barriers to the IAC programmes

The main reasons for firms to participate in the IAC programmes were to conduct R&D collaboration (31.6%), followed by to obtain research funding (20.0%), to exchange information (12.6%) and to use other organisations' R&D equipments (11.2%) (see Table 6.4). As explored in the chapter 3, one of the weaknesses of SMEs is a limited resource. They might suffer from lack of finance and staff resources and restricted local network (Bryson and Daniels, 1998). 82.4% of the firm respondents were small firms with less 50 employees (see Table 4.6). They might recognise these problems as serious barriers to their business activities. This means that the opportunity to conduct R&D

collaboration and to obtain research funding through government support could be important motivations to participate in the government programmes.

Table 6.4 Main reasons of firms' participation in the IAC programmes

	N	%
For obtaining research funding	43	20.0%
For R&D collaboration	68	31.6%
For using other organisations' R&D equipments	24	11.2%
For using other organisations' facilities	12	5.6%
For information exchange	27	12.6%
For technology transfer	15	7.0%
For management support	7	3.3%
For human resources exchange	16	7.4%
Other	3	1.4%
Total	215	100.0%

Source: The survey about barriers to the IAC programmes

6.2 Interactions between agencies in the policy process

As discussed in the methodology chapter, interactions in the implementation process are categorised into three types: firm-university; firm-government; and university-government.

6.2.1 Interactions between firms and universities in the policy process

The results of some previous surveys suggested that the most important factor that influenced the success of collaboration activities between industry and university was the sharing of common interests or clearly defined project goals between them (MOCIE, 2004; Meseri and Maital, 2001). Also, other surveys to investigate barriers to establishing collaborative relationships between industry and university in joint research activities indicated that the most serious barrier was differences in research objectives between them (FKI, 2006; Howells et al., 1998). Accordingly, at the general level, firms and universities seemed to believe that common interests and objectives were important to facilitating collaborative interaction between them. Schartinger et al (2001) argued that they were intrinsically heterogeneous organisations with different goals and cultures. In this respect, successful

collaboration seems to demand efforts to share common interests or objectives between them.

Similarly, in the survey reported here, firms responded that sharing common objectives for programme was one of the important factors for the successful implementation of programmes in terms of firm-university interaction. However, firms suggested information about programmes, mutual trust and communication as more essential factors (see Table 6.5). On the other hand, firms were likely to think that previous experiences of local networking activities and contacts with universities were relatively less significant factors, given that these two factors did not exceed 8% of firm respondents. The responses of universities were very similar to those of firms. Academic members perceived mutual trust, communication and sharing common objectives to be significant like the firm respondents.

In fact, these three factors seemed to contribute to reducing different organisational characteristics between industry and university. Although they were participating in the same government programmes, their organisational and behavioural characteristics might be inherently different. Such differences could be potential barriers to interaction between them because their actions could be influenced by different institutions, norms, and rules consisting of their organisational structures, as argued by Giddens (1984). Probably, like general relationships between them as mentioned above, even in the policy process they might perceive that to reduce these organisational differences is very essential to sustain collaborative interactions, so that they seemed to think that mutual trust, communication and sharing common objectives are important factors to interaction between them.

Among the responses of firms and universities, the most distinctive factor was the exchange of information for programmes. 18.9% of the responding firms thought exchange of universities' information about programme implementation as the most important factor, and 8.8% of the responding universities said this factor was important. According to the Chi-square test, there is a statistically significant difference between the responses of firms and universities in this factor at the .01 level. As explored in the previous chapter, university members managed the programmes. On the other hand, each firm was only one of many participants, not playing as an

important role as university members in controlling the programme. Thus, the amount of information about the programmes, which the firm could gain, might be limited, compared to information that university members could obtain in the policy process. In this respect, firms were more likely to perceive information exchange to be an important factor to interaction between them than universities.

Table 6.5 Important factors to firm-university interaction in the policy process

	Firm		University		Pearson χ^2	
	N	%	N	%	df	p
○ Exchange of partners' information	73	18.9	9	8.8	1	.002
○ Mutual trust between firms and universities	60	15.5	22	21.6	1	.070
○ Communication with partners	53	13.7	16	15.7	1	.554
○ Sharing common objectives for programmes	51	13.2	14	13.7	1	.999
○ Understanding of partner's characteristics	36	9.3	11	10.8	1	.648
○ Influence on partners in the policy process	32	8.3	4	3.9	1	.095
○ Firm's proper expression of needs for programmes	31	8.0	5	4.9	1	.228
○ Previous experiences of local networking activities	30	7.8	11	10.8	1	.288
○ Contacts with partners	21	5.4	10	9.8	1	.091

Note: Number of respondents (Firm: 132, University: 34)

Source: The survey about barriers to the IAC programmes

To identify actual barriers to interaction between firms and universities, the respondents were asked to indicate to what extent suggested factors were barriers to their participation in the IAC programmes. Most responding firms and universities perceived the indicated factors as real barriers to interactions between them, even though there were some differences in each barrier (see Table 6.6). Also, barriers, which were indicated in previous surveys such as lack of information and difference of goals (FKI, 2006; Schartinger et al., 2001; Howells et al., 1998), were shown as major real barriers in this survey. However, as this survey focused on interaction between them in the policy process, firms' and universities' perceptions to each barrier were slightly different according to their different positions and roles in the policy process.

There were some factors that stood out in the firm responses in terms of being 'not a barrier': insufficient contact with university; lack of trust between firm and university; and insufficient firms' expression of needs for programmes. The share of firms responding 'not a barrier' in these factors was over 30%. According to the results of

cross-tabulations (see Appendix F), in respect to these three barriers, there was no difference by firm characteristics, such as number of employees, R&D expenditure ratio of turnover, number of experiences of programmes, firm age (old and new firm) except industrial sector. However, there was likely to be a relationship between industrial types (i.e. manufacturing and service) and these barriers. Firms that perceived these two barriers as 'not a barrier' were mainly manufacturing. That is, manufacturing firms were considerably more likely to perceive these two factors as 'not a barrier' than firms in service sector. In general, the customer of service firms might be more directly involved with the production process and thus production and consumption might occur more simultaneously than in manufacturing (Yavas and Yasin, 1994; Curran, 1991). Also, the production and output from a particular service provider might be more unique to each customer than those from manufacturing firms which were generally enjoy relatively standardized production (Foster et al., 2000). Thus, in the service sector, every customer might have more or less unique needs, requiring the service process to be tailored to the needs (Foster et al., 2000). Under these circumstances, service firms might be used to experiencing more rapid and dynamic changes in their businesses than manufacturing firm. Thus, service firms might want to make more contact with universities than manufacturing firms. It might also be more difficult for service firms to tell universities about what they wanted than manufacturing firms in the implementation process.

Table 6.6 Barriers to collaborative interaction between firms and universities in the implementation process

Firm (N=132)	Barrier						Not a barrier		Total	Pearson χ^2	
	Sub-total		Strong		Weak		N	%		N	df
	N	%	N	%	N	%					
○ Insufficient exchange of university's information about programme	99	81.8	23	19.0	76	62.8	22	18.2	121	2	.329
○ Lack of firm's influence on university	94	77.0	21	17.2	73	59.8	28	23.0	122	2	.780
○ Insufficient sharing common objectives for programme	92	76.0	19	15.7	73	60.3	29	24.0	121	2	.009
○ Lack of communication with university	91	74.0	19	15.4	72	58.5	32	26.0	123	2	.072
○ Lack of experiences of networking activities with universities	89	73.0	18	14.8	71	58.2	33	27.0	122	2	.602
○ Lack of understanding of partner' characteristics	86	72.9	22	18.6	64	54.2	32	27.1	118	2	.084
○ Insufficient firms' expression of needs for programmes	82	69.5	20	16.9	62	52.5	36	30.5	118	2	.004
○ Lack of trust between firm and university	82	68.9	22	18.5	60	50.4	37	31.1	119	2	.001
○ Insufficient contacts with universities	80	65.0	13	10.6	67	54.5	43	35.0	123	2	.000
University (N=34)											
○ Lack of trust between firm and university	31	96.9	13	40.6	18	56.3	1	3.1	32	2	.001
○ Insufficient contacts with firms	30	90.9	12	36.4	18	54.5	3	9.1	33	2	.000
○ Lack of understanding of partner' characteristics	30	90.9	9	27.3	21	63.6	3	9.1	33	2	.084
○ Insufficient firms' expression of needs for programmes	28	90.3	13	41.9	15	48.4	3	9.7	31	2	.004
○ Insufficient sharing common objectives for programme	29	87.9	13	39.4	16	48.5	4	12.1	33	2	.009
○ Lack of communication with firms	29	87.9	10	30.3	19	57.6	4	12.1	33	2	.072
○ Insufficient exchange of firm's information about programme	29	87.9	10	30.3	19	57.6	4	12.1	33	2	.329
○ Lack of university's influence on firms	25	78.8	4	12.1	21	63.6	8	24.2	33	2	.780
○ Lack of experiences of networking activities with firms	16	75.8	7	21.2	19	57.6	7	21.2	33	2	.602

Source: The survey about barriers to the IAC programmes

There were two factors that stood out in the university responses in terms of being 'not a barrier': lack of experiences of networking activities with firms; and lack of universities' influence on firms. The share of universities responding 'not a barrier' in these two was over 20% unlike other factors. In particular, there were several factors which universities assessed as more 'strong barrier' than other factors: (1) lack of trust between firm and university in the policy process; (2) insufficient contacts with firms in the implementation process; (3) insufficient firms' expression of needs for programmes; and (4) insufficient sharing common objectives for programmes. In particular, universities were more likely to suggest these factors to be strong barriers than firms. According to the results of the Chi-square test, the differences between firms and universities were statistically significant in these four factors at the .01 level (see Table 6.6).

This might result from their different experiences and roles in the programme process. Generally, in the programmes, academics managing programmes and supporting firms might work with many diverse types of firms (see Table 4.5), whilst firms contacted a very small number of academics. Also, the firms, which participated in the programmes, were small in terms of employment size (see Table 4.6) and they might be busy in operating daily businesses (Atherton and Austin, 1996). Thus, in terms of contact with partners, universities might have more difficulties than firms. In such processes, it was possible that academics could confront with much more diverse and serious problems than firms. In addition, given that small firms were generally reluctant to expose their business (Turok and Raco, 2000), they might not sufficiently express their needs. Based on such situations, academics might also think that it was not easy to form reliable relationships between them and to share common objectives for programmes. Therefore, these could influence the perception of academics in such a way to suggest that barriers were thought to be more serious than they were by firms. In other words, universities were more liable to think that it was difficult to sustain direct interaction between them than firms. For this reason, it seemed that different perceptions between firms and universities were much larger in the above factors than in other factors. As a consequence, it seemed that the positions and experiences of firms and universities might affect their different perceptions to some barriers to impede interaction between them.

6.2.2 Interactions between government and target groups

There were two different types of interaction between government and target groups in the programmes: firm-government and university-government. Such interactions between government and target groups are basically seen as interactions between public and private sectors in the policy process. In this respect, these interactions are to some extent similar to the concepts of policy network or public-private partnership (PPP) explaining certain forms of relationship between public and private actors. Of course, these concepts are different from the interactions between government and firms or universities in the programmes. Policy networks are a set of relatively stable relationships which are of a non-hierarchical and interdependent nature linking a variety of actors (Börzel, 1998) and PPP refers to a form of structured cooperation (e.g. legally-binding contract) between government and business for the provision of assets such as transportation infrastructure (Koppenjan, 2005). However, in the sense that these concepts are also sustained by co-operative interaction between public and private parties, some essential factors to relationship between public and private actors might be also important to the interaction between government and firms or universities in the programmes (see chapter 4). In these concepts, communication and trust have been stressed as important elements to co-operation between public and private actors because they could be useful to diminish uncertainty, to bridge cultural differences, and to allow participants to exchange information.

Likewise, in this survey, firms and universities generally responded that factors related to communication with government were significant elements for interactions with government (see Table 6.7). In the responses of firms, even though government's flexibility to the change of their needs was the most important consideration, the factors in relation to communication with government, such as channels for contact and communication and direct communication with government were also important to interactions with government. In addition, in the universities' responses, the governments' channels for contact and communication was the most important factor, followed by simplifying ministries dealing with the IAC programmes and communication with government.

However, according to these results, both firms and universities seemed to consider the government's channels for communication as a more important factor to facilitate interaction with government than direct communication with government in the programme process. Given these results, it seemed that administrative set-ups and instruments, which could support communication between government and target groups, should be preferentially established to foster interaction between them. According to Curran and Blackburn (1994) firms were often reluctant to approach government or government-sponsored agencies because government might be seen as being the organisation steeped in bureaucracy and the (over)regulator of business. Also, they inherently had different characteristics and cultures. Although firms and universities were participating in the government programmes, communication with government did not seem to occur easily. Accordingly, policy delivery systems, which have communication channels and instruments which target groups can use, seem to be important to interaction between government and target groups. This implies that the policy structure can to some extent influence the actions of agencies in the implementation process, as explored in the literature review.

Comparison between the responses of firms and universities shows that the distributions are generally similar, but there seemed to be notable differences in two factors (see Table 6.7). Regarding government's flexibility to needs, 14.5% of firms responded this factor was important, but the percentage of universities was only 8.1%. On the other hand, on the need to simplify ministries dealing with IAC programmes, the share of firms concerned was only 7.9%, while that of universities was 12.1%. According to the Chi-square test, in government's flexibility to needs, there is a statistically significant difference between the responses of firms and universities at the .05 level (see Table 6.7). Firms' needs could be diverse, given various types of participating firms (see Table 4.5), while those of universities might be viewed as being more collective than firms because they could collect diverse information, managing the programmes in the implementation process. In addition, only universities had a legitimate authority to suggest amending programme contents when the needs of firms and universities changed. Given this context, the change of firms' needs might be accepted less than that of universities' needs. For this reason, firms were more likely to perceive government's flexibility to be an important factor to interaction with governments than universities.

Table 6.7 Important factors to firm-government and university-government interactions in the implementation process

	Firm		University		Pearson χ^2	
	N	%	N	%	df	p
○ Government's flexibility to change of needs	57	14.5	8	8.1	1	.043
○ Government' channels for contact and communication	55	14.0	15	15.2	1	.719
○ Communication with government	39	9.9	11	11.1	1	.691
○ Exchange of government's programme information	39	9.9	9	9.1	1	.778
○ Target group's expression of needs for programmes	33	8.4	5	5.1	1	.222
○ Simplifying ministries dealing with IAC programmes	31	7.9	12	12.1	1	.138
○ Government's interest in firms' and university's needs	31	7.9	6	6.1	1	.501
○ Target group's influence on government	29	7.4	7	7.1	1	.925
○ Sharing common objectives for programme	25	6.3	6	6.1	1	.906
○ Understanding of mutual characteristics	23	5.8	7	7.1	1	.627
○ Active role of local government	21	5.3	7	7.1	1	.480
○ Contacts with government	11	2.8	6	6.1	1	.099

Note: Number of respondents (Firm: 132, University: 34)

Source: The survey about barriers to IAC programmes

In order to identify practical barriers to interaction between government and firms or universities, the respondents were asked to indicate to what extent the suggested factors were barriers to their participation in the IAC programmes. Firms and universities seemed to think that most of the suggested barriers were significant practical barriers to interactions with government, given a low share of 'not a barrier' not exceeding 30% in each suggested barrier (see Table 6.8). This was similar to the results of the question about barriers to collaborative relationships between industry and university in the policy process. It was likely that firms and universities were confronted with many barriers to collaborative interactions with government in the implementation process. Overall, problems related to communication, such as lack of direct communication, dispersion of ministries, and lack of channels for communications were actually significant barriers (Table 6.8). In addition, lack of government's flexibility and the passive role of local government were also considered important barriers to interactions with government.

Looking at the results in detail, firstly, firms and universities seemed to think that barriers such as the lack of communication and contact, the lack of channels for

communication, and the dispersion of ministries impeded interactions with government were more important than problems such as power relations, understanding of mutual characteristics, and government's interest in needs. Given that the majority of literature on PPPs and policy networks suggests the importance of communication in public-private relations, these results were understandable. Secondly, in both firms' and universities' responses, the share of 'not a barrier' was relatively high in the following factors: the insufficient firms' expression of needs for programmes; and the lack of understanding of mutual characteristics. Insufficient firms' or universities' expression of needs for programmes was related not to government's problem but to their own defects. These results seemed to be intuitive. However, a relatively high share of 'not a barrier' in the lack of understanding of mutual characteristics was unexpected, given that much of the literature on PPPs stress the importance of mutual trust in being able to bridge cultural differences. This is probably because firm (or university) and government interactions in the programmes were based on relationships between supplier and clients unlike PPP, as mentioned above, and thus firms and universities did not seem to interact actively and collaboratively with government like the interaction implied in PPPs. Therefore, although there were different cultures and characteristics between the firm and government and the university and government, the lack of understanding mutual characteristics was less likely to be a serious problem than other barriers such as the lack of communication and contact. However, considering that over 70% of firms and universities responded that the lack of understanding of mutual characteristics was a barrier, this was also seen as one of the important barriers to interaction between government and firms/universities. Generally, on these issues there was little difference by firms' and universities' characteristics (see Appendix F). However, there was a relationship between industrial sector and insufficient firm's expression of needs, namely firms in the manufacturing sector were considerably more likely to think that this factor was not a barrier, compared to firms in the service sector. This has been already discussed above.

Table 6.8 Barriers to interactions between government and target groups in the implementation process

Firm (N=132)	Barrier						Not a barrier		Total	Pearson χ^2	
	Sub-total		Strong		Weak		N	%		N	df
	N	%	N	%	N	%					
○ Lack of government's flexibility to change of firms' needs	110	90.9	44	36.4	66	54.5	11	9.1	121	2	.598
○ Lack of communication with government	106	86.2	31	25.2	75	61.0	17	13.8	123	2	.587
○ Insufficient exchange of government's programme information	106	85.5	32	25.8	74	59.7	18	14.5	124	2	.109
○ Dispersion of ministries dealing with IAC	95	84.1	26	23.0	69	61.1	18	15.9	113	2	.303
○ Insufficient contacts with government	100	84.0	23	19.3	77	64.7	19	16.0	119	2	.932
○ Lack of channels for contact and communication with government	102	82.9	32	26.0	70	56.9	21	17.1	123	2	.974
○ Passive role of local government	97	80.8	37	30.8	60	50.0	23	19.2	120	2	.637
○ Lack of firms' influence on government	90	79.6	28	24.8	62	54.9	23	20.4	113	2	.728
○ Insufficient sharing common interests for programme	89	75.4	15	12.7	74	62.7	29	24.6	118	2	.124
○ Government's small interest in firms' needs	91	75.2	31	25.6	60	49.6	30	24.8	121	2	.902
○ Lack of understanding of mutual characteristics	87	73.1	14	11.8	73	61.3	32	26.9	119	2	.056
○ Insufficient firms' expression of needs for programmes	82	70.7	17	14.7	65	56.0	34	29.3	116	2	.931
University (N=34)											
○ Dispersion of ministries dealing with IAC	29	87.9	12	36.4	17	51.5	4	12.1	33	2	.303
○ Lack of communication with government	28	84.8	11	33.3	17	51.5	5	15.2	33	2	.587
○ Lack of government's flexibility to change of needs	28	84.8	11	33.3	17	51.5	5	15.2	33	2	.598
○ Passive role of local government	27	81.8	13	39.4	14	42.4	6	18.2	33	2	.637
○ Insufficient sharing common interests for programme	27	81.8	9	27.3	18	54.5	6	18.2	33	2	.124
○ Lack of channels for contact and communication with government	27	81.8	8	24.2	19	57.6	6	18.2	33	2	.974
○ Insufficient contacts with government	26	81.2	6	18.8	20	62.5	6	18.8	32	2	.932
○ Lack of university's influence on government	26	78.8	6	18.2	20	60.6	7	21.2	33	2	.728
○ Insufficient exchange of government's programme information	26	78.8	3	9.1	23	69.7	7	21.2	33	2	.109
○ Government's small interest in universities' needs	24	75.0	7	21.9	17	53.1	8	25.0	32	2	.902
○ Insufficient universities' expression of needs	23	71.9	4	12.5	19	59.4	9	28.1	32	2	.931
○ Lack of understanding of mutual characteristics	21	63.6	8	24.2	13	39.4	12	36.4	33	2	.056

The differences between the responses of firms and universities did not seem to be large. In particular, in terms of issues that are 'not a barrier', responses were very similar as indicated in Table 6.8. These results were considerably different from those of interactions between firm and university in Table 6.5 above. As firms and universities were in a same position as policy beneficiaries, their perceptions of the interaction with government might be thought to be more similar than their perceptions of the interaction between them. However, even though they all were policy beneficiaries, their positions and roles in the policy process were, as mentioned earlier, slightly different. Universities played a main role in implementing the programmes, for example preparing programme proposals, managing programmes, supporting firms and reporting performance results, so that they could interact more directly with government than firms. The comparison of the responses between firms and universities shows that there were several barriers which seemed to show large differences, particularly in the perception of 'strong barrier': (1) lack of understanding of mutual characteristics; (2) insufficient sharing common interests for programme; (3) dispersion of ministries dealing with IAC; and (4) insufficient exchange of government's programme information. However, according to the results of the Chi-square test, there was not a statistically significant difference between the responses of firms and universities in the perception of the barriers to interaction with government (see Table 6.8).

6.3 Coordination of IAC programmes

In relation to coordination of similar government policies, generally, many researchers stressed that a lack of coordination of programme on same policy issue was largely caused by the internal structure of government (Kapstein, 2004), such as deficiencies in the organisation of decision-making on policy (GDI, 2002) and non-transparent information links among individual departments (Picciotto, 2004). Similarly, this survey showed that the factors related to the government side were important in increasing linkage and coordination between different programmes. Furthermore, the contents of programmes and roles of programme implementing organisations (universities) were indicated as significant factors (see Table 6.9). The problem of programme contents seemed to be related to the government side because most programmes were designed by government initiatives. However, the role of the programme implementing

organisations, that is the universities, was connected not with the internal but the external structure of government. This was also associated with the implementation process at the local level rather than the design process of the programmes at the central level. The responding firms and universities, therefore, seemed to indicate not only that the structure of government in decision-making but also that issues within the implementation process were important factors in increasing policy coordination. In practice, as universities took responsibility for carrying out programmes, the respondents, particularly university respondents, seemed to think that their efforts to link the programmes together and ensure relevant information exchange seemed to be important in increasing coordination of programmes at the local level.

The responding firms indicated fulfilment of diverse needs, information exchange between programme implementing organisations, and local government's efforts as the most important factors (Table 6.9). In contrast, for universities, programme implementing organisations' efforts, considerable distinctions between programmes, and local government's efforts, were more significant. There was not, however, a statistically significant difference between the responses of firms and universities at the .05 level, except in the fulfilment of target groups' diverse needs. (see Table 6.9). Firms were more likely to perceive fulfilment of target groups' diverse needs to be an important factor than universities in the issue of coordination of the IAC programmes. As noted previously, the needs of firms might be more individual and diverse than those of universities who appear to have broader views on the IAC programmes, and on managing and controlling the implementation process of the programmes. In addition, firms' needs might be more substantial than universities' because firms might be under more competitive pressures at work than universities. Therefore, firms were more likely to perceive the reflection of target groups' diverse needs on the programmes to be important than universities in increasing the coordination of the diverse IAC programmes.

Among the factors indicated, obtaining information about other IAC programmes was relatively unimportant in both firms' and universities' responses. The firms and universities both perceived information exchange between programme implementing organisations to be more important factor. Generally for firms or universities, information about the programmes in which they were involved may be of importance

because information can be associated with knowledge and power (Kent and Williams, 1990). However, as they might not be interested in coordination, the activities required to obtain information for co-ordination of the programmes might not be important to them. In particular, although they could access and gain information about other programmes, they did not seem to think that such a simple activity could contribute to policy co-ordination. In contrast, the respondents might think that information exchange between universities, which were programme implementing organisations, could be more effective to increase policy co-ordination than the activity to obtain information about other programmes.

Table 6.9 Important factors to coordination of the IAC programmes

	Firm		University		Pearson χ^2	
	N	%	N	%	df	p
○ Fulfilment of target groups' diverse needs	75	19.8	13	12.7	1	.030
○ Information exchange between universities	57	15.0	11	10.8	1	.177
○ Local government's efforts to increase linkage	52	13.7	15	14.7	1	.739
○ Programme managing organisations' efforts	50	13.2	19	18.6	1	.091
○ Government's provision for incentives	47	12.4	11	10.8	1	.594
○ Considerable distinctions between programmes	46	12.1	16	15.7	1	.262
○ Integration of organisations dealing with programmes	36	9.5	13	12.7	1	.278
○ Obtaining information about other IAC programmes	16	4.2	4	3.9	1	.884

Note: Number of respondents (Firm: 132, University: 34)

Source: The survey about barriers to IAC programmes

The respondents were asked to indicate to what extent the suggested factors were barriers to the co-ordination of the programmes in the IAC programmes. The shares of 'barrier' (strong and weak barrier) in all factors were much higher than those of 'not a barrier'. The frequency analysis indicates that, generally, the pattern of responses between firms and universities were quite similar (Table 6.10).

Firstly, they all considered lack of distinctions between programmes, lack of local government's efforts, dispersion of government organisations as more serious than other factors. According to these results, firms and universities seemed to think that problems related to the government side impeded the coordination of the programmes more strongly than other problems. The dispersion of ministries dealing with IAC programmes in the central level was seen as an immediate problem caused by the

internal structure of government. In addition, as the lack of distinctions between programmes could stem from the lack of communication between ministries or the absence of an organisation to integrate the programmes, this barrier was also connected with the internal structure of government. In this respect, the respondent might think that if the system of designing and delivering the programmes was not well-organised, it was difficult to co-ordinate the programmes.

Unlike these two factors, it was not clear that the lack of local government effort was immediately related to the problem arising from the internal structure of government. In general, local government was excluded from planning and designing the programmes, and thus, it was not a direct supplier of the programmes. However, in the implementation process, it supported some part of budget of the programmes, and thus to some extent had an authority to supervise the programmes. Firms and universities, therefore, seemed to perceive that the local government was one of the suppliers in the programmes. Even if at national level there were three different ministries involved in the IAC programmes, at regional level, only local government dealt with the programmes. In this respect, firms and universities might think that if there was the lack of local government efforts, the programmes would not be well co-ordinated at the local level. The local government's legitimate roles in the programmes were mainly regulated by the policy structure (as explored in the previous chapter) and, accordingly, the lack of apparent effort also seemed to be one of the problems caused by the internal structure of government. However, the local government's efforts in the programmes might be influenced not only by its legitimate roles but also by its capacity to respond the programmes. This issue is further discussed in the next chapter.

On the other hand, the factors associated with information, such as insufficient information exchange and difficulty in obtaining information, were considered to be less serious in relative terms but important nonetheless (see Table 6.10). Picciotto (2004) argued that information links among individual departments in the central government was important to the issue of policy coordination. Over 70% of the responding firms and universities perceived these two factors as barriers, and the deficits of the information link among local agencies seemed to impede co-ordination of the programmes. In these two factors, there was no difference by firm characteristics and types (see Appendix F).

Table 6.10 Barriers to the coordination of the IAC programmes

Firm (N=132)	Barrier						Not a barrier		Total	Pearson χ^2	
	Sub-total		Strong		Weak		N	%		N	df
	N	%	N	%	N	%					
○ Lack of distinctions between programmes	103	85.8	27	22.5	76	63.3	17	14.2	120	2	.114
○ Lack of local government's efforts	100	84.7	33	28.0	67	56.8	18	15.3	118	2	.252
○ Dispersion of government organisations	94	83.9	24	21.4	70	62.5	18	16.1	112	2	.057
○ Lack of fulfilment of firms' diverse needs	103	83.8	29	23.6	74	60.2	20	16.3	123	2	.800
○ Lack of government's provision for incentives	93	80.9	34	29.6	59	51.3	22	19.1	115	2	.839
○ Lack of programme managing organisations' efforts	94	80.3	30	25.6	64	54.7	23	19.7	117	2	.324
○ Insufficient information exchange between universities	91	79.1	20	17.4	71	61.7	24	20.9	115	2	.272
○ Difficulty in obtaining information about other programmes	91	77.8	20	17.1	71	60.7	26	22.2	117	2	.566
University (N=34)											
○ Lack of local government's efforts	30	90.9	14	42.4	16	48.5	3	9.1	33	2	.252
○ Lack of programme managing organisations' efforts	30	90.9	11	33.3	19	57.6	3	9.1	33	2	.324
○ Lack of distinctions between programmes	28	87.5	13	40.6	15	46.9	4	12.5	32	2	.114
○ Dispersion of government organisations	26	83.9	13	41.9	13	41.9	5	16.1	31	2	.057
○ Lack of fulfilment to firms' diverse needs	27	81.8	6	18.2	21	63.6	6	18.2	33	2	.800
○ Lack of government's provision for incentives	26	78.8	11	33.3	15	45.5	7	21.2	33	2	.839
○ Insufficient information exchange between universities	24	75.0	9	28.1	15	46.9	8	25.0	32	2	.272
○ Difficulty in obtaining information about other programmes	23	69.7	4	12.1	19	57.6	10	30.3	33	2	.566

Source: The survey about barriers to the IAC programmes

In terms of 'strong barrier', universities were more likely to indicate these factors to be serious than firms (see Table 6.10). Universities might have more general perspectives about the IAC programmes on the basis of much information and the diverse experiences of the programmes because they managed the programmes and they could have more opportunities to hear firms' complains about the programmes. Also, universities' concerns about different programmes might be generally greater than firms' because they might try to support different types of firms in carrying out the programmes with diverse ways. Thus, if there were some problems derived from factors related to the coordination of the programmes, universities were likely to think the problems more seriously than firms. In particular, there seemed to be large differences between firms' and universities' perspectives in four factors: (1) lack of local government's efforts; (2) lack of distinctions between programmes; (3) dispersion of government organisations; and (4) insufficient information exchange between universities. However, the Pearson Chi-square value of each barrier was more than 0.05 (see Table 6.10), and thus there was not a statistically significant difference between the responses of firms and universities.

6.4 Local voluntary and social networking activities between industry and university in Daegu City

This section explores local networking activities between firms and universities in the Daegu City region. As this issue is also about relationships between firms and universities, this is somewhat similar to the interaction between firms and universities in the policy process investigated above. However, since in this section firms and universities were asked about experiences of networking activities between them in the Daegu City region, excluding government support programmes for collaboration, there might be some differences. The literature review identified that agency capacity is one of the important factors affecting agency interaction in policy delivery systems. Thus, it is necessary to explore the capacity of firms and universities to respond the programmes in the study area, the Daegu City region. However, as noted in the methodology chapter, as the IAC programmes aimed to enhance local collaborative relationship between firms and universities, identifying important factors and barriers that influence local voluntary

networking activities between them seemed to be important to understand their potential capacity to respond interaction between them in the implementation process of programmes in more depth.

As mentioned earlier, many previous studies and surveys generally emphasised the importance of common concerns in relationships between industry and university (FKI, 2006; MOCIE, 2004; Meseri and Maital, 2001; Howells et al., 1998). In other words, a clearly defined project goal must be a significant precondition for successful collaboration between firms and universities that have different goals and cultures. In this survey, sharing common objectives for collaboration was indicated to be one of the most important factors in facilitating networks between industry and university in the Daegu City region, particularly in the universities' responses (see Table 6.10). However, the responding firms and universities assessed a suitable match between the types of knowledge firms require and the types of knowledge universities have as the most important factor. In addition, in the firms' responses, human/material resources and activeness of partners were more important factors than sharing common objectives. In the universities' responses, enough local firms which want collaboration with universities, activeness of partners, and mutual trust were pointed out as important factors, following sharing common objectives. Suitable match between them in terms of the types of knowledge, human/material resources and enough number of firms seemed to be the factors related to local infrastructure and environment for networking activities between firms and universities. According to the results of the survey, the respondents seemed to consider these local conditions as more important than common objectives. This is consistent with the previous studies that suggested this was the most important factor in university-firm relationships. The geographical area examined was important in this study where the characteristics or dimensions of the study region seemed to influence respondents' perceptions toward regional industry-university networks more strongly than other factors.

As noted previously, the share of SMEs in Daegu City was the highest in Korea. In addition, there were rarely large companies leading or contributing to regional technology innovation. Also, most SMEs in the region were very small subcontracting firms, so they did not seem to need high level technology generally developed by intensive R&D activities. However, universities generally aim at advanced and academic technology on a

theoretical basis. Thus, although firms and universities recognised that networks were important to both of them, the types of knowledge general local firms required in a practical business sense did not seem to adequately match the types of knowledge local universities had. If there had been many R&D intensive companies and large companies, with a need to possess high technology, the results of the survey might have been different.

According to the Chi-square test (see Table 6.11), firms' and universities' perceptions were statistically different in following factors at the .05 level: (1) suitable match between the types of knowledge firms require and the types of knowledge universities have; (2) human and material resources of partners; and (3) number of partners for collaboration. Since small firms, generally, might be used to working in a practice-oriented construct, firms might require more applied and practical knowledge in collaboration with universities which are generally more theory-oriented. Given that firms generally use knowledge which is provided by universities in the collaboration, firms are more likely to perceive suitable match of the types of knowledge to be a significant factor than universities.

There were diverse types of participating firms in terms of firm ages and industrial sectors, in terms of the human and material resources of partners (see Table 4.5). Thus, firms might think that the human and material resources of a small number of local universities (see Table 5.9), which were generally theory-oriented, were not enough to tackle their practical and diverse problems, compared to a large number of local universities (see Table 5.8). In addition, as small firms, which are generally price-oriented (Siu and Kirby, 1998), are used to buying something for their businesses but universities are not familiar with selling. Thus, when universities did not have human and material resources which could be used in collaborative activities, firms were more likely to perceive that as a serious problem than the universities. In this respect, firms might indicate human and material resources which could be used in tackling their needs as a pressing problem more strongly than universities. On the other hand, as regards number of partners for collaboration, universities perceived this to be an important factor much more than firms. Universities might want increased numbers of firms to require collaboration with universities in the region but, as mentioned above, given that the local economic structure is driven by very small subcontracting firms,

universities might think there were too few firms who are relevant for productive collaboration with them.

Unlike other factors, issues such as intellectual property right issues, the establishment of interdependent relationship and obtaining of information for relevant partners were not thought to significant concerns. Intellectual property right issues achieved the lowest score. This factor is related to management of results by collaborative R&D such as patents. However, given that there were some gaps between local SMEs and universities in terms of knowledge and technology level as mentioned above, there were few cases in which local firms and universities applied for patents through collaborative R&D. In this respect, the intellectual property rights did not seem to an important issue in local networking activities between them in the Daegu City region. Thus, this result was likely to be somewhat understandable.

Table 6.11 Important factors in facilitating networks between industry and university in Daegu City

	Firm		University		Pearson χ^2	
	N	%	N	%	df	p
○ Suitable match between the types of knowledge firms require and the types of knowledge universities have	86	21.9	15	14.7	1	.022
○ Human and material resources of universities and firms	64	16.3	9	8.8	1	.019
○ Activeness of partners for collaboration	44	11.2	11	10.8	1	.892
○ Sharing common objectives for collaboration	42	10.7	13	12.7	1	.496
○ Balances between universities' capabilities and facilities	33	8.4	7	6.9	1	.577
○ Mutual trust between firms and universities	29	7.4	11	10.8	1	.216
○ Obtaining information needed for contact with relevant partners	27	6.9	3	2.9	1	.112
○ Universities' interest in the innovation or commercialisation	22	5.6	8	7.8	1	.364
○ Firm's proper expression of needs for collaboration	16	4.1	7	6.9	1	.209
○ Establishment of interdependent relationship	14	3.6	5	4.9	1	.513
○ Number of partners for collaboration	8	2.0	12	11.8	1	.000
○ Intellectual property rights issues	8	2.0	1	1.0	1	.469

Note: Number of respondents (Firm: 132, University: 34)

Source: The survey about barriers to IAC programmes

The respondents were asked to point out the extent to which the suggested barriers were practically constraining their networking activities in Daegu City. For most firms and universities the main factors seemed to be the general and practical barriers hindering local networking activities between them. Universities were more likely to perceive these factors as barriers than firms (see table 6.12). This result was very similar to that of the interaction between firms and universities in the policy process. As explained above, a possible reason might be that universities were generally faced with more various and difficult problems than firms, collaborating with very different types of firms having different characteristics.

Firms and universities were asked to indicate to what extent the partners had problems in the networking activities. The pattern of responses between firms and universities to individual factors was somewhat different, especially when compared to the results in other sections such as their interactions with government and the coordination of the programmes. For example, firms suggested lack of universities' human and material resources, lack of universities' specific knowledge that firms need and insufficient firms' expression of needs were difficult barriers. In the universities' responses, insufficient firms' expression of needs, insufficient local firms' activeness, and lack of information for relevant firms were identified as serious barriers.

It was not only universities but also firms that assessed the insufficient firms' expression of needs as one of the most difficult barriers. Although this problem was related to firms themselves, they seemed to acknowledge that this issue was an important barrier. Similarly even universities recognized that their lack of interest in firms' innovation or commercialisation was a very serious barrier. These results may be associated with their different organisational characteristics and different cultures. It became generally acknowledged that there was small interest in commercialisation of knowledge among university academics due to academic achievements (Geenhuizen et al., 1996) and SMEs were reluctant to expose themselves and their business to outside (Turok and Raco, 2000). Given these circumstances, these results of the survey seemed to confirm the literature to some extent. However, the fact that firms and universities perceived the factors related to their own characteristics to be serious seemed to mean that there were some fundamental problems in the context of the factors. This is also to be further investigated later.

In addition to such different cultures, lack of information was also a significant problem as other previous studies (FKI, 2006; Howells, et al., 1998). However, difference of objectives between them was suggested to be less serious than other factors unlike the results of the previous surveys (see Table 6.12). Instead, the factors related to the local economic and educational infrastructure, such as gaps between knowledge firms needed and knowledge universities has, lack of universities' human and material resources, small number of local universities and a high share of small firms, were much more serious barriers than difference of objectives between them. That is, the issues related to local specific dimensions tended to be much more emphasised. This is probably because this survey focused on local networking activities within a specific region unlike the previous similar studies (FKI, 2006; Howells, et al., 1998), which were conducted through the whole countries such as South Korea and the U.K. Thus, it can be assumed that the local economic structure and locally constructed behaviours of economic actors within the local economic structure may influence firms' and universities' perceptions of local networking activities very strongly and practically. In the factors which firms suggested more as 'not a barrier' than other factors (e.g. different objectives in networking, lack of trust between firms and universities, conflict of intellectual property rights), there was no difference by firm characteristics and types (see Appendix F).

Table 6.12 Barriers to networks between industry and university in Daegu City

Firm (N=132)	Barrier						Not a barrier		Total	Pearson χ^2	
	Sub-total		Strong		Weak		N	%		N	df
	N	%	N	%	N	%					
○ Lack of universities' human and material resources	106	89.4	36	29.3	74	60.2	13	10.6	123	2	.225
○ Lack of universities' specific knowledge that firms need	108	86.4	51	40.8	57	45.6	17	13.6	125	2	.563
○ Insufficient firms' expression of needs for collaboration	101	86.3	17	14.5	84	71.8	16	13.7	117	2	.044
○ Small number of local universities and their organisations	101	84.9	18	15.1	83	69.7	18	15.1	119	2	.202
○ Universities' small interest in firms' commercialisation	99	79.8	37	29.8	62	50.0	25	20.2	124	2	.321
○ Gaps between local universities' capabilities and facilities	92	78.0	25	21.2	67	56.8	26	22.0	118	2	.616
○ Lack of information about relevant academic organisations	96	78.0	26	21.1	70	56.9	27	22.0	123	2	.049
○ Insufficient establishment of interdependent relationship	88	75.2	17	14.5	71	60.7	29	24.8	117	2	.027
○ Insufficient universities' activeness to collaboration	92	74.8	27	22.0	65	52.8	31	25.2	123	2	.049
○ Different objectives in networking	72	63.2	17	14.9	55	48.2	42	36.8	114	2	.319
○ Lack of trust between firms and universities	69	57.0	20	16.5	49	40.5	52	43.0	121	2	.001
○ Conflict of intellectual property rights	54	48.6	11	9.9	43	38.7	57	51.4	111	2	.583
University (N=34)											
○ Insufficient firms' expression of needs for collaboration	32	97.0	10	30.3	22	66.7	1	3.0	33	2	.044
○ Insufficient local firms' activeness to collaboration	32	94.1	10	29.4	22	64.7	2	5.9	34	2	.049
○ Lack of information about relevant firms for collaboration	31	93.9	12	36.4	19	57.6	2	6.1	33	2	.049
○ Universities' small interest in firms' commercialisation	27	90.0	8	26.7	19	63.3	3	10.0	30	2	.321
○ Gaps between knowledge firms need and knowledge universities have	30	88.2	11	32.4	19	55.9	4	11.8	34	2	.563
○ Insufficient establishment of interdependent relationship	28	87.5	11	34.4	17	53.1	4	12.5	32	2	.027
○ Lack of trust between firms and universities	29	85.3	14	41.2	15	44.1	5	14.7	34	2	.001
○ Gaps between local universities' capabilities and facilities	25	83.3	5	16.7	20	66.7	5	16.7	30	2	.616
○ A high share of small firms not needing collaboration	27	81.8	9	27.3	18	54.5	6	18.2	33	2	.202
○ Lack of firms' human and material resources	27	79.4	11	32.4	16	47.1	7	20.6	34	2	.225
○ Different objectives in networking	21	67.7	2	6.5	19	61.3	10	32.3	31	2	.319
○ Conflict of intellectual property rights	20	58.8	4	11.8	16	47.1	14	41.2	34	2	.583

As shown in Table 6.12, the factors associated with regional infrastructure for industry-academia collaboration, such as knowledge gaps between firms and universities and lack of partners' human/material resources were assessed as strong barriers in both of firms and universities. However, there is a statistically significant difference between firms' and universities' perceptions in the following factors at the .05 level: (1) lack of information for relevant partners; (2) lack of trust; (3) insufficient establishment of interdependent relationship; (4) insufficient partner's activeness to collaboration; and (5) insufficient firms' expression of needs. Universities identified all these factors to be 'strong barrier' much more frequently than firms (see Table 6.12).

One explanation is that, given that there were quite a few small subcontracting firms in the region (KIET, 1998), information about local firms might not flow very well. Thus, universities might have difficulties in seeking information about local firms for collaboration. In addition, in many cases the business sector received inputs from universities through highly educated human capital, academic publications and presentations, and technology consultancy (Schartinger et al., 2001). Thus, some firms might be used to waiting for university supports, not seeking universities for collaboration. In such cases, it might be difficult for universities to gain information which they want. Firms might also be seen as being intrinsically conservative in information publicity about their businesses (Turok and Raco, 2000) unlike universities members who prefer to exposing results and issues of researches in public. Accordingly, the lack of information for relevant partners and the insufficient firms' expression of needs might be more serious problems to universities than to firms. Generally, in collaboration between firms and universities, universities were generally supporters and advisors because universities acted as knowledge creators and suppliers. Therefore, universities were more likely to think that the establishment of interdependent relationship (e.g. give and take) was difficult than firms because what universities were able to gain from collaboration might be very limited. This situation might also influence universities' perceptions towards trust formed in collaboration with firms. In particular, regarding the insufficient partners' activeness there is a large difference between firms' and universities' perceptions in terms of 'not a barrier'. Since small firms might generally find it difficult to set aside their day-to-day pressures, they might not have the same motivation to collaborate as universities. In this respect, universities were much more liable to think the partners' inactivity was a problem.

6.5 Summary and issues

The firm and university surveys showed that communication, trust, and sharing common objectives were important factors that affected agency interaction in the policy process. The responding firms and universities seemed to think that these factors could play a key role in facilitating interaction between agencies that had different organisational characteristics. With respect to barriers to agency interaction, the responding firms and universities perceived that problems in these factors could hinder interactions between agencies involved in the implementation process. However, in some cases the surveys showed different results from previous and similar studies. For example, the respondents indicated government's channels for contact and communication was one of the most important issues. Institutional set-up and structure that could foster contact and communication with government might be seen as more significant preconditions for interaction with government. Also, with respect to local voluntary networking activities, the factors related to local economic structures in the study region were stressed more than elsewhere in the literature. These results could have arisen because the surveys focused on the interaction in the policy process and the local networks in a specific region. In this respect, the institutional set-ups of the policy delivery system and the local economic structure seemed to strongly influence agency perception about interactions.

Moreover, many responding firms and universities seemed to perceive the suggested barriers as real and practical. However, there were distinct differences between firms' and universities' perceptions in some barriers such as information exchange, sharing common objectives, and relations with government. Also, in many cases universities suggested that the barriers were more serious than firms did. Such differences might be attributed to their different organisational characteristics and different roles or positions in the programmes. Small firms participating in the programmes might be busy with the task of operating a daily business and have more diverse and individualistic needs from the programmes, while the needs of universities seemed to be more collective. As mentioned in the previous chapter, universities were responsible for managing and implementing the programmes at the local level. Under this circumstance, they could interact more with central and local government than

firms. They might also be faced with more diverse and difficult problems than firms because they generally made contact with a variety of firms that had different characteristics and needs. In this respect, universities' perceptions about some factors and barriers might be differently shaped. It can be assumed that the institutional set-ups of the policy delivery system could strongly affect agency interaction. That is, as explored in the literature review, the actions of agencies could be influenced by organisational structures and policy delivery systems in which they existed.

The importance of the policy delivery system also seemed to be identified in the context of policy co-ordination. With respect to the co-ordination of the programmes, it was not only the internal structure of government in decision-making but also the roles of local agencies (e.g. programme managing organisations and local government) that were considered as important. Both the responding firms and universities indicated that a lack of local government effort and poor dispersion of government organisations were serious barriers to policy coordination at the local level. In addition, even in the universities' responses', lack of universities' effort was the most difficult barrier to increasing local policy co-ordination. The dispersion of government organisations was closely related to the institutional set-ups of the policy delivery system at the central level. Moreover, the legitimate role of local government and universities in the implementation process was mainly constructed by the central government. In this respect, how to structure the policy delivery system seems to be important in co-ordinating the programmes at the local level.

Accordingly, the surveys presented significant factors and serious barriers to interactions between diverse agencies and policy co-ordination, and also suggested that different organisational characteristics of agencies and their different roles in the policy process could affect their behaviours and perceptions differently. However, the results of the surveys had several limits in respect to the important issues which this research addressed.

Firstly, although the survey showed the perceptions of firms and universities involved in the programmes toward the indicated factors and barriers, it was not easy to understand practical and concrete meaning of each factor and barrier through the survey. In addition, most of the suggested barriers seemed to be real and differences

between the shares of factors or barriers were not distinct. More importantly, it is very difficult to use the survey to understand how these barriers occurred in practice and where they took place in the policy process. Moreover, in general, a social problem might be influenced by a variety of factors and thus they might be linked to one another. That is, there might be certain relationships between the indicated factors in the survey to some extent, but it is hard to trace these relations in the results of the survey.

Secondly, according to the survey results, the policy delivery system seemed to influence some significant factors and serious barriers. That is, to some extent practical relationships between policy delivery systems and the actions of agencies, which have been explored in the literature review, seemed to be identified through the surveys. However, it is unclear how this policy delivery system affected individual factors and barriers in practice and how the behaviours and perceptions of agencies were specifically formed within the policy delivery system. Moreover, in the previous chapters, agency capacity has been identified as one of the important factors that might influence agency interaction. However, the survey did not clearly show how agency capacity influenced agency interaction in the policy delivery system. For example, such serious barriers as the lack of programme managing organisation's efforts and the lack of local government's efforts in the issue of policy co-ordination might be affected by institutional structure in the programmes, but to some extent they might stem from lack of institutional capacity of universities and local government to respond to the programmes. However, it is difficult to completely trace these relations with the results of the surveys.

Thirdly, according to the survey, different organisational characteristics between firms and universities seemed to influence their different perceptions. These characteristics might be seen as being related to their organisational structures which, of course, consist of institutions and norms and rules that could condition the actions of individuals. Thus, it is necessary to investigate their different organisational structures in order to understand the perceptions and behaviours of agencies in more detail. However, the surveys did not seem to entirely shed light on how different they were and how they influenced agency action in the policy process. Furthermore, through the survey, the factors and barriers to influence local voluntary networking activities

between firms and universities in the Daegu City region were identified. However, it is still not entirely clear how the behaviours of firms and universities were shaped in the local economic structure and how the behaviours influenced the individual factors and barriers.

Chapter 7 The nature of interaction between local agencies

The surveys identified the perceptions of firms and universities about significant factors and barriers to interactions between local agencies involved in the programmes. In this respect, it was possible to answer one of the focal questions of this research: what did local agencies perceive as barriers to interaction and policy co-ordination in the implementation process? However, as these statistical figures could only provide general opinions and attitudes of firms and universities, there were some limitations to understanding agency interaction. In addition, since only the perceptions of firms and universities were investigated, it was difficult to approach the perspectives of the central and local government officers who were also key agencies in the programmes. In particular, the survey did not seem to provide detailed information about the actual practices of agencies in the programmes, the practical meaning of the barriers, and the relationship between agency and the policy delivery system.

The purpose of this chapter is to explain how the perceived barriers occurred in the context of the policy delivery system and the Daegu City region in more detail and depth with interview data and other sources, focusing on the significant factors and serious barriers identified in the survey results. The explanation in this chapter is developed according to the implementation procedures of the programmes considering that main agencies and issues related to interaction and policy co-ordination might differ with the implementation procedures. Generally the procedure of the programmes can be broken down into the following stages: (i) scheme establishment and public notice; (ii) submission and acceptance of proposals; (iii) deliberation and assessment of proposals; (iv) selection of managing organisation; (v) amendment and complement of proposals; (vi) agreement; (vii) performance; (viii) evaluation; and (ix) calculation of funds. Even though interaction between agencies could happen at every stage, certain stages were mainly related to internal procedures of administration such as selection of a managing organisation, evaluation, and calculation of funds. At these stages, interaction between local agencies (e.g. local government, firms and universities) might not be very well identified. Thus, this chapter focuses on scheme establishment and public notice;

preparing and submission of proposals; and performance of the programmes, in which local agencies are mainly involved.

Section 1 discusses interaction between agencies at scheme establishment. As programme schemes were seen as being formulated on the basis of information about specific problems, the needs of local firms and universities and the government's interest in their needs were considered to be important issues. In addition, relationships between programmes and between ministries which could influence policy co-ordination are discussed. Section 2 addresses the process of preparing and submitting a proposal. At this stage, since local universities made proposals with firms and submitted them to central government with agreement from local government, interaction between firms and universities and the role of local government are analysed. Section 3 is about the performance of the programmes at the local level. At this stage, universities carried out the programmes, collaborating with firms at the local level. Therefore, interaction between firms and universities and the role of universities in coordinating the programmes are mainly focused on. Section 4 deals with local voluntary networking between firms and universities in the Daegu City region. This is not related to the implementation procedures of the programmes. However, in order to understand interaction between firms and universities in the policy process in more depth, it is necessary to analyse their behaviours and attitudes about the local voluntary networking between them. Also, their capacity to respond to interaction between in the policy process can be understood, by exploring barriers to local voluntary and social networking. This chapter is concluded with a reflection on demand side coherence.

7.1 Scheme establishment

Generally, central government set up programme schemes and announced them. Since ministries decided schemes and the content of programmes, firms and universities may have interacted less with the government at this stage than at others. As policy is problem-solving behaviour (Hill and Hupe, 2002), programme schemes can be seen as being formulated on the basis of information about specific problems which target groups are faced with and specific needs which they have. There might be some issues

in terms of the needs of local firms and universities and the government's interest in their needs at this stage. Also, communications between the government and target groups, which were indicated as a significant factor in the surveys, need to be addressed. In particular, as explored in chapter 4, since co-ordination of the programmes at the local level might be influenced by the operations and actions of ministries responsible for them at the central level, it is necessary to investigate relationships between programmes and between ministries.

7.1.1 Interaction between government and target groups

Some researchers, who emphasised interaction between the government and the target groups in regional innovation policies, tended to believe that the interaction could help the government find and understand the substantial needs and problems of target groups (Nauwelaers and Wintjes, 2003; Lajendijk, 2000; Morgan and Nauwelaers, 1999; Rosenfeld, 1999). It can be possible to understand the characteristics and problems of interaction between the government and the target groups in the context of Korean regional Industry-Academia Collaboration (IAC) programmes, by investigating the needs of local firms and universities and the government's interest in their needs.

With respect to the needs of the target groups, it did not seem that the needs were very well expressed in the policy process due to the target groups' lack of concern about government policies, the few opportunities to contact government officers and the difficulties in formulating substantial needs. General SMEs were unaware of the existence of government supporting programmes and sceptical of their effectiveness (Turok and Raco, 2000) and they had little time and resources to commit to public processes (Rosenfeld, 1999). In particular, the majority of local firms in the Daegu City regions were small subcontracting firms and thus they might suffer under day-to-day pressures. Therefore, it is assumed that many local SMEs tended to have few interests in government programmes although this may not be the case. These problems were highlighted by the owner of an IT consulting firm:

“There might be some public notices and presentations of policies, but we seldom look at the notices and attend the presentations because we are very busy. Basically, many SEMs are not seen as being interested in such policies”.

Also, direct and frequent contact between firms and government was necessary for the expressed needs of firms (Kaufmann and Tödting, 2003). However, given that firms often tended to be reluctant to approach government and firms seemed to be intrinsically conservative in information publicity about their businesses (Turok and Raco, 2000; Curran and Blackburn, 1994), it did not seem to be easy in practice for local firms to make contact with central government. Some firm owners participating in the programmes were willing to express these situations:

“While participating in a government programme, there are few opportunities to contact central government officers. Therefore, even if we have something to tell them, we seldom do that”. (Owner of internet commerce firm)

“It is very hard for us to contact central government officers because there is geographical distance between local firms and them and also, we very often feel that they are bureaucratic and authoritative”. (Owner of IT consulting firm)

Under these circumstances, it seemed to be difficult for firms to define their problems and needs in detail for government programmes. According to Lee and Oh (1999) since technological problems were generally solved by constant research and development in the long-term perspective, they might have difficulties in expressing their needs explicitly toward government R&D programmes carried out in the short-term period. The owner of a software development firm put the detailed view:

It is very difficult for firms to indicate a specific problem in terms of technological perspective. That is, to define problems in detail is quite hard because the technological problems are generally linked together. Those who have not experienced practical R&D in firms may complain that firms do not express their problems in detail. However, in practice it is very difficult.

Moreover, even though firms were aware of problems in their businesses, firms' needs might not be expressed very well if they were lacking in abilities to assess what the essences of the problems were and how they should tackle them in terms of technology. In particular, considering Daegu's local industrial structure consisting of small subcontracting firms, many local firms did not seem to have the capacity to find

their problems and express them. Universities, also, did not seem to express their needs in relation to the government programmes, although universities might be more aware of how to contact the government officers. A possible reason for this was because they were likely to participate in the programmes in order to receive financial support from government without taking their own specific needs into consideration, as indicated by one central government officer dealing with the Central University for Industry-Academia Collaboration (CUIAC) programme:

“Basically universities do not seem to try to receive government support for developing their specialised fields. Rather, as there are government programmes, they just try to attract them. That is, they do not have specialised needs. They just participate in the programmes as the government finances them. Therefore, it seems to be difficult for them to express specific needs for the programmes”.

In fact, shortage of funds was one of the most serious problems in universities (Sutz, 2001). In particular, many regional universities in Korea had difficulties in attracting students due to the decrease in the young population and the concentration of people in the region of the national capital. They also had more difficulties in obtaining R&D expenditure from external resources (e.g. large companies) than the universities located in the national capital region (MOCIE, 2004). Furthermore, because they were unsure of what the future was and competition between universities was increasing, government funds seemed to be important to local universities in South Korea. In this respect, local universities might, generally, try to attract many different government programmes to expand research equipment and obtain R&D expenditure. In such circumstances, it did not seem to be easy for local universities to form their specific needs towards the programmes. So, the reasons for insufficient expression of target groups' needs were by and large related to their characteristics and capacities.

The central government also seemed to have little interest in the needs of target groups, in particular, firms' needs. According to Nauwelaers and Wintjes (2003), if policy instruments were developed in a reactive and top-down fashion, users' expressed and latent needs might be difficult to be taken into account. Given that the selected IAC programmes in South Korea seemed to be generally designed and implemented in a supplier-oriented mode and a standardised approach, the issue of the target groups' needs might not be important to the central government. For example, when asked to

what extent users' needs were considered in these programmes, the director of the New Industries Division (NID) in Daegu City government said:

“In general, the central government has designed and implemented the programmes in a supplier-oriented way. Thus, the central government does not seem to investigate local needs of firms properly. That is, the government seems to design the programmes on the basis of the abstract assumption that these kinds of programmes are necessary for local collaboration between firms and universities without identifying what they want in government programmes”.

The programmes seemed to adopt a bottom-up approach in terms of procedure in the sense that in the programmes government made local universities (in some cases local government) submit proposals consisting of the practical action plans for the programme implementation. However, as the specific contents of the programmes were in many cases decided by the central government in advance and also the contents of proposals were strictly restricted by the rules and regulations of the programmes, it seemed that local agencies were not given much discretion to adapt the programmes to local conditions or dimensions in preparing proposals, as pointed out by some respondents:

“The central government tends to interfere with specific contents of the programmes”. (The deputy director of the Science and Technology division in the City government)

“Even if there are some contents which we do not want in the programmes, we have to meet the contents when we prepare proposals”. (An academic in charge of the CUIAC programme)

Given these circumstances, the programmes were generally seen as being operated in a supplier-oriented way and with a top-down approach to a large degree. The central government did not seem to be interested in target groups' needs in such systems because the main concern in the system was policy goals and objectives as explored in implementation models. In addition, given that the government tried to support as many firms as possible with limited budget, users' needs did not seem to be an important issue in the programmes. According to the owner of a machinery firm:

“The funding system of the programmes is too segmented. As government tries to provide government services to many firms, limited budgets of individual programmes are divided into small amounts of money for participating firms.

Therefore, such funding system may not be helpful to firms which have substantial needs but to firms which just want to receive government funds”.

Kaufmann and Tödtling (2003) argued that government programmes did not have to try to help as many SMEs as possible disregarding the outputs in terms of innovativeness and competitiveness of SMEs. However, as pointed out by the above respondent, in some cases government tended to prefer a segmented and dispersed funding system in order to support many beneficiaries. For example, according to the report of the Korean Small Business Institute (2005) in the University, Industry and Research Institute Consortium (UIRIC) programme aiming at supporting small and practical R&D collaboration between local SMEs and universities, the amount of money invested in each R&D subject was relatively small due to many participating firms, so that it was difficult for this programme to sufficiently support promising firms which had more substantial needs. Given such a funding system, it seemed that the government was not interested in firms’ needs. Instead, the government tended to try to design a way of making many firms participate in the programme. Furthermore, a standardised and holistic approach to the programmes could be a problem in taking target groups’ needs into consideration. The reason why the government chose such an approach was probably because the programmes also pursued national growth, although they aimed to promote regional innovation. However, asked whether government programmes could meet university needs, an academic in charge of the CUIAC programme told:

“Government programmes seem to be uniformed and thus there are some contents of the programmes which do not match local dimensions. Even if the characteristics of local universities generally differ with regions as well as university types (e.g. national or private university), the programmes are implemented in a standardised way”.

That is, since the government very often tended to design the programmes on the basis of a holistic perspective, it might be very difficult to consider and coordinate a variety of needs of local firms and universities, or regions. After all, the problems of the government’s low interest in target groups’ needs seemed to stem from the delivery system of the programmes being mainly based on a top-down approach. Such insufficient expression of users’ needs and the government’s low interest in users’ needs might impede interaction between the government and the target groups as well

as the formation of well coordinated and tailored programmes to users' needs. In fact, these two factors probably might have a certain relation. That is, active expression of needs could attract the government's interest, and an increase in the government's concern for needs could make users express their needs properly. For such circulation of needs, it seemed to be necessary that communication between them was fostered. According to Landabaso (1997) communicative interaction helped to find out the needs of firms, in particular the tacit and latent aspects of needs. Similarly, Cooke et al. (2000) argued that the lack of communication between policy actors led to programmes designed by the public sector that did not match the needs of users. In this respect, it was natural that the responding firms and universities to the survey considered the factors related to communication as more important than other factors and perceived the deficits of the factors to be more serious than the problems surrounding needs. However, as there was a lack of concern on the part of target groups in the policies, and they did not make contact with the government officers as noted earlier, communicative interaction between them did not seem to occur frequently at this stage. In particular, although there might be some opportunities to contact the government officers in workshops and forums for presentations of programme schemes, target groups were not willing to attend such events as highlighted by a former deputy director of the Science and Technology Division (STD) in the Daegu City government:

“There are some forums and seminars before programmes are implemented, but local firms seem to be reluctant to attend them because they are very busy and are not concerned with them”.

Under these circumstances, it might be difficult for government officers to have opportunities to make communication with target groups. However, more fundamentally, the delivery system of the programmes did not seem to foster communication between them. The traditional top-down approach might cause communication failures between agencies (Bateria and Ferreir, 2002). The IAC programmes were generally driven by the top-down and supplier-oriented approach, as mentioned above, so that it was to be expected that communicative interaction between them might not occur frequently. Also given that the government did not seem to be concerned with local dimensions in the delivery system the communication between them seemed to be difficult. Furthermore, even though there were forums,

seminars and workshops in which they could meet each other and exchange information and opinions, these kinds of methods were not seen as being effective, given the characteristics of target groups as discussed above.

In addition, dispersion of ministries dealing with IAC could be another factor that hampered communication. Although three different ministries had their own purposes in carrying out the IAC programmes (e.g. MOCIE: commercialisation; MOEHRD: human resources development for industry; SMBA: improvement of competitiveness of SMEs), dispersion of responsible ministries could cause the dispersion of information about IAC. Thus, users might be confused in obtaining relevant information which could be an important source of communication. In the results of the surveys, the fact that government channels for contact and communication was identified as the most significant factor to influence interaction between them was understandable, considering above the problems arising from the delivery system.

7.1.2 Coordination of the IAC programmes at the central level

In terms of coordination of the programmes, according to the survey results, the factors related to internal structure of government were serious barriers to coordination of different programmes, for example, the lack of distinctions between programmes, lack of fulfilment of users' needs, and dispersion of government organisations.

Firstly, with respect to the lack of distinctions between programmes, the objectives of the programmes seemed to be slightly different, but in terms of specific contents they were by and large seen as overlapping in the sense that most of them conducted similar functions, such as business establishment support, technology guidance, establishment of R&D centres, information provision and education and training for human resources cultivation (ITEP, 2005) (see Table 7.1). Thus, many interviewees seemed to perceive that the programmes were somewhat duplicated in terms of contents and functions:

“Similar government programmes are implemented in a dispersed manner in the Daegu City region”. (The owner of an electronics firm)

“IAC programmes, which are currently carried out, are not differentiated, so that local firms can feel confused”. (A staff member of a medical equipment firm)

“The contents and functions of IAC programmes are very similar and thus, duplication problems between them can be caused”. (The deputy director of the STD in the Daegu City government)

Even a central government officer in the CUIAC programme recognised this problem:

“Many similar programmes for supporting collaboration between local firms and universities seem to be carried out at the local level at the same time”.

Table 7.1: The comparison of the six IAC programmes in terms of functions

	R&D	Human resource cultivation	Support of firm's business	Establishment of equipment and facilities
TP	O	O	O	O
TIC	O	O	O	O
RRC	O	O	O	O
UIRIC	O		O	
BI			O	
CUIAC	O	O	O	O

Note: O indicates the presence of function in a programme

Source: Based on ITEP (2005) Linkage model and strategy of TIC and RRC programmes

Looking at the contents of the programmes, the duplication between the Techno Park (TP) (by MOCIE) and the Business Incubator (BI) (by SMBA) programmes was relatively remarkable. Basically, the TP programme aimed to establish a complex where R&D resources of industry, universities, and institutes were accumulated in order to improve technology innovation and technology-intensive industry through industry-academia-institute collaboration in a certain region. However, among the functions of the TP programme (e.g. R&D, education and training, business establishment support, information interchange, etc) business establishment support seemed to be very similar to the BI programme aiming to provide preliminary founders and start-ups with synthetic supports. The TP programme also provided newly-established firms with business spaces like the BI programme. Of course, in terms of target groups, they were slightly different (i.e. BI: start-ups, TP: post start-ups). However, some TPs supported both of them (Yang, et al. 2003). In the Daegu City region, three universities (Kyungbuk University, Keimyung University and Yeungjin College), where TP was established, also carried out BI programmes.

Among them, the Yeungjin College operated the TP and BI together unlike the other two universities. Consequently, it did not seem to be easy to differentiate the TP from BI programmes in terms of business establishment support. In addition, there seemed to be some similarities between the Technology Innovation Centre (TIC) and Regional Research Centre (RRC). Even if their main purposes were slightly different (TIC: establishing expensive research equipment, RRC: genuine R&D performance), they both conducted similar functions for supporting the technology development of firms by setting up centres in universities (Table 7.1). Furthermore, since they were implemented independently, similar R&D subjects in terms of technology were duplicated in practice (ITEP, 2005).

Secondly, the lack of fulfilment of target groups' needs was another issue of policy co-ordination. Although diverse programmes were implemented at the local level at the same time, the possibility of policy co-ordination might be increased if the programmes dealt with diverse needs of target groups. According to Cooke et al. (2000), there were broader aspects to be taken into account in innovation, especially for SMEs, such as firm organisation, management competence, skills development, quality management and finance. Thus, if diverse programmes did not meet such broad aspects and needs related to local IAC activities, this could hinder linkage between programmes. One member of the Daegu TP Foundation presented this view:

“If the contents of programmes are not specialised for substantial and diverse problems of local firms, the co-ordination problem can not be tackled”.

However, considering that the users' expression of needs and the reflection of needs on the programmes were quite difficult in the policy process due to the problems presented above, it did not seem to be easy to design specialised programmes to match users' needs.

The third and most important issue was the dispersion of ministries responsible for the programmes. The programmes were designed and implemented by three different ministries, MOCIE, MOEHRD, and SMBA. As what individual ministries pursued in the IAC policies was different as noted above, the programmes were separately formulated and implemented in individual operating systems. However, this seemed to

make it difficult to co-ordinate the programmes. When asked to what extent the programmes were co-ordinated, some respondents pointed out these views:

“As ministries responsible for local IAC programmes are dispersed, a duplication problem between similar programmes seems to occur and co-ordinated operations between the programmes do not emerge. (The director of NID in the Daegu City government)

Since there are many ministries, the contents of IAC programmes seem to be similar. Of course the purposes of individual ministries may be different in their programmes, but if there is a government body able to integrate or co-ordinate the programmes, it could be better. (The owner of an electronics firm)

These views were also observed in previous similar studies. In the study on similar IAC programmes that this research addressed, Kim (2002) argued that different programmes of different ministries were independently carried out, not linked to one another even in a university which was implementing several programmes at the same time, and thus duplication occurred in terms of equipment and facilities for R&D. Also, in another similar study focusing on IAC programmes, Lee and Oh (1999) argued that due to independent performances by individual ministries or even departments in the same ministries, most of the programmes were not linked to one another. Recently, the government tried to tackle the problems caused by duplication and the lack of linkage among programmes. For example, after the authority of RRC was transferred from MOST to MOCIE in 2004, two programmes was integrated to the Regional innovation Centre (RIC) for improving the linkage between them. Also, the recently launched programme, CUIAC, was designed and performed collaboratively by two ministries, MOCIE and MOEHRD, and for successful performance of this programme directors between the two ministries were interchanged. However, it was still difficult to increase co-ordination of the programmes as long as there was a traditional departmental egotism and the programmes were carried out in different operating systems. One central government officer responsible for the CUIAC programme expressed these situations in detail:

“As many similar programmes seem to be implemented, it is necessary to increase their linkage or integrate them. However, it is not easy. In fact, it is difficult to integrate some programmes even in a ministry. As ministries tend to want to have initiatives in their policy areas, there might be departmental egotism. Thus, coordinating the programmes seems to be difficult. Also, the

guidelines and regulations of the programmes as well as the funding systems of ministries are different, so that integrating the programmes is not easy”.

After all, due to such dispersion of ministries, the programmes were seen as being independently carried out. Therefore this seemed to be a serious barrier constraining co-ordination of the programmes.

7.2 Preparing and submitting proposals

At this stage applicants (i.e. universities) submitted proposals to the central government, and then the government made a selection of appropriate proposals through internal deliberation procedure such as the investigation of public institutes and a meeting of the deliberation or management committee set up by each ministry for effective and fair selection. Importantly, for most of the programmes, participation and funding of firms and local governments were preconditions. Thus, universities sought out proper firms and received participation agreements from local governments. Generally, when applicants asked local governments to participate in the programmes, the local governments investigated the needs of the programmes and considered their financial situation before making a decision. Given such a process, what is important to be considered at this stage is interaction between firm and university in the process of searching partners, setting up common interests for programmes and making proposals. Moreover, given that the decision of local governments to take part in the programmes was made, there is a need to investigate the formal and practical role of local government and its behavioural features in terms of interaction with users (particularly universities), and coordination of the programmes.

7.2.1 Interaction between firms and universities in making proposals

Among the diverse factors and barriers to influence interaction between firms and universities in the policy process which were identified in the survey, important issues at this stage were for searching information, reflecting the needs of firms on proposals and sharing common objectives because universities sought out firms participating in the programmes and made proposals on the basis of the firms' needs.

Firstly, as universities that were generally eligible to apply for the programmes tried to identify and search for suitable partners, i.e. firms, the obtaining of information about firms seemed to be an important issue to universities. However, firms, particularly small firms, were generally reluctant to expose themselves and their businesses (Turok and Raco, 2000). Thus universities might have difficulties in seeking out relevant firms. In particular, the process of acquiring relevant information about firms was related to high search costs for universities (Scharinger et al., 2001). In this regard, as presented in the survey results, for universities the insufficient exchange of firms' information could be one of practical barriers to interacting with firms. Due to such difficulties, university members were more likely to seek out firms that they had contacted previously and had experience with, as indicated by one university member in charge of the Central University for Industry-Academia Collaboration (CUIAC) programme:

“Because information about local firms is limited, we basically try to contact firms that we have already known. We have more information about these firms than other firms and thus can easily approach such firms”.

Some business owners who had participated in several Industry-Academia Collaboration (IAC) programmes also recognised this behaviour of university members:

“When universities seek collaborations for government programmes, it is difficult to for firms to refuse their suggestions because they generally approach to firms on the basis of personal relations”. (The owner of an internet commerce firm)

“Academics want to collaborate with firms about which they have readily available information as they do not want to spend time and money on gaining information about firms that they do not know very well”. (The owner of an electronics firm)

That is, past informal and personal networking activities of academics could influence the selection of firms in the programme. This means that informal interaction might affect formal interaction formed within the context of policy. These kinds of links were also likely to be an important factor for firms collaborating with universities. In particular, according to Charles and Howells (1992), the role of personal links was seen as being important in the research and technical context, where those who stayed abreast of the technological field and collected and interpreted information for the

benefit of the organisation might play an important role in screening and decision-making in IAC. The owner of an internet commerce firm gave a very similar view:

“If we have consistently close relations with universities, it will help us to collaborate with them when there is a need. It may also be easier for us to participate in government programmes in the future”.

Experience of networking activity was seen as being an important factor for interaction between firms and universities pursuing programmes in the sense that such informal interaction could influence the formation of formal ties between them. Also, if an academic already had the experience of carrying out projects with firms, institutional and individual barriers to interaction with firms were less likely to occur than in the case of a member without any relevant experience (Scharinger et al., 2001). Therefore, a lack of previous experience might be a significant barrier to cooperation between firms and universities in the implementation process of the programmes. However, in some ways these situations could cause some problems in interaction between them in the policy process. Firstly, firms tended to believe in the social reliability of university members. Thus, if previously contacted academics required firms to participate in government programmes together, firms might participate in the programmes without examining the plans of the university in detail because the firms might consider them reliable, as highlighted by the owner of an internet commerce firm:

“Generally, when academic members give a call to us to suggest us participating in government programmes, we consent to the suggestion without investigating their plans in depth because we think that they are aware of our business and they regard us as a suitable partner”.

If so, it might be possible for firms' needs or opinions about the programmes not to be reflected in the proposals. In this case, although they participated in the programmes, it might be difficult for them to achieve what they wanted from the programmes. This problem is discussed in more detail later. Secondly, as reliance between firms and universities was already established, it might be difficult for firms to complain or suggest problematic issues to universities in preparing proposals and managing the programmes. In particular, as mentioned in the previous chapters, universities had more power in the programmes than firms in the sense that they prepared the proposals and managed the programmes and thus, they generally had more knowledge and information about the programmes than firms. In addition, firms were generally in

the position of beneficiaries supported by universities in the programmes. Given these circumstances, the power of universities seemed to be much greater than that of firms in the government programmes. Thus, in such an extreme asymmetry of power, if some relationships between them in the programmes relied on previously established personal links, it was more likely that firms would be reluctant to tell of their dissatisfaction about university management of the programmes in order to sustain the relationships. A member of a medical equipment firm presented this view in detail:

“As firms are provided with support by universities in government programmes, we may think that the expressing of dissatisfaction in preparation of proposals can hamper established relationships between firms and universities. If reliance between them is damaged due to such a problem, it may be difficult for firms to participate in other government programmes operated by universities”.

For this reason, as shown in the survey results, firms were likely to perceive the lack of influence on university to be one of the most serious barriers to interaction between them, while universities indicated this as less problematic than other barriers.

The second issue was about firms' needs in the preparation of the proposal. Generally, with identifying and selecting firms, university members prepared the proposals to be submitted to the government on the basis of guidelines provided by ministries. Although universities were in charge of preparing proposals, universities needed to properly reflect the needs of firms and local governments who were also key agencies in the programmes. However, in practice, leading the programmes, universities tended to draw up proposals exclusively without proper participation of firms. Therefore, according to the majority of the firm respondents, it was difficult for firms to participate in the preparation of proposals, and thus, sometimes the needs or roles that firms wanted in the programmes did not seem to be taken into appropriate consideration in proposals. When asked to what extent firms could participate in preparation of proposals in government programmes, the owner of an internet commerce firm said:

“In general, firms did not participate in the preparation of proposals... Since universities prepare proposals broadly without understanding specialised sectors and characteristics of firms, some problems can occur in the implementation process. For example, in the past our firm was good at design, but is now specialised in the development of software. In the circumstance where the university allocated a role for participating firms, the university gave us a design

sector role in the programme. Thus, it was quite difficult for us to carry out the allocated role effectively and also the needs that we had could not be satisfactorily met”.

However, this non-interactive preparation of proposals was also seen as being related to the complexity of proposal contents. The contents of proposals generally had to contain a variety of topics such as technological subjects, administrative affairs, and the local economic situation. Thus, firms which did not have much experience of paper work were liable to rely on social reliability and experience of academics without active participation and interest in the proposals. In this respect, one SME's owner who had participated in several government programmes stressed that academic members' exclusive preparation of proposals was likely to be inevitable in government programmes where a synthetic perspective and approach is needed.

“In the programmes, those who have experience of drawing out specific subjects would do very well. Regarding simple technological issues, firms can do well. However, when the government evaluates a proposal, it seems to consider diverse factors such as operation strategy, management structure, investment planning of budget, and technology. In fact, SME owners cannot deal with such broad issues very well. Thus, they just tend to follow what academics want in preparation of proposals”. (The owner of an electronics firm)

In these situations, the amount of information that firms obtained in the programme would be limited. This could be one of the reasons why the responding firms indicated insufficient exchange of university's information about programmes as the most serious barrier as presented in the surveys. Of course, passive participation of firms in preparation of proposals could also take place because firms had difficulties in expressing their technological problems explicitly, as discussed earlier. The owner of a software development firm told:

“Many academics and government officers complain that we do not show our problems to them. However, it is not easy to tackle our technological problems by one or two simple measures as all production processes of firms are linked together. Thus to tell them our specific needs is not easy. In order for academics to understand these problems, they have to stay in firms for a long time”.

This implies that it was quite difficult for firms to express their needs in detail in the government programmes that were generally operated by universities. However, for

universities supporting a variety of firms through the government programmes, if the substantial needs of firms were not articulated properly, they might have difficulty in sustaining interaction with firms in the programmes. Thus, as a result of the survey, universities were more likely than firms to perceive insufficient firms' expression of needs as a barrier to interaction between firms and universities. Even so, the problems above in the process of preparing proposals seemed to be in many cases related to the operating system of the programmes in which universities had full responsibility for preparing proposals. Information, including firms' needs, conducive to foster collaborative interaction did not seem to be very well exchanged in the one party (i.e. university) dominant delivery system.

Another issue in the preparation of proposals was sharing common interests and objectives for programmes between firms and universities. In fact, many studies and surveys suggested common concerns or clearly defined project goals as one of the most important factors for success in collaboration between firms and universities because they had intrinsically different goals (FKI, 2006; MOCIE, 2004; Meseri and Maital, 2001). Before looking into common interests and goals between them, it is necessary to first investigate their motivations in industry-academia collaboration (IAC) because motivation could be a fundamental factor to the establishment of interaction between them. Generally, there were a variety of motivations for universities and firms to collaborate with each other, and they seemed to be somewhat different (Schartinger et al., 2001; Lee, 2000; Charles and Howells, 1992). The reasons for firms collaborating with universities were as follows: to research product development; to conduct research for new technology; to solve technical problems; to design prototypes; to gain access to complementary know-how, outsourcing of R&D and cost reduction; to gain access to research networks. Contrary to this, universities seemed to collaborate with firms due to the following reasons: to secure funds for graduate assistants and lab equipment; to supplement funds for and gain insight into research projects; to field-test applications of researchers' theories; to keep abreast of current technological trends. Such different motivations between them were likely to stem from their different cultures. According to Schartinger et al. (2001),

“The main goal of universities (beside teaching) is to produce knowledge and thus to enhance the stock of knowledge open to the society as a whole. On the

contrary, profit maximising firms seek to appropriate the results of the innovation process and often try to keep the results secret” (p. 261).

Consequently, as long as different motivations originated from their cultural differences existed between them, it might be very difficult to share common interests or establish common goals in the IAC programmes. One central government officer dealing with the UIRIC programme expressed that the different cultures between them hindered the sharing of common interests.

“The goal of firms is to expand their profits through programmes, while universities want to contribute basic research and they are always likely to be interested in overheads from programmes. Thus, with such different interests it is difficult to share common concerns between them even though they participate in the same government programme”.

Also, one owner of a software development firm participating in several government programmes indicated a similar view focusing on the different organisational characteristics of firms and universities:

“It is not easy for firms and universities to share common interests in the programmes because a programme for supporting IAC is similar to a policy that attempts to support collaboration between baseball players who have learned skills to bat a ball and football players who have learned skills to kick a ball”.

Considering these perceptions, in practice there seemed to be somewhat different motivations and behaviours between them mainly stemming from different goals and characteristics. According to Boggs and Rantisi (2003), individual actors tended to operate within a context of institutions, norms and rules within their organisational systems. Thus, it seemed that if their organisational systems were different, behaviours of individual actors were also different to a large degree. In this regard, although firm owners (or staff) and academics collaborated with each other participating in the same government programmes, to bridge their interests was viewed as being difficult, given their different goals and characteristics. Consequently, interaction between firms and universities in the policy process did not seem to be inherently easy. This is discussed in more detail in the next section. In addition to different motivations based on different organisational structures of firms and universities, the current process of making proposals was a barrier to sharing common goals. Adequate communication and information flow between firms and universities

that had different cultures might contribute to shared common objectives in collaboration between them. However, given the university-dominant system and the passiveness of firms, these communication and information flows did not seem to take place very well in the current process of the forming of proposals. In this regard, to establish common goals between firms and universities for programmes was not seen as being easy. In particular, the work of setting up common objectives might be a more difficult task to university members, who generally contacted many participating firms in the process of preparing proposals. Therefore, like the survey showed, universities were much more likely to perceive insufficient sharing common objectives as a barrier to interaction between firms and universities than firms

Furthermore, the majority of the respondents said that in the programmes of grant-in-aid funding systems, the main concern of firms and universities for the programmes might be to receive funding from government. One academic in charge of the CUIAC programme explained in detail:

“University members tend to participate in government programmes in order to obtain research funding which helps to carry out their academic research and to publish their results. On the other hand, since most firms -particularly SMEs- are faced with financial problems, they try to join the programmes in order to gain money for their R&D expenditure”.

Given that most local universities in Korea suffered from a shortage of funds and the majority of local firms in the Daegu City region were small subcontracting firms, this seemed to be a very common situation. Consequently, as they were likely to focus on government funding in such funding systems, it can be assumed that they paid little attention to the sharing of common objectives in the programmes. Rather, there was a possibility that they tried to achieve their own goals through government funding without efforts and attempts to establish common goals. Nauwelaer and Wintjes (2003) also argued that providing simple R&D subsidies might have a limitation to changing the rationality of SMEs in relation to innovation processes. In particular, in circumstance where inherently different characteristics between them existed as noted above, this delivery system focusing on a university-dominant approach and grant-in-aid funding systems did not seem to foster interaction between them.

7.2.2 The role of local government in the programmes

After preparing proposals, universities discussed them with local government. Since most of the programmes, except BI and TP programmes, required universities to attach a confirmation letter of local government participation and funding in proposals, the participation intention of local government in programmes was quite an important precondition. Local government was in a position to be able to link local bodies (e.g. firms, universities) to the central government and it could investigate proposals before they were submitted to central government. At the central government level, there were several ministries dealing with the programmes, while at the local level, a local government was engaged in the programmes. Therefore, it can be assumed that it could play a key role in encouraging the interaction between the central government and local agencies and the coordination of the programmes. According to the survey results, in terms of interaction between government and firms/universities, the responding firms and universities did not note the role of local government (i.e. Daegu City government) as an important factor, but they suggested the passive role of the local government to be one of the most serious barriers. Also, regarding coordination of the programmes, they assessed the efforts of the local government to be an important factor and the lack of the local government efforts to be a serious barrier. That is, the responding firms and universities seemed to perceive that if the local government played a more active role in the performance of the programmes at the local level, interaction between government and firms/universities as well as policy coordination could be improved. Why did they think local government was so passive within the context of the programmes? Basically, the reason for this could be attributed to three aspects: limited legitimate role of local government given by ministries in the programmes; local government's low interest in the programmes; and weak capacity of local government.

Firstly, with regard to the legitimate role of local government, central government did not seem to give local government the authority to deal with the programmes. In most of the programmes local government did not play a part in essential roles such as designing, controlling and evaluating programmes; only in supporting the fund allocated by central government. According to the guidelines of most programmes, the local government was classified not as a managing organisation but as one of a number of participating institutions, which took responsibility for expense and administration support, like firms

(see Table 7.2). Also, in most of the programmes, it seemed to be difficult for local government to engage with scheme establishment, operation, and evaluation of the programmes. One director of NID in the Daegu City government stated:

“The central government tends to control specific action plans of the programmes. As the central government are too much concerned with the implementation process of the programmes, local government does not play a role in the programmes”.

Table 7.2 Position and roles of local government in the programmes

Programme	Position	Roles
BI	-	-
TP	Participating organisation	<ul style="list-style-type: none"> ○ Responsibility of expenses and human resources for programme ○ Administrative support ○ Participation in operation processes of programme
TIC/RRC	Participating organisation	<ul style="list-style-type: none"> ○ Responsibility of expenses and human resources for programme ○ Administrative support ○ Participation in operation processes of programme ○ Support and cooperation for specific technology
CUIAC	Participating organisation	<ul style="list-style-type: none"> ○ Collaborative performance of programme and utilisation of outcomes ○ Responsibility of expenses for programme ○ Support of human resources, facilities, space and administration
UIRIC	Managing organisation	<ul style="list-style-type: none"> ○ Scheme establishment for operation and support of local consortium ○ Conclusion of agreement with local consortium ○ Supervision and investigation for proper expenditure of expenses ○ Evaluation of operation of local consortium

Source: compiled by the author

Even if the guidelines of the TP and RRC programmes allowed participating institutions to join in the operating process of the programmes, this did not seem to define detailed roles or tasks for local government because a participating organisation was broadly defined as an institution participating in establishing and operating a programme with a managing institution (i.e. universities). That is, the legitimate role of local government in the programmes seemed to be weak and it did not seem to make efforts to engage with the operation of the programmes, as highlighted by a central government officer dealing with the CUIAC programme:

Local government is unlikely to collaborate with universities and firms in the operation of the programmes. This might be due to the lack of formal tasks in these programmes. Since they are at the request of central government, local government seems to participate in the programmes unwillingly.

The role of the local government in the programmes seemed to be limited to preparation of local budget in the delivery system in which the crucial decisions for design and implementation of the programmes were made by central government and also, universities were responsible for performing the programmes at the local level (Kim et al., 2000). Such a delivery system of the programmes might be a serious barrier to the role of local government in the programmes as an intermediary agency which can link firms and universities to central government and draw out local needs regarding those programmes.

Secondly, local government did not seem to be interested in the programmes, even if the programmes aimed to promote local innovation activities. As the programmes were for developing the local economy as well as national competitiveness, the central government wanted local government to invest some of its budget in these programmes in order to increase local government's concern towards the success of the programmes. However, local government seemed to have little interest in them despite investment of local budget, as one academic responsible for the CUIAC stated:

“The degree of local government's participation in this programme is quite low. Local government does not seem to be involved in the programmes leaving most matters to us”.

A possible reason for this was because the programmes were a form of national policy led by the central government, as indicated by one academic managing a BI centre:

“Local government seems to regard the BI programme as only the business of SMBA (Small and Medium Business Administration), and tends to neglect this programme at all times, even though it invests some money”.

Even one director of NID in the City government gave a similar view:

“As these IAC programmes are designed by the central government and most of the budget for them is from the central government, local government's interest in these programmes seems to be low”.

Due to such low interest, local government was not likely to be actively involved even in the UIRIC programme in which local government seemed to have a more legitimate role than in other programmes (see Table 8.2). One university member who had managed the UIRIC programme complained that the Daegu City government allocated a very small budget for the programme:

“The Small and Medium Business Administration (SMBA) allocated a large budget for UIRIC programme of the Daegu City region, but the Daegu City government that should pay 25 per cent of the costs of the programme allocated a very small budget. Thus, the supporting fund of the SMBA was reduced. Is the organisation which should support local SMEs in the Daegu City region the Daegu City government or SMBA? After this, Daegu City government may be blamed for that”.

After all, in the operating system in which the important contents of programmes were decided by the central government and local government could only co-finance initiatives, the local government seemed to have little interest in the programmes. The central government was likely to recognise this situation. In the report on investigation into the current status of industry, academia and research institute collaboration in Korea, Ministry of Commerce, Industry and Energy (MOCIE) (2004) stressed that as many programmes were being implemented by a government-led mode, local government followed the policy of central government only formally and passively. Thus, local government’s low interest in the programmes might be, by and large, related to the lack of legitimate role and detailed tasks discussed above. However, as shown in the example of the UIRIC programme, even if local government had a relatively large mandate to manage the programme, it seemed that the local government was not engaged in the programme in the sense that this was a national initiative. Therefore, in the delivery system of the programmes based on a top-down approach local government did not seem to play a key role in the programmes even though the objectives of the programmes were for local economic development, as discussion at implementation models (see chapter 2) and the typology of innovation support systems (see chapter 3) showed.

The third issue was the problem related to the capacity of local government. The majority of interviewees said that local government was generally less specialised than national ministries. Unlike central government, local governments did not have the experience of independent decision-making without the guidance of central government due to long-term centralism, and thus they had less information, human resources and experience than the central government in terms of the IAC programmes (MOCIE, 2004). When asked how he assessed the capacity of local government, the owner of a software development firm said:

“Local governments do not seem to experience these kinds of policies very much. Thus, they are not likely to have capacity to assess the policies”.

Therefore, it was to be expected that local government had difficulties in understanding and assessing proposals submitted by universities consisting of technological subjects, terminology, and specific knowledge. If local government could not evaluate the proposals accurately, it might be difficult for the local government to co-ordinate newly launched programmes with existing programmes at the local level. Of course, even if local governments did not seem to have enough of a legitimate role in the programmes as discussed earlier, they could have a chance to express their opinions on them because in most of the programmes universities could not submit the proposal to the central government without a local government’s confirmation letter. However, given the lack of experience and expertise of local governments, the proposals might not be properly investigated by them. In addition, due to the lack of human resources the local government might have difficulties in dealing with the programmes successfully. In the Industry and Technology Division of Daegu City Government engaged in the programmes, 3 or 4 officers were responsible for the six IAC programmes. However, as they were not only in charge of the programmes but also other affairs (e.g. local government’s own affairs) at the same time, it might be difficult for them to approach these programmes and/or accumulate relevant specific information and knowledge. In particular, as the Korean government adopted traditional a rank-in-person system which resulted in frequent job rotation of government officers (Cho, 2004) their term of taking charge of the programmes was not long. In this system local government officers might have limits to developing expertise in the IAC programmes. Even a director of Daegu City government and a member of KOTEF entrusted with the responsibility of performing a programme from MOCIE and MOEHRD were willing to express this view:

“In terms of management of IAC programmes, the role of local government is insufficient. In particular, civil servants are lacking in ability and the number of workers dealing with these programmes is not enough”. (A former director of STD in the Daegu City government)

“In order to engage in these programmes, they need to make a great deal of effort. However, officers of local government generally have many administrative affairs, so it might be hard for them to engage in those

programmes actively with sincere cooperation and frequent contact with firms and universities". (A member of the KOTEF dealing with the CUIAC programme)

Under these circumstances, the lack of capacity of local government officers to respond to the programmes could be a barrier to appropriate assessment of proposals and effective management of the programmes. Thus, even if local governments were empowered in the programmes, they might not play a key role in facilitating interactions between agencies and coordinating the programmes at the local level as long as this weakness in the competence of local governments and local government officers existed as explored in the previous chapters. As a result, due to the lack of legitimate authority and internal capability of local government, their involvement in these programmes seemed to be insufficient. In this respect, the responding firms and universities in the survey seemed to perceive the passive role of local government to be one of the most serious barriers to interaction between the government and firms/universities and coordination of the programmes at the local level.

7.3 Carrying out the programmes at the local level

After proposals were selected by the government, universities carried out the programmes on the basis of the plan submitted to the government, with the financial support of central and local government. That is, universities started collaborating with firms through collaborative R&D, technology and management guidance, provision of business spaces, and equipment utilisation. Accordingly, more frequent contacts between firms and universities might take place at this stage than at the stage of searching for partners and making proposals, and thus communication, contact and trust between them can be seen as important issues in understanding their interactions. In terms of interactions with government, the central government did not seem to be directly involved in performance of the programmes. However, as it constantly supervised and monitored the programmes for successful implementation, it could occasionally interact with firms and universities. Also, as several IAC programmes were carried out in a certain university at the same time, the role of universities in coordinating the programmes needs to be addressed.

7.3.1 Collaboration between firms and universities

According to the surveys, the responding firms and universities suggested mutual trust and communication between them were important factors for the successful implementation of the programmes. Also, they indicated that the lack of communication, understanding of partner's characteristics, trust, and contacts were barriers to collaborative relationships between them in the implementation process. Universities particularly suggested lack of trust, contacts and understanding of partner's characteristics as the most serious barriers. Why did they think so? Some interviewees told that these problems were caused by 'busyness'. Small firms were always busy due to their day-to-day pressures and academics were also busy in teaching, supervising, and researching. Thus, even in the same programmes they might not make frequent contact with each other, and thus to some extent they might not have the chance to communicate with each other, to understand partner's characteristics, and to enhance trust. However, more fundamentally, the problems in communication, understanding of their partner's characteristics, and trust seemed more probably to stem from cultural differences between them, extreme asymmetry of power arising from their legitimate role in the programmes, and lack of dedicated staff dealing with operating the programmes.

At first, as noted previously, firms and universities had different cultures. In fact, various studies on industry-academia collaboration (IAC) indicated cultural differences between them as the most difficult barrier in terms of human behaviour (Irwin, 2002; Hussain, 1998; Geenhuizen and Nijkamp, 1995; Carr, 1992; Smilor and Gibson, 1991). Culture could influence the patterns of organisational behaviour, its values and its basic underlying assumptions (Feldman and Desrochers, 2004; Hussain, 1998;). In particular, collaboration between firms and universities in the implementation process of the programmes was generally carried out by individual actors of firms and universities, who operated within different contexts of institutions, norms, values, and rules within their different organisational systems, as discussed in the previous section. Thus, even though academics and firm staff collaborated with each other in the same programme, there might be gaps between their behaviours and perceptions arising from their different organisational cultures. In this respect, Smilor and Gibson (1991) argued that

such different cultures could cause barriers to active communication and stable reliability between individual actors. Also, Carr (1992) noted that misunderstanding the needs and motives of partners in collaboration between firms and universities mainly stemmed from their different cultures. Similarly, Geenhuizen and Nijkamp (1995) stressed that the different vocabulary used in communication, resulting from different organisational cultures between them, was one of the most important barriers to communication. More specifically, with respect to the most remarkable feature of their cultural gaps, the majority of the respondents told that firms, in particular small firms, pursued modification and application on the basis of practice-oriented thinking, while universities tended to be interested in new theories and technologies because they were academic and basic science-oriented. That is, universities often had no concern for establishing hands-on applied-type relationships with industry, pursuing excellence in research (Stewart and Gibson, 1990). In the report of Measures to Promote Industry-Academia Collaboration, MOEHRD (2003) responsible for the CUIAC programme indicated this problem as one of the barrier to IAC:

“Shortcomings of the current IAC stem from the lack of on-site adaptability of university knowledge because university focuses on the theoretical approach which fails to meet the practical needs of industry”. (MOEHRD, 2003, p.1)

Therefore, as long as this problem existed in practice, academics and firm staff seemed to have difficulty in communicating with each other, as indicated by two business owners participating in several government programmes:

“Due to competition, small firms generally produce goods with slight modification on the basis of existing technologies. However, universities are different. Universities tend to follow new technological trend. Thus, even if we ask universities to support the technological modification in government programmes, generally universities are likely to be reluctant to accept our requests. In this case, we feel difficulty in communicating with universities”. (The owner of a display manufacturing firm)

“University members are theory-based, but firm staff are practice-based. Therefore, due to this difference there might be a conflict of opinions between them in the process of implementing government programmes. After all, this is one of the insolvable problems unless university members experience the business of firms”. (The owner of an internet commerce firm)

Due to such differences, even if firm staff participated in the programmes in order to receive supports from academics, firm staff might not believe that academics had much information and knowledge to tackle the practical problems of firms. One academic responsible for a BI centre indicated that in practice firms had this perception and this was a possible reason for the passive attitude of firms in the programmes:

“Even if firms occupying BI centres of universities are provided with facilities and information by universities, they very often tend to think that university members are lacking in practical knowledge. Therefore they are often passive to collaboration with university members”.

Under such circumstances, firm staff might consider academics as unreliable. Firms participating in the IAC programmes might think that they could receive substantial support from universities. However, if they realised that academics did not understand the practical aspects of production processes of business activities, this might make it difficult to enhance trust between them, as pointed out by one owner of an internet commerce firm:

“Because universities do not understand the practical processes of firms very well, to improve trust between firms and universities seems to be quite difficult”.

Such cultural gaps might be related to different organisational objectives between them (Scharitinger et al., 2001). Universities were generally concerned with basic research and publications, whilst firms sought a profit and money in the first place, as mentioned by one owner of a metal firm:

“What universities seek in government programmes is to publish papers and articles. On the other hand, firms try to earn money from participation in them”.

Also, a central government officer managing the UIRIC programme indicated that these gaps in objectives could cause disagreement in opinion in the implementing process of the programmes:

“Firms may have information and knowledge about technology which they want to gain from universities. However, university members are not field workers, so that they tend to approach firms’ problems on the basis of academic researches and theories. Also they want to connect government programmes with academic achievement. That is, through them they try to write papers and develop their research fields. In this respect, there might be a disagreement in opinion between them. This is probably due to their different objectives”.

As explored in Giddens's view on the agency-structure relations, the structure within which people existed influenced peoples' practice. Individual actors of firms and universities operated within different structures or systems that had different norms, rules, and values and therefore, the disagreement in opinion between the individual actors seemed to be, in many cases, inevitable. This problem was also observed in terms of their different perceptions of time. There were different lead times of research projects in universities and firms (Geenhuizen et al., 1997) because there might be time gaps between the basic research of universities and the applied and development work of firms (Charles and Howells, 1992). Academics became used to carrying out research with a long-term perspective, unlike firm staff who wanted rapid results. Therefore, in the implementation process, academics might not respond to firm's needs as fast as the firm wanted, as stressed by one owner of a display manufacturing firm:

"Generally, firms require rapid outputs, but university members are very slow because they are not practical but academic".

Firms seemed to have a fixed idea about the behaviour of academics in terms of working speed. This might be a significant barrier to enhancing interaction between firms and universities. That is, as the individual actors of firms and universities seemed to be used to acting within their own organisational cultures, it might be difficult for them to communicate with each other and to understand the partner's characteristics easily in the implementation process. Moreover, due to the position of university members managing and implementing the programmes, which very often required administrative procedures, they might not support firms as quickly as firms wanted. One academic in charge of the RRC programme indicated that a slow response of the university, derived from the university culture and administrative procedure, could hamper trust between firms and universities:

"In the government programme, academics try to possess the results of the programme or to write papers. On the other hand, what firms want is to gain outputs to tackle their problems quickly. Nevertheless, there are administrative procedures and reporting processes, so that it is difficult for universities to respond quickly. Thus, firms might consider universities as unreliable".

Given the agency-structure relations based on structuration theory, academics could be constrained by the structure of the university consisting of institutions, norms, rules and values. Thus if there were some administrative procedures and processes set up by

the university for operating the programme, academics might have to follow them. However, in such a case, firms might not be able to tolerate the bureaucratic procedures, while universities might not fully appreciate the firms' need to minimise procedure and to move quickly (Carr, 1992). Accordingly, the lack of mutual understanding within the context of the programmes could be a barrier to trust between them.

The second issue was the extreme asymmetry of power between universities and firms in the implementation process. As mentioned above, due to the university-oriented operating system of the programmes the influence of universities in the programmes seemed to be much bigger than that of firms, so that firms were only in the position of beneficiaries supported by universities. Thus, academics might have a sense of superiority to firms in the programmes because they thought they helped and supported firms through the government programmes. In this respect, the relationship between firms and universities might be subordinate rather than cooperative and collaborative relationships, as presented by a member of a medical equipment firm:

“Universities are authoritative, and try to stand above firms. University members think they help firms with their academic achievements, and firms want to receive supports from them in government programmes. Therefore, this results in a dominant-subordinate relationship, so that partnerships between firms and universities cannot be formed very well”.

A similar view was presented by one university member managing the CUIAC programme:

“Generally, academics believe that they are in a superior position to firms in programmes. Thus, they tend to carry out the programmes in terms of rendering aid to firms”.

Communication was often an interactive process including various feed-back loops between actors (Geenhuizen and Nijkamp, 1995). However, if the operating system of the programmes was extremely university-led, the voice of firms might not be taken into account in the programmes (Nauwelaers and Wintjes, 2003). Therefore, academics might have an authoritative and superior attitude and then, the relationship between firms and universities within the context of the programmes might be subordinate. That is, due to such a university-led operating system, the programmes might be

implemented in a non-interactive mode which resulted in lack of communication. Under these circumstances, academics might have much more information about the programmes than firm staff and this might influence different perceptions of the responding firms and universities toward information exchange in the programmes as identified in the survey. Thus, if a policy was implemented in a top-down approach in which a supplier (e.g. the central government) had a strong initiative, the degree of interaction between agencies was low. Similarly, if the universities had strong implementing power in the programmes, the interaction between firms and universities did not seem to be high.

Third, the lack of specialised staff in the programmes could also be one of the barriers to communicative interaction between firms and universities. According to Charles and Howells (1992), specialised staff in universities, who had the full range of necessary expertise, could provide a firm with high quality services. As noted above, academics were generally busy because of their basic jobs, so that it might be difficult for firms to contact them frequently. In this respect, the majority of the respondents said that if universities had sufficient specialised staff for the programmes, universities could contact firms very often, and thus the chance of communication as well as trust between them might be enhanced, as presented by an academic managing a BI centre:

“The lack of specialised staff in the BI centre is a significant problem. If there are few dedicated staff in a BI centre, it might be difficult to meet specific needs of firms. In contrast, if there were competent staff, reliability between firms and the university might increase through them, and thus, networks between them could be continuously sustained”.

One owner of an electronics firm in a TP centre also stressed the importance of specialised managers in operating the TP centre:

“There are few specialised managers. TP needs to employ more managers. If a person has been in his field for a long time, he may have much information. The information he has is money, and thus we can receive more support from TP”.

In particular, the issue of specialised staff was important in the BI programme because this aimed at providing start-ups with diverse and general support such as technological guidance, advice on contract law, and business plans. However, in their study on BI centres in South Korea, Yang et al. (2003) stressed that due to the lack of

programme funding most BI centres did not have sufficient dedicated managers for business incubating and thus, academic staff held concurrent posts, so that the capacity of the BI centres to support firms was not high. Since SMBA required that each BI centre possessed more than three experts related to business incubation and support, most of BI centres seemed to hold the minimum number of experts in order to meet the regulations of SMBA. However, in some BI centres which did not have sufficient budget, heads and managers were responsible not only for BI centres but also for their original jobs such as teaching or administrative affairs (see Table 7.3). In these cases they might not make frequent contact with occupying firms in the BI centres, compared to staff taking full responsibility for BI centres. Given that the jobs of academics and the roles of academics in the programmes were decided within the operating structure of the university, the operating structure of the university might prevent individual academics from actively participating in the programmes.

Table 7.3 The number of heads/managers of BI centres by SMBA in Korea (2003)

BI centres	Head		Manager		Total		
	Full service	Concurrent position	Full service	Concurrent position	Full service	Concurrent position	Total
292	180	112	381	199	561(1.9)	311(1.1)	872(3.0)

Note: the figure in brackets is the average number of each BI centre

Source: Yang et al. (2003)

Furthermore, the lack of staff in firms could cause problems in communication. In fact, many successful firms in collaborative programmes had designated staff who were principally engaged in the programmes (Charles and Howells, 1992). However, since small firms had a small number of employees, it might be difficult for them to designate staff for communication and contact with universities. Thus, an academic dealing with TIC explained that the partners for collaboration in firms were insufficient:

“As there are only six managers in this TIC, it is difficult to support 58 participating firms. In order to carry out the programme we try to meet firms, but firms are very busy. In particular they are very small. Most of firms have only 5 to 10 employees. Thus it is not easy to find a proper partner for collaboration in firms”.

To prepare appropriate staff in firms for the programmes could be a bridge to link the programmes to the firms because through them contact and communication between

firms and universities could start. However, given that the majority of firms participating in IAC programmes were generally small firms, it might be difficult for them to prepare or designate appropriate staff for the programmes. Accordingly, if universities and firms did not have sufficient staff who were dedicated to the programmes, interaction between them seemed to be difficult to be enhanced.

7.3.2 Interaction of firms/universities with government

At this stage interaction between users and supplier was broken down into two types: interaction between firms and government; interaction between universities and government. As regards interaction between firms and government, firms did not seem to interact with government. Basically, as the programmes aimed at supporting firms through universities, the government was unlikely to contact firms directly. In this regard, firms participating in the programmes seemed to think that the government did not contact firms often and the firms could be dissatisfied with this situation, as presented by the owner of an internet commerce firm:

“In the process of implementation we do not have a chance to meet government officers. We want to contact them. Because we do not contact them, it is difficult for us to deliver what we want to say to them. For example, if the government explain the objective and tools of programmes to firms in detail, mutual understanding between firms and the government can increase”.

Gibson and Harlan (1995) argued that person-to-person contact was a significantly important factor to interaction between different organisations. Also, Nauwelaers et al. (1999) noted that interactive programmes were implemented in personal communicative interaction with the actors involved. However, as there were a large number of firms in the implementation process and the programmes were practically implemented and managed by universities at the local level, firms did not seem have a chance to have contact with the government. In such circumstances firms may perceive that there are some problems in interaction with the government. Unlike the case of firms, since there were regular meetings, workshops and evaluations, academics could contact the government officers fairly frequently. In this respect, some of university respondents told that the problem in communication with the government was generally not serious. Nevertheless, the majority of the respondents

said that the government was not flexible, and thus, this might hamper communication with the government. In particular, the government was likely to control the use of funds very rigidly, so that many academics indicated that they did not have autonomy in spending funds, and this could cause problems in communicating with the government, as presented by two university members:

“We have accumulated surpluses in the process of managing the BI centre. We tried to spend the money in training BI managers. The government did not allow us to use the money for that purpose, stressing that it was an appropriation of fund”. (An academic in charge of a BI centre)

“There are rigid controls and regulations of government in using the funds in the programmes. The government needs to let us use the fund freely and flexibly, but it tends to interfere in using the funds in detail. Thus, it is not easy for us to communicate with government officers in terms of the use of the funds”. (An academic in charge of the CUIAC programme)

Regarding this issue, government officers also admitted a rigid control in using the fund, and they recognised the current operating system of programme funds needed to be improved. However, they said that the expansion of autonomy in using the funds was difficult due to the possibility of financial incidents and the problem of responsibility.

“University members very often suggest the problem of using the funds and complain of a rigid control of the government. However, we have to keep regulation of the funds because there is always a possibility of danger”. (A central government officer dealing with CUIAC programme)

“Basically, in terms of the fund use it seems to be necessary to give autonomy to universities to some extent. However, if financial incidents happen after the expansion of autonomy we cannot cope with them. General officers in charge of the programmes do not want to take responsibility of these problems”. (A member of the KOTEF dealing with the CUIAC programme)

Consequently, government officers were likely to manage the programmes in a regulatory way, particularly the use of the funds. In relation to behavioural aspects of government financial managers, Dittenhofer (2001) argued that government officers who should serve a government could only do what the law provided for and thus, this restriction could cause inflexibility on the part of the government officers. Due to such

attitudes of the government officers, firms or universities might perceive that the government approached target groups not in a cooperative or interactive manner but in a supervisory or controlling way. That is, as discussed in structuration theory, the practices of government officers could be influenced by the structure of government. Thus, even if government officers tried to be flexible in dealing with the programmes, they might not be as flexible as target groups wanted them to be because they might act within a context of government structure, following the rules and regulation of government. That means that the structure of government surrounding the government officers might prevent them from being flexible. Therefore, individual actors of firms and universities might consider the government officers inflexible and bureaucratic. Such a situation was also identified in the issue of government's response to changing needs of target groups in the middle of the implementation process. According to one government officer, the government tried to respond to changing needs of users flexibly, keeping the original objective and basic framework of the programmes. However, asked whether the government was flexible to changing needs, one academic managing the CUIAC programme said:

“Government is lacking in flexibility. It tends to make a decision in a supplier-oriented mode rather than in a user-oriented mode. In the implementing process of the programmes, if some problems happen they have to take responsibility of the problems. Thus they do not seem to be flexible to changing needs”.

However, according to the survey results, with respect to the lack of government's flexibility to the change of needs, the perceptions of responding firms and universities were slightly different. Firms indicated this to be a much more serious barrier than universities. This was probably because only universities could suggest the change of plans to implement programmes. That is, the change of firms' needs was delivered to the government through universities. Thus, one member of the TP Foundation indicated that firms' needs might not be exactly delivered to the government due to universities:

“Firms' needs do not seem to be delivered to the government. Even if universities receive firms' suggestions about programme plans, universities might deliver them to the government after amending them for their advantage”.

As a result, the satisfaction of firms with government response to their changing needs may be lower than that of universities. After all, many barriers to interaction between individual actors of the government and firms/universities may stem from different

structures within which they existed and acted and which influenced their behaviours. Also under such different structures, firms or universities may regard the government as an inflexible and bureaucratic organisation. This could hamper the interaction with the government officers because they might be reluctant to approach the government due to perceived attitudes of the government officers (Curran and Blackburn, 1994)

7.3.3 The role of universities in coordinating the programmes

At this stage the role of universities in coordinating the programmes was seen as being important. Some of the programmes were carried out in the same university at the same time (see Table 7.4), so that academics dealing with them could often meet one another and thus, they could exchange relevant information about other programmes.

Table 7.4: The IAC programmes implemented in local universities in Daegu City

University	TP	BI	TIC	RRC	UIRIC	CUIAC
Kyungbuk University	O	O	O	O	O	O
Keimyung University	O	O		O	O	
Yeungjin College	O	O	O		O	
Daegu Polytechnic College		O			O	
Yeungnam College of Science & Technology		O			O	
Korea Polytechnic VI College		O			O	
Daegu Health Colledge		O			O	

Note: O indicates the presence of programmes in a university.

Source: compiled by the author

Furthermore, in some guidelines of the programmes the government advised universities to make an effort to increase linkage between the programmes (Table 7.5). Also, recently, the Industry-Academia Collaboration Foundation (IACF) in each university was established for synthetic management of IAC affairs according to the regulation of the Industrial Education Promotion and Industry-Academia Collaboration Facilitation Act. Therefore, this organisation might play a crucial role in managing the diverse IAC programmes implemented in universities in an integrated way.

Table 7.5 Provisions regarding university's effort for linkage with other IAC programmes in programme guidelines

Programme	Contents
RIC	If there is a Techno-Park within the administrative area where the Regional innovation centre is located, the RIC has to make an effort in order to increase linkage with the Techno-Park.
CUIAC	The managing university has to establish an operating system for linkage with the Regional Innovation Centre in order to achieve the objectives of the CUIAC programme effectively.

Source: compiled by the author

However, according to the survey results, a lack of effort by universities was indicated as a serious barrier to linkage and coordination of the programmes, particularly in the response of universities. That is, the responding firms and universities seemed to perceive that universities did not function very well in coordination of the programmes. This was probably due to the lack of cooperation between academics and the low involvement of the IACFs in operating the programmes.

First, academics did not seem to cooperate with one another even though they were in the same university. This could be due to the fields of individual programmes being relatively distinct and individual academics managing the programmes with a strong initiative about their own programmes. They might not want to be interfered with by other programmes. When asked why academics did not cooperate with each other, a government officer said:

“Most of the programmes have their own fields. Also, academics are likely to think that they possess equipments in their laboratories, even if they are established by government programmes”. (A central government officer in SMBA)

More importantly, this lack of cooperation between academics seemed to be affected by different managing systems of the programmes derived from being implemented independently by several ministries. As the programmes were operated by different budget systems, academics might have difficulty in making the effort to coordinate the programmes. This problem was particularly highlighted by the government-side:

“We tried to supplement the insufficient part of CUIAC with TIC, but we failed to do due to their different budget systems. That is, their operating systems were

different. Even the programmes carried out by one ministry may have different budget systems". (A member of the KOTEF dealing with CUIAC)

"The regulations of spending budget differ with ministries, so that it may difficult to increase linkage among the programme". (A staff member of the ITEP dealing with the TIC)

In particular, according to Hassink (2001) who researched South Korea's regional innovation support systems, agencies in the regions were strongly vertically dependent on national ministries. In this respect, individual academics might not make an attempt to coordinate the programmes designed and implemented by different operating systems of different ministries in a centralised delivery system. That is, given this delivery system of the programmes, interaction between academics for co-ordination of the programmes did not seem to occur very well.

The second issue was about the low involvement of the IACF in the programmes. According to MOEHRD (2003), the IACF aimed to set up a point to facilitate communication and information exchange between firms and universities as well as to provide firms with a synthetic one-stop service. Also its main role was to coordinate and integrate government support services and to facilitate partnerships among organisations supporting SMEs. In this respect, it can be assumed that the IACF could contribute to the coordination of the IAC programmes. However, the IACFs did not seem to function in the coordination and linkage of the programmes, as highlighted by the university member in charge of the UIRIC programme in the Kyungbuk University where all of the selected IAC programmes were performed at the same time:

"The role of IACF is to manage the funds of the programmes effectively. However, IACF is not involved in individual programmes at all. It may assist the programmes, but it cannot coordinate the programmes now".

Another academic responsible for the RRC in a university where several IAC programmes are carried out presented a similar view:

"IACF is very busy in management of the accounts of the programmes. In university it needs to play a key role in the linkage of the programmes. However, it is likely to perform only simple affairs related to accounts and administration".

A possible reason for the passive function of IACFs might be the lack of dedicated staff and the low expertise of the staff members (Son and Lee, 2005). If the IACFs

wanted to be involved in co-ordination of the programmes, they needed to be fully aware of diverse characteristics and functions as well as operating systems including the funding structure of the programmes. However, if the IACFs did not have sufficient human resources with expertise, this would be difficult. In particular, given the strong ownership of individual academics managing the programmes and the independent operating systems of the programmes by national ministries, it seemed to be more difficult for the IACFs, which did not take responsibility of the programme directly, to control and coordinate the programmes at the local level.

7.4 The characteristics of local networking activities in Daegu

According to Blau (1968, quoted in Grabher, 1993a), social exchange relations generally started with minor transactions where little trust was needed, so that the relations evolved in a slow process. However, if both partners in the relations could prove their trustworthiness, they might expand their relation and engage in major transactions (Blau, 1968, quoted in Grabher, 1993a). Thus, long-term personal knowledge between key actors could stimulate subsequent relations between the actors (Grabher, 1993a). In particular, repeated informal interactions between actors could contribute to falling costs of future interactions by the development of routines and conventions, and thus this could make the relationship stable because the actors might benefit from a climate of trust and mutual understanding in the interactions (Dahl and Pedersen, 2003).

In successful interactions between firms and universities in the programmes, local voluntary networking activity between firms and universities can be seen as one of the most important issues. If local voluntary and social networking activities between firms and universities were actively established in a certain region in which the IAC programmes were implemented, it might be assumed that more interactive relationships between firms and universities in the policy process could occur because trust and personal knowledge between them might be already accumulated. Moreover, the behaviour and thinking of firms and universities towards collaboration in the programmes might be influenced by the local collaborative networking environments shaped in regions. In this respect, the local networking activities could be related to the

capacity of firms and universities to respond to interaction between them in the policy process. In addition, according to the survey results, firms and universities perceived that the lack of previous experience of networking activities between them was one of the barriers to interaction between them for the successful implementation of programmes. That is, voluntary networking activities between them could influence interaction between firms and universities participating in the programmes, as highlighted by one member of the Deagu Techno-Park Foundation:

“Policy programmes for IAC can be implemented very well, if local collaboration activities between firms and universities are well-established before the programmes are carried out in a region”.

Furthermore, in regions where local collaborative networking activities were facilitated, the lasting effects of the IAC programmes might be greater than in regions where these activities were lacking, as presented by the staff member of the KOTEF responsible for the CUIAC programme:

“Government support for IAC is limited. If collaborative activities among firms and universities in a certain region are weak, as soon as the programmes are finished collaboration between firms and universities will not last. In contrast, if there is a social basis and infrastructure of collaboration between them, they will collaborate with each other constantly after the support finishes”.

This section deals mainly with barriers to local networking activities in the Daegu City region in order to understand the characteristics and context of the networking activities. This might contribute to an understanding of behaviours of local firms and universities participating in the programmes in more detail and depth. The factors and barriers to influence local networking activities between firms and universities were identified through the survey. They could be broken down into general and regional issues. The general factors are broad and common issues to be addressed for understanding networking activities between firms and universities such as trust and interdependence. These issues could be applied to other types of interaction between other organisations in other regions. In contrast, the regional factors are mainly related to problems being faced by local universities and firms in the context of regional industrial structure in Daegu City (e.g. suitable match between the types of knowledge local firms required and the types of local knowledge universities had, enough partners for collaboration, and human and material resources of partners). Of course, the regional factors can be in some ways

general factors because they can be used in understanding networking activities in other regions which have similar characteristics to Daegu City. Also, they might overlap with the general issues to some extent. However, in the sense that these factors are connected to more specific spatial issues, they are separately discussed in this section.

7.4.1 General issues in local networking activities

General issues included cultural differences, trust, interdependence, and information flow. First, there seemed to be generally different intrinsic features between firms and universities in terms of objectives, interests, technology, knowledge, and expression of needs, etc. That is, while firms tended to pursue modification and application technology on the basis of a practice-oriented approach and tried to maximise profits, academics tended to be interested in publishing papers pursuing basic research in a theory-oriented approach. As long as these differences between them existed, collaborative networking activities between them might not be established easily. Such factors have already been discussed in the previous sections explaining the barriers to interaction between firms and universities in the context of the programmes. Of course, voluntary relationships between them might be different from interactions between them formed in the programmes. However, as the behavioural aspects of an organisation were based on its culture (Hussain, 1998) the behaviour related to such cultural factors might not differ largely with other types of interactions. Under these different cultures, as discussed earlier, individual actors of firms and universities acting within their different organisational contexts might have difficulty in collaborating with others.

Trust was also an important factor in relationships between two organisations. As trust was one of the key determining factors which bound the relationship together (Smith and Holmes, 1997), the lack of trust could discourage interaction between key participants. This was also highlighted by two business owners:

“If there is trust between firm and university, they can approach each other with an open mind”. (The owner of an electronics firm)

“In the sense that networks between firms and universities are to collaborate with each other, partnership based on trust is important. Once trust between them is broken down, it is very difficult to collaborate with each other again”. (A member of staff of a medical equipment firm)

In this regard, trust might be seen as a fundamental component to build collaboration between different organisations. Porras and Clegg (2004), also, argued that if trust existed, organisations might be willing to collaborate with other organisations and they were likely to share and exchange resources and information more openly with other participants in collaboration. Therefore, without trust between firms and universities collaborative networks might be difficult to establish. The lack of trust in collaboration between them could be caused by a variety of factors. However, the majority of the respondents told that cultural gaps between them were one of the basic reasons (see section 7.2 and 7.3). In other words, they might be aware that both sides had different objectives as well as different approaches to technology and knowledge as mentioned above, so that they (particularly firms) might have a perception that counterparts were not helpful and supportive. This perception was a sort of distrust and thus if they had this perception they might not make the effort to build a collaboration.

The further factor in the general issues was give-and-take relationships. In order to form and develop collaboration networks both sides needed to obtain benefits from collaboration. In network theory reciprocity which meant actions that were contingent on rewarding reactions from others was one of basic features (Grabher, 1993a). These give-and-take relationships seemed to be a precondition for collaboration networks. Generally, in collaboration networks between them firms (particularly SMEs) were beneficiaries while academics were supporters. Thus, what academics obtained from collaboration was important, as presented by two interviewees:

“When firms want to collaborate with academics, collaboration relations cannot be built if academics obtain nothing from the collaboration with firms”. (The owner of a display manufacturing firm)

“Academics need to acquire something from collaboration with firms, for example, publishing research papers”. (The director of NID in the Daegu City government)

In general, due to sufficient financial resources, big companies could give financial compensation to academics in collaboration. However, small firms, which, generally, suffered from a lack of financial resources, might not compensate academics' efforts in collaboration. In particular, given academics' basic jobs such as publishing research papers and teaching students, if sufficient financial compensation was not secured academics might not be willing to collaborate with small firms. Moreover, as small

firms generally pursued more practical technology than large firms, it might be difficult for academics to gain important sources for their research through collaboration with the small firms. In that case, academics might not have a motivation to collaborate with small firms. In this respect, universities seemed to need to give incentives to individual academics participating in collaboration with small firms in order to enhance local networking activities, but in practice such incentives were unlikely to be sufficient, as highlighted by one member of the KOTEF responsible for the CUIAC programme:

“Generally, there do not seem to be sufficient compensating systems and incentives to enable academics to collaborate with firms in universities in South Korea. Under current circumstances it is difficult for universities to encourage academics to participate in collaboration”.

In particular, as the assessment of academics in universities focused on the publication of research papers, there might be little motivation for academics to collaborate with small firms in which other benefits (e.g. to secure funds for graduate assistants and lab equipments, to supplement funds for one’s own research) were difficult to gain due to the insufficient funds of small firms in the collaboration. If universities considered the activities and performances of academics in IAC in the assessment of academics, academics might be more willing to participate in collaboration with firms, as pointed out by an academic who dealt with the CUPAC programme:

“If university regarded collaboration activities with firms as achievements of research activity, the collaboration activities with firms could be more facilitated”.

After all, rewards for academics might be insufficient, particularly in collaboration with small firms. For this reason, in the survey universities were likely to perceive insufficient establishment of give-and-take relationships to be more of a ‘strong barrier’ than firms.

A lack of information was another barrier to collaboration between firms and universities. Information could help an organisation to scan and become aware of a possible and proper collaborative partner (Charles and Howells, 1992). Moreover, Grabher (1993a) argued that better information might reduce search costs. However, there might be information gaps between universities and firms within the context of collaboration because firms had the vague idea of technologies and capabilities

available in universities and universities did not know what firms wanted (Carr, 1992). A director of NID in the Daegu City government dealing with the programmes said:

“It is quite difficult for firms to identify who has the technology and knowledge that are suitable for their product processes. Also academics do not know which firms they should deliver their knowledge to”.

Firms might be faced with this problem more often than academics because they were generally the beneficiaries who wanted to obtain technology information within the context of collaboration, as indicated by a central government officer responsible for the UIRIC programme:

“Firms have difficulty in identifying academics’ special fields of study. It may be hard for them to visit universities by themselves in order to find suitable academics for them”.

Due to such incomplete information, actors generally tended to rely on their primary relations with other actors in searching for appropriate collaborating partners and thus information on potential collaborating partners was determined by previous personal relations (Grabher, 1993a). This tendency was also shown in relations between firms and universities in the programmes, as explained in section 2. That is, academics were likely to seek collaborating firms participating in the programmes with previously established contacts and relations. From these cases, it can be assumed that more information can lead to more relations between firms and universities (Grabher, 1993a). Thus, as long as the lack of information existed in the context of local collaboration networks, it might be difficult to facilitate the collaboration activities.

7.4.2 Issues of industrial structure in local networking activities

Generally, regional innovation activity might be hampered by the absence of, or a weak regional innovation system, such as insufficient relevant regional actors, a lack of innovation collaboration between players, and a lock-in situation (Asheim and Isaksen, 2003). Many stressed that similar deficits in regional economic dimension existed in the Daegu City region. According to the majority of the respondents they might be barriers to facilitate local collaboration activities between firms and universities. These deficits were mostly related to the features and development

processes of Daegu's industry such as organisational thinness, an industrial structure oriented towards subcontract companies and a lock-in situation in the textile industry

First, in relation to 'organisational thinness', Asheim and Isaksen (2003) asserted that a lack of relevant regional actors hindered a regional innovation system because this might fail to enable collective learning. 'Organisational thinness' was broken down into two parts: the firm side and the university side. Firstly, in relation to a lack of relevant players in terms of firms, the majority of the respondents told that even though there were many firms in the Daegu City region, firms suitable for collaboration with local universities were not sufficient because there were few large or medium-sized firms able to invest in R&D activities, as pointed out by the director of the Daegu Regional Innovation Agency:

"In the Daegu region, there are no players on the firm side. There are rarely large as well as medium-sized firms. Thus, R&D and marketing activities in local firms are rare. This situation is the main reason why collaborative activities between firms and universities in the region have not been very well developed".

In particular, as mentioned above, academics seemed to be more willing to collaborate with large firms than small firms because large firms could invest more R&D expenditure and compensate academics' activities in collaboration than small firms, as indicated by an academic responsible for the CUIAC:

"Generally academics do not seem to participate in collaboration with small firms, even though the firms ask for collaboration. Academics need to obtain data for research and secure funds for graduate assistants. Small firms may not be able to afford to do this. Academics tend to want to collaborate with large firms such as Samsung Electronics. Although there are some small high-tech firms that can improve their business with small support from academics in the Daegu City region, academics are unlikely to collaborate with them".

Given this statement, the presence of large firms was likely to be important to improve local collaboration activities. In fact, larger firms were more likely to form R&D collaboration in order to acquire increased innovation capabilities due to their greater resource capacity than smaller firms focusing on exploiting existing capabilities due to their lower resource capacity (Dickson and Weaver, 2005). However, the share of SMEs with below 300 employees in Daegu City Region was the highest in Korea (see Table 5.8) and the number of large firms with over 300 employees in Daegu was also

fewer than any other regions. Moreover, R&D expenditure in the firm sector was much lower than that in any other region (see Table 7.6). After all, as the most of local firms were small and their R&D scale was unlikely to be large, it might be expected that the academics in local universities did not actively participate in collaboration networks with local firms. In this respect, in the survey it was understandable that the responding universities perceived the number of partners for collaboration as one of the most important factors in local networks.

Table 7.6 R&D expenditure in firm by regions in Korea (2002)

	Region	Number of manufacturing firm	R&D expenditure	Composition rate of R&D expenditure in country	R&D expenditure per firm
City	Seoul	20254	2813525	21.96	139
	Busan	9699	148779	1.15	15
	Daegu	7060	107895	0.83	15
	Incheon	9614	368622	2.84	38
	Gwangju	1823	137731	1.06	76
	Daejeon	1250	620234	6.05	496
	Ulsan	1534	232240	2.49	151
Pro- vince	Gyeonggi	32718	5607249	44.25	171
	Gangwon	1599	38319	0.30	24
	Choungcheongbuk	2810	299589	2.31	107
	Chungcheongnam	3545	401010	3.09	113
	Jeollabuk	2358	490672	3.79	208
	Jeollanam	2693	95379	0.74	35
	Gyeongsangbuk	5663	460333	3.55	81
	Gyeongsangnam	8076	697940	5.38	86
	Jeju	329	2119	0.02	6
	Whole country	111025	12612637	100.00	113

Source: Taken from: Korea National Statistical Office, Report on the Survey of R&D in Science and Technology (MOST & KISTEP, 2003)

In addition, in terms of the exchange of human resources, the absence of large firms seemed to be a barrier to local collaboration networks. If there were several big companies in a region, many students who graduated from local universities in the region might join the companies and then, academics in the local universities might have more interest in collaboration with the companies. One academic in charge of the UIRIC presented a similar view:

“Since there is no big company that students want to join, it is not guaranteed that my student will get a job with local firms. Thus, I have had no interest in local

firms. If there were several big firms in our region, the situation may be different. That is, the activities of local collaboration networks would be much better”.

Also, if many university students joined local companies the students might be a bridge to collaborative networks between the companies and the universities in a long-term perspective, as mentioned by an academic in charge of the CUIAC programme:

“If there are a few large firms and they cooperate with firms in our region, students may attempt to get a job with these firms. If many students work for the local firms, collaboration with the firms may be established very well”.

With respect to the number of local universities in Daegu, the responding firms in the survey did not seem to perceive this to be an important factor to collaboration networks with universities. In fact, there were 9 educational institutes (2 universities, 7 junior colleges) in the region, so that the number appeared to be lower than in other regions. However, since the number of local firms which wanted to collaborate with universities did not seem to be high due to the high proportion of traditional small firms, which were not interested in collaboration with universities (this is discussed in the second spatial issue in detail), the number of local universities was unlikely to be an important factor to collaboration between firms and universities:

“In the context of local collaboration the supply exceeds the demand, so that the number of local universities is not a significant problem”. (Former director of STD in the Daegu City government)

“In Daegu many firms are in traditional industry sectors which do not need collaboration with universities, so the number of local universities is not insufficient”. (A staff member of Daegu Techno-Park)

Instead of the number of universities, the responding firms in the surveys perceived human and material resources of universities to be one of the important factor and they also indicated the lack of human and material resources of universities as a serious barrier to collaboration with universities. This was probably due to a lack of postgraduate students in local universities, as one academic in a chemical engineering department stated:

“One of the significant problems in collaboration with firms is a lack of research staff. Postgraduate students are being drained in local universities. There are 9 academics in our department, but around three students in the master’s degree also

enter our department. The value of human resources is becoming extremely important”.

One important reason for the lack of postgraduate students was possibly due to the concentration of population and economic resources around the Seoul metropolitan area, called the ‘capital region’, including Seoul City, Incheon City and Gyeonggi Province. According to OECD (2006), this area accounted for around 48% of the national population and most economic activity was concentrated in this area producing almost half of Korea’s gross domestic product (GDP, 47.7% in 2002), firms (45.6%) and employment (49.6%). In particular, Seoul hosted the headquarter functions of large internationally competitive Korean companies (such as Samsung, LG and Hyundai) (OECD, 2006). Furthermore, 40 of 181 universities in Korea were located in the Seoul City. According to the survey of the Korea Employers Federation (2006) large companies tended to prefer to employ the students graduated from universities in Seoul City. In this respect, even if the students graduated from local universities, they generally wanted to enter the research schools in Seoul City. Consequently, local universities did not seem to have sufficient graduate students who are important to collaborate with firms, as presented by two interviewees:

“If there are few postgraduate students, collaboration between firms and universities may not be well carried out. Competent students do not seem to enter graduate schools in local universities. Rather, they want to enter universities located in Seoul City. Local collaboration between firms and universities may be difficult to establish in this respect”. (The owner of a metal firm)

“It is very difficult for local universities to secure competent graduate students. The capable students tend to enter universities located in Seoul, the capital city because the headquarters of large companies are there”. (A director of the Daegu Regional Innovation Agency)

The second spatial issue was the subcontract companies-oriented industrial structure of Daegu City. In addition to the absence of large firms, in Daegu’s economy the share of small companies in oriented towards the subcontracting industry was likely to be high as investigated in chapter 5. According to Curran and Blackburn (1994), subcontracting was the most commonly used notion in analysing relations between small and large firms and this means the supply of items or services on the basis of written agreements. Also, subcontractors referred to those who supply firms outside, or large, dominant local

firms (Asheim and Isaksen, 2003). The types of subcontracting relationships were differently categorised by researchers. However, Asheim and Isaksen (2003) broke down subcontractors into two types: specialisation subcontractors; dependent subcontractors. Specialisation subcontractors were those who could co-operate with customers on design and quality, and they often had highly technical competencies. Dependent subcontractors generally had very little technical competence, produce parts and components to order, and were subject to strong pressure on pricing (Grabher, 1993a). According to this classification, the majority of local firms in Daegu City seemed to belong to dependent subcontractors. The Korea Institute for Industrial Economics and Trade (KIET) (1999), one of the public think tanks in South Korea described one of the serious problems of the Daegu City economy as follows:

“Although the share of SMEs in the Korean economy is, generally, high, the SMEs in the Daegu City region are mostly comprised of subcontractors which only manufacture items on the basis of the orders of large firms, and thus they are lacking abilities of independent marketing or technological development” (p.4).

The majority of respondents said that this industrial feature of Daegu was a barrier to collaboration between firms and universities. As these firms, generally, did not need R&D activities, they might not be willing to participate in collaboration with universities, as highlighted by one academic responsible for the TIC programme:

“Most firms in the Daegu region are oriented towards the subcontracting industry. They only produce components according to order from large firms. They do not recognise the necessity of collaboration with universities”.

A similar view was presented by the director of the Daegu Regional Innovation Agency:

“As business owners in our region have run only factories, they do not know markets. There are likely to be only dependent subcontractors in our region. Thus, collaboration with universities is not an important factor to their business because they just receive orders from large firms and then supply components. Thus they have not tried to invest in R&D and known what to do for R&D. They do not have entrepreneurship in this respect. This means that there is no precondition for collaboration networks between firms and universities in our region”.

Moreover, under these circumstances, it was likely that the type of technology or knowledge, which many dependent subcontractors wanted to develop, might not suit the type of knowledge academics had. Thus, although they tried to collaborate with

universities, collaboration between them might not take place very well. One member of the Daegu Techno-Park Foundation pointed out knowledge gaps between local firms and local universities to be a significant barrier to local collaboration networks:

“Generally, the research of local universities tends to focus on high technology. However, there are few local firms to adopt the high technology directly to their business. Generally local firms want the technology suitable for mass production. After all, there are big gaps between firms’ knowledge requirement and the knowledge universities possess. In this situation, it is difficult to develop local collaboration networks”.

The third issue was a lock-in situation. Cumulative learning and path-dependency could cause the institutional, social and cultural ‘lock-in’ of local business behaviour (Asheim and Isaksen, 2003). This lock-in situation often occurred due to a history of dynamic industrial development (Isaksen, 2003). As mentioned above, Daegu was known as a textile city in Korea. Although the local textile industry was declining and its share in the local economy was decreasing, it was still a dominant industry in Daegu City. Thus, many pointed out that Daegu had a mono-structural economy (Hassink, 2005; KIET, 1998). The local textile industry might have largely influenced the local economy for a long time. One academic responsible for the CUIAC programme stated:

“Daegu’s economic culture, which influences the behaviours and perceptions of local economic actors, has been led by those who own textile companies in Daegu”.

This view was also stressed by a member of the Daegu Techno-Park Foundation:

“The culture of the textile industry is the culture of Daegu City’s economy. That is, the local economic and entrepreneurial culture has been dominated by those who own textile companies”.

Daegu’s textile industry was characterised as a distinctive production system that specialised in producing chemical fibre through local dense subcontracting networks or in the middle-stream of textile production processes (Hassink, 2004). Many textile firms in Daegu tended to rely on the production of orders of large firms or overseas buyers rather than production of their own designs (Lee et al., 2000). The majority of these firms were not specialisation subcontractors because they were producing and weaving fibre with automatic weaving machines without specific technology (Lee et al., 2000). Thus, Daegu’s textile industry was specialised in the narrow low-value added and low-tech middle stream of the textile value chain on the basis of mass production, while

high-value added high-tech downstream activities (e.g. fashion and design) on the basis of technology development were completely absent (Hassink, 2005; KIET, 1998; MOST & Daegu City, 2003). That is, the narrowly specified mass production (i.e. weaving) on the basis of dependent subcontracting was locked in (Hassink, 2004) and thus the institutional, social and cultural 'lock-in' of business behaviour might have existed in the context of the local textile industry.

Given such features, it might be obvious that most local textile firms had not recognised the necessity of collaboration with universities because of little interest in R&D activities. This view was highlighted by several the local government officers who were in charge of local economy affairs:

“Collaboration between firms and universities can take place when firms have desires and concerns for new product and technology development. As firms do not cope with them with their own ability, they tackle them with support from universities or academics. However, many local textile firms are not interested in developing new product and technology. They just run their businesses weaving fibre with automatic weaving machines. Collaboration with universities is not important to local textile firms lacking in such desires and concerns for new product and technology development” (A former director of STD in the Daegu city government)

“One of the distinctive features of the local textile industry is subcontracting. The majority of local textile firms just follow orders of large firms. Thus, they do not consider the reflection of their ideas in their production process. Since their own ideas are unnecessary, they do not need technology development and thus they do not need to invest in R&D”. (A deputy director of STD in the Daegu city government)

“Those who run many local textile firms do not seem to have an entrepreneurial mind. They have solely imported automatic weaving machines from other countries and then, have tried to export textile through mass production. They have not attempted to gain their own technology and thus, have not invested in R&D. Thus, the culture of collaboration with universities has not taken place in the local textile industry”. (A director of NID in the Daegu city government)

Isaksen (2003) also argued that a region in which there was a general 'lock-in' of entrepreneurial spirit toward a 'sub-contractor culture' might be less successful in networking between industry and universities. After all, as the dominant industry

which had a big influence on the local economy did not contribute to developing collaborative networking activities with universities there might have been little interest in local collaboration activities and thus, the culture that favoured collaborative interaction might have not been established very well.

Another side of the 'lock-in' situation was that in an area which has 'lock-in' situation it might be difficult to provide an enabling environment for the new types of economic activity (Isaksen, 2003). In particular, this problem was about 'political lock-in' related to the decreasing competition and dynamism (Grabher, 1993b). According to Grabher (1993b), the politico-administrative system, which the central government, regional and local planning authorities and unions and professional associations sustained, kept the region effectively on course, even when this course became a dead-end. Thus, the highly cooperative linkages between industry and the politico-administrative system could hamper a reform culture of consensus and thus, to a large extent blocked the settlement of new industries. That is, political lock-ins endeavoured to preserve existing traditional industrial structures, not to enhance industrial restructuring and the development of indigenous potential and creativity (Hassink and Shin, 2005). For a long time local economic power in Daegu City was occupied by those connected with the textile industry, as pointed out by a director of NID in the Daegu City government:

“The Daegu Chamber of Commerce and Industry has been operated by the owners of textile firms. This means that they have led the local economy for a long time”.

In such processes, investment in the local textile industry might have been sustained, making it difficult to establish proper circumstances for new types of economic activity, for example the active establishment of start-ups and research intensive firms and their dense interactions with knowledge infrastructure, as mentioned by two local government officers:

“Due to the owner of local textile firms and their lobby organisations that have economic power in Daegu, massive local economic resources seem to be invested in the textile industry, and thus, this may cause a preponderance phenomenon toward the textile industry. In this respect, this is a possible reason why the sector of high-tech firms such as ventures have not been supported and focused on earlier in our region”. (The director of NID in the Daegu city government)

“If some of the local economic resources invested in the textile industry had been invested in other industry, local collaboration networking activities would have been more developed.... One possible reason for inactive establishment of ventures in our region is probably the influence of the textile industry”. (Former director of STD in the Daegu city government)

Furthermore, such a political lock-in seemed to be a cause of a retardance in a change of traditional industrial structures of the local textile industry based on the narrow low-value added and low-tech middle stream activities. In order to respond to the decline of the local textile industry the central and local government launched a project called the Milano Project to restructure the Daegu’s textile industry aiming at promoting both new activities (fashion and design) and projects with new actors (research institutes, universities, design schools, and banks) (Hassink, 2005). However, the actors with a vested interest, local textile producers and their lobby organisations were against these plans, arguing that Daegu’s textile industry should sustain its competitiveness focusing on the present middle stream (i.e. weaving), whose technology, know-how and market accessibility were believed to be at the top of the world (Hassink, 2005). Given such political lock-ins, it might be difficult to facilitate collaboration networking between the textile firms and universities despite government’s efforts. To a large degree, the lock-in situation of the textile industry in Daegu city seemed to be a significant barrier to developing local collaboration activities between firms and universities.

After all, due to the high share of small subcontracting firms which had very little technical competence, the lack of postgraduate students in local universities and the ‘lock-in’ situation in the textile industry, local networking activities between firms and universities did not seem to have been developed well in Daegu City. In addition, considering the survey results, the respondents perceived the factors derived from these problems to be more serious barriers than the general factors. If many individual actors of local firms and universities participating in the IAC programmes experienced difficulties in collaborating with each other under these problems, this could influence their capacity to respond to interaction between them in the implementation process of the programmes. That is, they might be lacking in capacity to enhance interaction between them in the programmes. Thus, even though they participated in the

programmes to aim to promote innovative collaboration activities between them, interaction between them might not be fostered as expected.

7.5 Discussion of results

This section is to analyse the finding from the empirical study in order to obtain an understanding of agency interaction in the policy delivery system in South Korean regional innovation policies. This section addresses how diverse factors and barriers identified are shaped in more conceptual perspective, finding answers to the research questions.

7.5.1 The practices of agencies in policy delivery systems

One of the important questions in this research was how the perceived barriers occurred in the IAC policy delivery system within the Daegu city region. Analysis of the findings provides three significant constructs to the barriers to agency interaction in policy delivery system: (1) relationship between individual actors and their organisational structure; (2) relationship between agencies and policy delivery system; and (3) agency capacity to respond to the programmes. The first and second constructs are to some extent similar in the sense that they all deal with agency-structure relations. However, the first is about relationships between an individual actor and a context of institution, norms and values which condition his/her action, while the second is about relationships between agency and legitimate roles within the policy structure.

Individual actors and their organisational structure

Many barriers to interaction between agencies identified from the empirical study seemed to occur due to different organisational structures within which individual actors existed and acted. As evidenced in the empirical study, firms tended to work in a practice- and price-oriented construct and thus they in many cases pursued modification and application technology, but universities often tended to have no interest in establishing hands-on applied-type relationship with industry, pursuing excellence in research. In most cases interactions between organisations were

conducted by individual actors. Thus, even if individual actors of firms, universities, and governments interacted with each other in the structure of government policies, their ideas, perceptions and behaviours might be inherently different in the sense that they were operating within different organisational structures influencing their practices. According to the structuration theory, structures shaped people's practices and thus structure could constrain and enable humans (Giddens, 1984). In this respect, if structures in which individuals acted were different, the patterns of practices and perceptions of individuals who belonged to different structures might be different.

Firms, universities, and governments had different organisational characteristics and goals influencing the practices of firm owners or staff, academics and government officers. Also, the individual actors can be seen as being familiar with their own organisational institutions, norms and values. Under these circumstances, individuals might have difficulties in interacting with other individuals with different organisational structures. As described by many scholars in terms of interaction between firms and universities, these problems are very often understood as cultural difference between them. As presented in the empirical study, these differences could cause problems to active communication and stable trust which were regarded as important factors for interaction between different organisations. In such different organisational structures, it seemed to be intrinsically difficult for the individuals to share common interests in the policy process and to understand a partner's characteristics.

In addition to such problems arising from different characteristics of structures, the rules and regulations of structure could constrain the practices of the individuals in interaction with other individuals. For example, if there were some administrative procedures and processes set up by universities in operating the programmes, academics might have to follow them. In such a case, firms might not be able to tolerate the bureaucratic procedures. This problem was also identified in interaction between government officers and target groups. Even if government officers tried to be flexible in dealing with the programmes, they might not be as flexible as target groups wanted them to be because they acted within a context of government structure, following the rules and regulation of government. That is, the structure of government that surrounded the government officers might in many cases prevent them from being flexible. Therefore, firm staff and academics might consider the government officers

inflexible and bureaucratic. In such cases, firm staff or academics might have difficulties in interacting with academics or government officers.

Agencies and policy delivery systems

The empirical study showed that the policy delivery system was an influential factor to shape the practices of agency in interaction and policy co-ordination. The most outstanding feature of the Korean IAC programmes was strong national initiatives. The majority of important elements of the programmes were determined by national ministries in advance. Also in most cases the central government established the centres to operate the programmes in universities and then made them co-operate with local firms. Moreover, although universities prepared and submitted proposals for the programmes, proposal contents were strongly restrained with guidelines set by the ministries. In addition, in terms of funding systems, local governments generally participated in the programmes only as co-financers, so that funding of the programmes was largely dependent on the central government. In particular, the legitimate role and specific tasks of local governments in the implementation process seemed to be very limited. Thus, in most cases local government did not seem to play a key role in carrying out the programmes. After all, the delivery system of the programme was characterised by a top-down and supplier-oriented approach. As discussed in implementation models, a top-down approach follows on in a fairly linear fashion from central government (Schofield, 2001). That is, such a delivery system limited the role of local agencies, particularly local government, in the programme. Thus, it might be difficult for local agencies to foster interaction between agencies in such a delivery system. In particular, according to the typology of regional innovation support systems discussed in chapter 4, the delivery system of Korean regional innovation policy seemed to belong to 'dirigiste systems' nationally initiated and funded. Hassink (2001) argued that in 'dirigiste systems' both local interactions and vertical interactions might be weak due to strong central government involvement. In this respect, many barriers to interaction between agencies in the programmes seemed to be caused by the delivery system being based on a strong top-down approach.

Also, such delivery systems of the programmes did not seem to contribute to local co-ordination of the programmes. The main problem of the local co-ordination of the

programmes probably resulted from different operating systems of the programmes derived from being independently implemented by several ministries. In the delivery systems in which individual ministries had strong power, the local government with a limited legitimate role in the programmes had difficulties in playing a role in coordinating the programmes at the local level. Also, even though academics had full responsibility for implementing the programmes at the local level, they might have difficulties in coordinating the programmes designed and implemented by different operating systems of different ministries in a centralised delivery system. That is, the involvement of local agencies in policy co-ordination might not be easy in the delivery system relying on the strong top-down approach. In this respect, Hassink (2001) argued that in 'dirigiste systems' policy co-ordination was potentially high due to the guidance and planning of national authorities, but in reality it was often weak, because of the lack of coordination between national and local initiatives at the regional level and the competition and conflict between different national ministries.

Furthermore, supplier-oriented delivery systems at the local level seemed to be problematic in terms of interaction between firms and universities. In the programmes universities were in the position of suppliers. The central government seemed to make universities support local firms with their information and knowledge by supporting them through government budgets. As presented in the empirical study, in such implementing structures universities had full responsibility for preparing proposals, managing programme funds, and operating the programmes and thus, they generally had more information about the programmes than firms. Under these circumstances, the power of universities seemed to be much greater than those of firms. Thus, to some extent the needs of firms might not be reflected in the operation of the programmes. Also, in some cases academics seemed to have authoritative and superior attitudes to firms and thus the relationship between firm staff and academics in the programmes was subordinate rather than co-operative and collaborative relationship. This university-oriented delivery system made communicative interaction between them difficult.

Accordingly, as the structures within which agencies existed influenced agencies' practice (Giddens, 1984), the structure of policy delivery could shape the interaction of agencies. In this respect, in dirigiste systems' or a strong top-down delivery system in which the role of local agencies was ignored, local agencies, particularly local

government and firms, might not be willing to be involved in interaction between local agencies and policy co-ordination at the local level.

Agency capacity to respond to the programmes

According to the empirical study, local agencies such as firms, universities and local government did not seem to have enough capacity to respond to the IAC programmes. This seemed to influence the barriers to interaction and policy co-ordination

Firstly, local voluntary networking activities between firms and universities in the Daegu City region did not seem to be very well developed. Of course, this problem might be caused by the different organisational structures of firms and universities as discussed above. However, the findings of the empirical study showed that the spatial issues related to local industrial structure were more important factors in such problems; for example the lack of relevant firms suitable for collaboration with local universities, the high share of dependent subcontracting firms with very little technical competence, and the lock-in situation arising from the textile industry specialising in production and weaving chemicals. Under these circumstances, local firms and universities were not likely to have learning opportunities in which they could develop their capacity to collaborate with each other. In particular, Keating et al. (2003) argued that the behaviours of economic actors were locally shaped by institutional incentives, learned behaviours and routines and cultural values and norms. Thus, individual actors of firms and universities in the Daegu City region did not seem to be used to collaborating with each other. In this respect, even though the IAC programmes aiming to enhance local collaboration between firms and universities were implemented, the capacity of firm owners or staff and academics to respond to interaction between them in the policy process might be weak in a way.

Secondly, the capacity of local government was likely to be more problematic. As shown in the empirical study the capacity of local government to facilitate local and vertical interaction between agencies and co-ordinate the programmes at the local level seemed to be weak. Such weak capacity of the local government could be due to the lack of experience of independent decision-making and the lack of staff with specialised knowledge. These problems might lead to the lack of strategic and innovative thinking

of the local government officers in the programmes. A more fundamental reason for such problems probably stemmed from the government system in South Korea. Even though local autonomy was launched in 1995, South Korea was still clearly a country with a highly centralised political-administrative system and thus local autonomy could be characterised as “local autonomy deficient in decision-making rights, tax base, and highly qualified human resources” (Kim, 2005, p. 1). In particular, in a long-term tendency of centralism local government officers might not have experienced independent decision-making without the guidance of the central government. Moreover, in terms of South Korean government financial structure the national taxes made up 79% of the taxes raised, while local taxes totaled only 21% (Cope, 2003). Due to poor financial resources local governments were much too dependent on financial support from the central government and this may lead to rent-seeking instead of innovation-seeking behaviour by them (Hassink, 2001). In this respect, local governments seemed to be interested in only attracting national programmes rather than supporting the programmes effectively and tackling barriers hampering communication between actors. Under these circumstances, the capacity of local government officers might not have been developed despite the process of political devolution.

As discussed in chapter 2 and 3, even though policy delivery systems enabled local agencies to interact with other agencies and local agencies were well empowered in the delivery system, the degree of interactions between them might not be as high as expected if they did not have enough capacity and willingness to absorb, integrate and respond to the policies (Nauwelaers and Mogan, 1999). Accordingly, if there was a lack of capacity of local agencies, interaction between local agencies and policy co-ordination might not be facilitated at the local level, even though the IAC programmes aimed to promote innovative collaboration activities between agencies and the delivery system had instruments to improve local policy co-ordination. Thus, it may be difficult for the programmes to gain the expected results. That is, there might be some gaps between policy expectation and policy results.

7.5.2 Demand-side coherence and policy delivery systems

In this research the concept of demand-side coherence was used as an empirical framework suitable to analyse the diverse issues that surrounded agency interaction in

Korean IAC programmes such as a user-oriented policy, collaborative networks between agencies and policy co-ordination which the Korean government intended to achieve in the policy process. Demand-side coherence is mainly determined by interaction and policy co-ordination which have been analysed through the empirical study. In order to address the third research question of to what extent demand-side coherence was dependent on the policy delivery system, there is a need to focus on two issues; the relationship between interaction and policy delivery systems; and the relationship between policy-coordination and the policy delivery system.

To what extent was interaction between agencies dependent on policy delivery systems?

Given that many barriers to interaction between agencies identified in the empirical study seemed to be caused by the policy delivery system being top-down and supplier-oriented, the policy delivery system was likely to be one of the decisive factors in agency interaction.

Firstly, in terms of interaction between the government and the target groups, as the programmes were implemented in a top-down fashion and also, the specific and important contents of the programmes were strictly restricted by the regulations of national ministries, local and vertical interaction seemed to be very weak. Also, the government tended to design and implement the IAC programmes on the basis of a standardised perspective. In addition, the delivery system did not seem to foster communication between the government and the target groups which could help to find out target groups' needs. Thus, the needs of target groups might be difficult to take into account in such a delivery system. This problem could make the target group perceive that the programmes were not tailored to their needs. This could hamper the enhancement of demand-side coherence.

Secondly, with respect to interaction between universities and firms, as mentioned above, the programmes were designed and implemented in a university-oriented manner. In this system, the university tended to draw up proposals exclusively without the participation of firms. Also, as there was extreme power asymmetry between firms and universities, firms seemed to be reluctant to express their dissatisfaction about universities' management of the programmes. Thus, the voices and opinions of firms

might not be taken into account in the implementation process. Under these circumstances, this delivery system did not seem to facilitate communicative interaction between firms and universities.

Thirdly, in relation to the role of local government, as there were strong national initiatives in the programmes, the legitimate authority and specific tasks of local government in the programmes seemed to be very weak. Local government might be in a position to be able to link the target groups to the central government and to deliver local needs to the central government. However, due to its limited role in such a delivery system, local government did not seem to be actively involved in the programme and thus it was not likely to play a key role in fostering local and vertical interaction.

After all, the delivery system of the Korean IAC programme led by the strong top-down approach seemed to hamper interaction between local agencies. That is, as explored in implementation models and the typology of innovation support systems, since the role and initiatives of local agencies might be ignored in the policy delivery system driven by a top-down model and dirigiste system, in which the role of central government and the objectives of policy, local and vertical interactions between agencies involved in policy process were stressed were seen as being weak. Thus, interaction can be to a large degree seen as being dependent on the policy delivery system. In this respect, if the programmes were implemented in an interactive way and a bottom-up approach in which the role and needs of local agencies were more fully considered, it can be assumed that agency interaction could be better facilitated. However, there were the problems of different organisational cultures arising from individual actor-structure relations and the lack of agency capacity as discussed above. Therefore, even in the delivery system based on the interactive and bottom-up approach, there might be limits to the fostering of interaction between local agencies. Accordingly even if the agency interaction in the implementation process is in many cases determined by policy delivery system, the policy delivery system is not always an absolute factor in shaping agency interaction.

To what extent was policy co-ordination dependent on policy delivery systems?

The empirical study showed that the most serious barrier to co-ordination of the programmes at the local level was the internal structure of government related to the policy delivery system, as explored in literature.

The first issue was the dispersion of ministries responsible for the programmes. The IAC programmes were designed and implemented by three different ministries: MOCIE, MOEHRD, and SMBA. Also, they were separately and independently carried out in different operating and funding systems. Furthermore, as there seemed to be a traditional departmental egotism, cooperation between ministries for increasing co-ordination was viewed as being weak. In such a structure, target groups might not perceive that the programmes were well co-ordinated.

The second issue concerned the legitimate and practical role of local agencies. As the programmes were implemented in the strong top-down system, local agencies might not have played a key role in co-ordinating the programmes at the local level. In particular, unlike the dispersion of ministries at the central level, a local government dealt with all of the programmes at the same time, but due to lack of legitimate authority in the programmes, it faced limits to co-ordinating the programmes at the local level. In addition, although IACFs were established for synthetic management of IAC affairs in universities, they did not seem to be involved in the co-ordination of the IAC programmes in such delivery system in which individual national ministries had a strong initiative in their own programmes.

Consequently, given these problems policy co-ordination seemed to be to a large degree influenced by the policy delivery system. Thus, it is assumed that if cooperation between ministries is increased, the programmes can be implemented in a more co-ordinated way at the local level. Also, as explored in implementation models, if local agencies are given the legitimate authority to be able to control and manage the programmes, the degree of policy co-ordination may be high. However, as evidenced in the empirical study, if there is a lack of capacity of local government, policy co-ordination might not be enhanced as expected even in a bottom-up approach.

In conclusion, the current delivery system of South Korean IAC programmes caused many barriers to interaction between agencies and policy co-ordination at the local level. In particular, the needs of target groups might not have been taken into account in the programmes due to the problems in interaction between agencies arising from a strong top-down approach. Accordingly, in such a delivery system, it might be difficult to achieve a user-oriented policy, cooperative networks of agencies and regional coordination of the programmes' which the Korean government pursued in the IAC programmes and which were important components of demand-side coherence. Given these empirical situations, if agency interaction and policy co-ordination are hindered by a policy delivery system led by a top-down approach, target groups may not perceive that programmes operated by the approach are co-ordinated and match their needs. In such cases, the degree of demand-side coherence is low due to a top-down approach since it can be increased when "programmes are found by the target groups to be well co-ordinated and tailored to current needs and context" (Christensen et al., 2003, 170). After all, demand-side coherence is to a large degree seen as being dependent on policy delivery systems.

However, as mentioned above, there are other problems at the local level derived from agency capacity and different organisational structures between agencies influencing agency interaction and policy co-ordination. This means that demand-side coherence is not necessarily determined by policy delivery systems. Accordingly, even if a policy delivery system is well constructed in order to enhance demand-side coherence, demand-side coherence may not be easily improved in the policy implementation as expected. In particular, in the delivery system based on a top-down approach, in which the role of the demand side is very often ignored, this may be much more difficult. That is, since local agencies do not always operate in accordance with government intentions, demand-side coherence may not be conditioned only by policy delivery systems even if the policy delivery system are one of the influential factors affecting demand-side coherence.

Chapter 8 Conclusion

This research has generated knowledge regarding the gaps between policy expectations and actions by understanding agency interaction in policy delivery systems. In order to understand these gaps, this research addressed the question of how interaction between local agencies that had different interests and organisational characteristics were shaped in the delivery system of regional innovation policy implemented by the Korean national government. In order to do this, this research started by looking at the issues of the relationship between agency and structure and the relationship between agency interaction and policy delivery systems from a theoretical perspective. Also, in order to understand diverse issues related to agency interaction in Korean Industry-Academia Collaboration (IAC) policies, such as a user-oriented policy and policy co-ordination, the concept of demand-side coherence was used as an empirical framework. On the basis of these theoretical and empirical frameworks, the research addressed the following questions:

- What did local firms and universities perceive as the barriers to interactions and policy co-ordination in the implementation process?
- How did the perceived barriers occur in the delivery system of IAC policies within Daegu City?
- To what extent was demand-side coherence dependent on policy delivery systems?

These questions were examined by a survey of targeted firms and universities, which were the main target groups in the IAC programmes, and a series of interviews targeted at agencies involved in the programmes. This chapter presents the empirical findings, further perspectives on the empirical findings in terms of analytical frameworks used in the research, and wide policy debates.

8.1 Overall conclusion of the findings

In the implementation process of the Korean regional IAC programmes, firms and universities perceived that many barriers to interaction between agencies and co-

ordination of the programmes existed. There were a variety of reasons for the barriers. The main categories were: (1) the different organisational structures that affect the behaviours of individual actors; (2) a policy delivery system characterised by a top-down and a university-oriented approach; and (3) the weak capacity of local agencies to absorb and respond to the programmes.

The interaction between different organisations was seen as being difficult. Individual actors had different behaviours and perceptions when they interacted with each other because individual actors in firms, university and governments were used to operating within the different contexts of the institutions, norms, goals and values which shaped and conditioned their practices. The individuals also tended to fit their behaviours to their organisational context rather than a policy context. As a result, considerable problems occurred in interaction between different organisations in the policy process, especially in terms of trust, communication, sharing common objectives, and understanding partner's characteristics.

The roles of individual actors or organisations in the programmes were shaped by the policy delivery system, and thus the degree of their engagement in the programmes was largely dependent on their legitimate roles. Although the Korean government emphasised the role of local agencies in the policy implementation process in order to pursue a demand-oriented approach, the delivery system of the Korean IAC programmes was still characterised by a top-down and university-oriented fashion in which individual national ministries and universities exercised considerable power. In such a delivery system, local government and firms did not have legitimate roles in operating the programmes, and local government particularly seemed to have little interest in dealing with the policy process. This seemed to limit their actions in local and vertical interaction between agencies and in policy co-ordination at the local level.

Local government was thought to be unlikely to be able to develop an independent decision-making ability in light of a long history of centralism. Thus, a small number of local government officers, who did not seem to have sufficient expertise had difficulty in dealing with the programmes strategically. Also, local voluntary and social networking activities between firms and universities in Daegu City were less successful as a result of: (1) a high share of small dependent subcontractors in Daegu

that were generally not interested in R&D activities; (2) a lack of human resources (e.g. postgraduate students) dedicated to local collaboration with firms; and (3) a lock-in situation in the textile industry which lacked any interest in new products and technology development through R&D activities with universities. It was therefore found that the capacity of firm staff and academics to respond to interaction between them in the policy process was limited. This had indirectly generated diverse barriers to agency interaction in the programmes.

The above findings provide important implications for the understanding of challenges and contradictions within the normative policy framework in which the Korean government attempted to pursue a demand-oriented approach. Firstly, there were limits to facilitating collaborative interaction between different agencies in the IAC programmes, particularly between firms and universities, as long as fundamental problems arising from individual-organisational structure relations existed in the implementation process. Secondly, as the policy delivery system operated in a strong top-down and university-oriented approach, interaction between local agencies was not fostered because the delivery system limited the actions of local agencies, particularly local government and firms, in the policy process. Thirdly, whilst the IAC programmes were implemented in a region with a low level of social networking between firms and universities, they did not effectively respond to interactions in the policy process. In particular, in a politically centralised country, it was difficult to expect local governments to actively engage with the national programmes due to their weak capacity. Although these implications have been drawn out from the study of the Daegu region, they might be relevant to other large cities in South Korea. The policy delivery system of the national IAC programmes were standardised throughout South Korea. In addition, most of the cities seemed to have a history of dynamic industrial development which might lead to lock-in situations which could hamper successful innovative networking or the development of the new types of economic activities. Moreover, they suffered from a lack of human resources and high-tech firms due to the concentration of national economic activities in the capital region. Thus there might be insufficient players who could contribute to shaping local innovative collaboration. Therefore, the innovative collaboration between local agencies might not be very well developed in the other cities like Daegu city. It might also be found that the other cities

might have difficulties in fostering interaction between agencies in the implementation of the programmes.

Accordingly, even though the Korean government attempted to increase interaction between local agencies and policy co-ordination, emphasising a normative perspective based on a demand-oriented approach, it was difficult to achieve a high degree of interaction and policy co-ordination in the implementation process because these problems existed. Also, as the agency interaction and policy co-ordination that determined demand-side coherence were strongly influenced by individual-organisational structure relations and agency capacity, it was not easy to enhance coherence through improved policy instruments. Local agencies did not act in accordance with the expectations of central government policies. This could lead to the enlargement of gaps between policy expectations and actions.

8.2 Further perspectives on empirical findings

In order to understand agency interaction in the delivery system of the Korean IAC programmes, this research utilised an analytical framework underpinned by three main constructs: Giddens's view on agency-structure relations; implementation models; and the notion of demand-side coherence. Based on the discussions of the empirical analysis, this section discusses the conceptual implications of the findings, focusing on gaps between policy expectations and actions.

8.2.1 Agency and structure relations

The issue of agency-structure relations in this research could be focused on two aspects: individuals-organisational structures; and agency-policy delivery system.

The findings showed that firm owners (staff), university academics and government officers fit their behaviours to rules and norms shaped by their own organisational structures. Thus, although they acted within the same context of policies, their behavioural characteristics were in many cases different because of their different

organisational structures. That is, organisational structures influenced the activities of human agencies more strongly than policy structure. The Korean government tried to facilitate local innovative collaboration between firms and universities emphasising the importance of cooperative interaction between local agencies in the implementation process. The government might expect that these policies could result in cooperative interaction between different agencies in the implementation process. However, in practice, such expectations were not met due to the impact of organisational structures on the behaviours of human agencies. Therefore, the innovation policies could face potential limits to supporting interaction between different organisations. If individuals acted in accord with their own organisational context even in the given context of the policies, pursuing their organisational goals and norms, it would be difficult for the policies to match policy expectations effectively.

Although the actions of agencies were strongly shaped by organisational structures in the policy process, it was difficult to ignore the influence of policy delivery systems on the actions of agencies. Given that agencies relied on rules and resources consisting of structure (Giddens, 1984), local agencies might consider not only organisational norms, goals, and values but also the institutional arrangements, rules and regulations of a policy delivery system when they act within a given policy context. This was evidenced by the actions of universities which had much more legitimate roles in the programmes and thus were deeply and actively involved in their operation. However, the empirical findings indicated that the current Korean IAC programmes were implemented in a top-down and university-oriented approach and thus the role of local government and firms were by and large ignored. In this policy delivery system, local government and firms were not given legitimate authority and roles in operating the programmes. This led to their low engagement in the policy process because their actions drew upon the rules and resources of the policy delivery system. Central government expected that local governments and firms would actively participate in the IAC programmes in the sense that the programmes were aimed to develop the local economy and support SMEs' innovative activities, However, they were seldom engaged with the programmes as expected, since the delivery system of the programmes seemed to limit the actions of local government and firms in the policy process. In South Korea some shifts from centralisation to decentralisation and from nationally-led strategy to regionally-led strategy recently took place after 2003 and the

government attempted to change policy making and delivery systems towards a bottom-up approach. However, South Korea was a highly centralised country and the delivery system of national policies for seeking to promote regional innovation was likely to rely on a strong top-down approach. With this in mind, it may be difficult to achieve a high level of local agency's involvement in regional innovation policies led by national governments in politically centralised countries.

8.2.2 Implementation of innovation policies

As mentioned above, the practices of agencies in the policy delivery process could be shaped by policy delivery systems. A policy delivery system based on a top-down approach might be limited in fostering the actions of local agencies. Actions could be more likely to be encouraged in a delivery system adopting a bottom-up approach which focuses on decentralised problem-solving by local agencies. Similarly, in the typology of regional innovation support systems, local and vertical interaction was much higher in grassroots and integrated systems in which local agency played a key role in policy than in dirigiste systems which were nationally initiated and funded. As shown in the empirical study, the current Korean IAC programmes were driven by a strong national initiative and the delivery system of the IAC programme was characterised by a top-down approach and dirigiste systems. The empirical findings indicated that this delivery system influenced the gaps between policy expectation and actions by limiting interactions between local agencies.

The role of local agencies (especially local government and firms) was not effectively taken into account in the delivery system of the IAC programmes. The limits of the local agencies' roles in the operation of the policies restricted their little interest and caused low involvement in the implementation process. As local agencies were not actively engaged with the policies at the local level, it made it difficult to meet policy expectations. Local agencies were also constrained by the strong initiatives of individual ministries of the central government. Thus, it was difficult for the local agencies that did not have legitimate authority to tackle the poor coordination of the programmes that resulted from the lack of cooperation between individual ministries. Although the central government tried to increase local policy coordination through

some policy instruments such as advisory guidelines and IACF establishment, policy coordination at the local level did not improve as expected.

The top-down delivery system of the IAC programmes did not take the diversity and complexity of local agency interaction into account. A top-down delivery system generally relies on a rational approach based on the assumption that local agencies in the context of policy will choose the precise actions which policy-makers at the central level expect (Hay, 2002). However, the empirical findings indicated that the actions of local agencies were influenced by complex factors such as individual-organisational structure relations and the local agency's capacity to deal with the policy process. These complex factors affected a variety of barriers to agency interaction. Although unexpected problems hinder meeting policy expectations, they might not be appropriately considered by the policy-makers in a top-down delivery system.

Given the problems of a top-down delivery system, it can be argued that if a delivery system would shift from a top-down approach and dirigiste system to a bottom-up approach and grassroots or integrated system, interaction between agencies could be encouraged much more successfully. Thus, the gaps between policy expectations and actions could be reduced because local agencies that are more aware of the characteristics of local agency interaction and the practical problems of policy implementation could play a more important role in operating policies. However, even though the gaps seem to be less serious in bottom-up delivery systems than in top-down ones, a bottom-up delivery system might have certain limits to achieving intended policy results if there are still the problems arising from individual-structure relations and the lack of local agency's capacity. Although the Korean government attempted to change policy making and delivery systems towards a bottom-up approach on the basis of a normative perspective, these problems could hinder the government's effort to achieve policy expectations.

8.2.3 Demand-side coherence in Korean regional innovation policies

The Korean government tried to deliver the IAC programmes in a user-oriented fashion by pursuing collaborative networks of agencies and regional coordination of the

programme. These were important ingredients in achieving demand-side coherence. In this context demand-side coherence means that “the programmes are found by the target groups to be well co-ordinated and tailored to current needs and context” (Christensen et al., 2003, p. 170). However, the degree of demand-side coherence in South Korean regional innovation policy was low.

Firstly, as Landabaso (1997) argued, communicative interaction between agencies could help to find out about firm needs. However, the findings indicated that due to individual-organisational structure problems, this communicative interaction did not occur very often in the programmes in which different agencies participated. This implies that in many cases, the problems or needs of firms were not well articulated in the policy process. Thus, to take the needs of target groups (particularly firms) into account was limited in the Korean innovation policies focusing on encouraging collaboration between firms and universities.

Secondly, in the IAC policy delivery system led in a strong top-down and university-oriented fashion, the needs of regions and firms were not taken into account. The limited role of the local government in the programmes made it difficult to link local needs to policy intentions and to play a key role in improving policy co-ordination at local level. Also, since universities had much greater power than firms, the voice and needs of firms were not sufficiently taken into consideration in the implementation process.

Thirdly, the innovative spirit and capacity of local government to respond to the national policy was not well developed. Thus, it was difficult for the local government to collect local firms’ needs, to foster local dialogue and to co-ordinate the IAC programmes. As most local SMEs in the Daegu City region were small subcontractor firms they had difficulties in assessing their problems and articulating their needs explicitly.

Given the problems derived from individual-structure relations, a strong top-down delivery system, and weak capacity of local agencies, the Korean IAC programmes examined were not well-coordinated and not well-matched to target groups’ needs and local context. It was difficult to achieve the collaborative networks of agencies and the

regional coordination of the programme in a user-oriented fashion which were intentions strongly stressed by the Korean government in the IAC programmes. This means that the degree of demand-side coherence which was perceived by target groups was low in the Korean national policies for regional innovation. Accordingly, if similar national policies supporting local collaboration between firms and universities were implemented by strong initiatives of national ministries in a region in which the capacity of local agencies to collect and articulate local needs was weak, the degree of demand-side coherence perceived by target groups in the region might also be low. Even though the Korean government emphasised the enhancement of demand-side coherence, the government ignored the practical and potential obstacles in the implementation process that were related to individuals-organisational structure relations and weak capacity of local agencies. Also, the government attempted to pursue demand-oriented policies, but still operated the policies in a supply-oriented top-down manner. Thus, policy expectations might not be well achieved in practice. However, more fundamentally, demand-side coherence related to a user-oriented approach and collaborative networks of agencies can be seen as being unrealistic in a regional innovation policy that supports collaboration between universities and small local firms. This is because the problems arising from the individual-organisational structure relations and the weak capacity of small firms inherently hamper the articulation of firms' needs and the communicative interaction between them.

8.3 Problems of national innovation policies and implications

The findings indicated that there were a variety of barriers to local agency interaction and they influenced the gaps between policy expectations and actions. Based on the summary of the empirical study and the further perspectives on the empirical findings, this section critically discusses problems in national policies for regional innovation implemented in a top-down delivery system, focusing on the gaps between policy expectation and actions. The problems can be discussed in three categories: (1) the human agencies' tendency for the pursuit of self-interest; (2) the limitations of policy structure on conditioning the actions of agencies; (3) the lack of knowledge and information available in a top-down delivery system.

Firstly, the empirical findings indicated that although individual actors acted in the policy context, the individual actors tended to pursue self-interest constrained by their organisational contexts. The influence of policy context on their behaviours in the policy process was less powerful than those of organisational contexts within which the individuals existed. As the individuals with different organisational contexts were more likely to attempt to maximise their self-interest in the policy process, it was difficult to enhance collaborative behaviour conducive to successful relationships between different actors. In particular, in the context of regional innovation policies that supported collaboration between firms and universities, this behavioural tendency of the individuals might make it difficult to develop collaborative interaction between them through the policies. This could cause the gaps between policy expectations and actions. This issue is by and large connected with the so-called 'collective irrationality' in the policy process. Government policy has been formulated in order to correct market failures stemming from collective irrationality (Pike et al., 2006). However, if the decisions made by individuals are based on individual rationality pursuing their self-interest in the policy context, individual rationality can translate into collective irrationality (Hay, 2002). As long as this problem still exists in the policy process, policy instruments might not contribute to the achievement of policy expectations.

Secondly, the role of policy context and structure in determining the actions of agencies in the implementation process is limited. The failure of the market mechanism might occur in knowledge creation and diffusion through networks of firms and universities and thus government interventions in such areas might be justified (Ahrens, 2005; Nauwelaer and Wintjes, 2002). In this respect, most regional innovation policies supporting collaboration between SMEs and universities seemed to attempt to enhance networking activities between them through policy structure. Therefore, governments might expect that firms and universities would interact with each other successfully in the given context of a policy. They are liable to believe that policy context and structure can determine the conduct of local agencies. However, as noted, the findings indicated that there were significant obstacles in the implementation process which were represented by the individual-organisational structure relations and the weak capacity of local agencies to respond to the policies. As a result of these obstacles, policy context and structure had limits to conditioning

the conduct of local agencies. Of course, the conduct of agencies in the policy process might be to some extent determined by the policy delivery system, as evidenced by the active involvement of universities from the empirical study, and thus, in some cases a certain policy structure could contribute to fostering collaborative activities between them. However, since policy structures could not determine all actions of local agencies in the context of policy, the forming of gaps between policy expectations and actions might take place.

Thirdly, more specifically, the emphasis of policy structure appears more strongly in a top-down delivery system. The findings revealed that it was difficult to meet policy expectations successfully in the IAC policy delivery system relying on a top-down approach constructed in a rational and normative manner. The most significant problem of this approach was that it tended to adhere to the assumptions that the behaviours of local agencies were predictable in the given context of a policy (Hay, 2002). However, as indicated in the findings, in the Korean innovation policies implemented in a top-down approach, the central government officers seemed to have limited knowledge and information available for making decisions in practice. In addition they did not seem to consider local dimensions appropriately in the policy process. That is, since there might be the problem of so-called 'bounded rationality', policy-makers could experience limits in formulating and dealing with complex problems that surround agency interactions and in understanding constraints which local agencies face. Within a policy delivery system, constructed in the situations where there was a lack of information, local agencies might not always choose precisely the action which policy-makers expected. In particular, as evidenced, the implementation process was characterised by the complexities that originated from diverse problems and different agencies. Such complexities are difficult to predict and policy-makers do not have an ability to understand them perfectly, and thus policy context has limits to predicting the behaviours of agencies. These problems could appear even in bottom-up delivery systems because policy-makers who design and construct delivery systems do not have a perfect knowledge of the environment that local agencies exist in. However, in a bottom-up delivery system, the gaps between policy expectations and actions might be smaller because local agencies should be more aware of information about local environments and how initiatives should operate the policy process.

In conclusion, the human agencies' tendency to pursue self-interest derived from individual-organisational structure relations severely limited interactions between different local agencies in the implementation process of the IAC policies. Also, since the practice of local agencies could be influenced by organisational contexts and their capacity to deal with the policy process, policy context and structure might have limits to conditioning their practices. It was also difficult to predict the behaviours of local agencies, given the limits to central policy-makers' ability to process information about the local level. Accordingly, national innovation policies that were seeking to promote collaborative activities based on strong national initiatives experienced limits in gaining expected policy results, despite the government's normative emphasis on the actions of local agencies in the implementation process. It seems that these problems were not largely different from the results of previous studies on innovation policies in several European regions. Since the behaviours of economic agencies are locally shaped by institutional incentives, learned behaviours, routines, cultural values and norms, one might argue that the actions of agencies vary from country to country. However, this research approaches their actions in the policy context from a more micro level perspective focusing on the relationship between human agencies and organisational structures, and the relationship between human agencies and policy delivery systems. Thus the influence of local cultural aspects on the actions of agencies was not considered in any detail in the analysis of agencies behaviours. Rather, this research explored more fundamental characteristics of the behaviours of human agencies in the policy process such as the human agencies' tendency for the pursuit of self-interest and the behavioural constraints associated with human agencies within organisational structures. In this respect, in terms of the actions of human agencies the differences between South Korea and Western Europe were not very much shown in this research.

The problems of national innovation policies do not mean that regional innovation policies initiated by central government are useless. Due to deficits in regional innovation system and the lack of financial resources of local governments in some regions, national initiatives are still considered as important in regional innovation policies. Also, the policies could provide local agencies with learning experiences which might be conducive to innovation activities. However, in order to minimise the

gaps between policy expectations and policy actions, several problems in such policies need to be improved.

Firstly, it seems to be necessary to expand the role of local agencies which are more aware of their problems and local dimensions in the implementation process as emphasised in a bottom-up approach. For example, if local governments could be given a more legitimate role in operating the programmes or they could have more detailed tasks in the implementation process, they might be more actively engaged in the programmes. Also, if policy delivery systems were structured to enable firms to play a more active role in making proposals and performing the programmes, the problem of non-interactive relationships between firms and universities could be improved to some degree. Moreover, it is not necessary for the central government to regulate the specific contents of the programmes in advance. Thus, if local agencies could be given a more legitimate authority to reflect their needs in government programmes when preparing proposals, they might perceive the programmes to be more tailored to their needs and local context. This means that the delivery system of regional innovation policies needs to shift from a top-down to a bottom-up approach in practice. The active involvement of local agencies in the policy process could not completely tackle the problems of individual-organisational structure relations, but the problems of limited information about local dimensions might be lessened.

Secondly, policy-makers must be aware that they might not have perfect knowledge about local dimensions and situations, and thus they need to have frequent dialogue with local agencies in order to tackle the lack of information available in the policy process. In addition, they must consider that individuals might not act in accordance with their intentions due to the individuals' tendency for the pursuit of self-interest. Therefore, they need to design measures to minimise the problems derived from the individual's tendency. For instance, if the efforts of university members to support firms in the IAC programmes are recognised as much as academic achievement, they might concentrate less on publishing papers in the implementation process which is one of the barriers to interaction between firms and universities. This might help to increase more interactive collaborations between them. Consequently, the policy-makers need to consider measures in which an academic society recognises the efforts of university members to support firms as an important achievement.

Thirdly, it is important to enhance the innovative capacity of local government officers to deal with the national innovation programmes since a lack of their innovative ability might make it difficult to utilise the given legitimate authority effectively. It might be very difficult and takes quite a long time. However, the expansion of personal training programmes and the improvement of personnel affair systems might be essential to improve the capacity. For example, their frequent job-rotation can be one of the serious barriers to accumulating experiences and information, and thus it is necessary to reduce the period of the job-rotation of local government officers to some extent. These measures might lead local agencies to involve in the regional innovation policies more actively.

8.4 Final reflection

Even though this research has tried to gain as reliable results as possible, there are some challenges related to the notion of demand-side coherence and the focus on barriers.

Firstly, in the sense that efforts made by the supply-side could influence the demand-side perspective through the institutional set-up and rules of policy delivery systems, this research addressed the impact of policy delivery systems on the actions of the demand-side. The empirical findings also indicated that policy delivery systems structured by the supply-side could, to some extent, shape demand-side perspectives on interaction and policy co-ordination. However, this research has not directly addressed interactions at the central level which could affect the formation of policy delivery system and the behaviours of local agencies. Thus, further research focusing on interactions between national ministries and between ministries and public institutes responsible for practical affairs of the IAC programmes could extend knowledge about the diversities of agency interaction at the central level, particularly in the policy making process.

Secondly, the concept of 'needs' in demand-side coherence could have been clearer. The empirical findings indicated that the needs of firms and universities were

important to agency interaction and policy co-ordination. As this research focused on identifying and understanding barriers to demand-side coherence this research did not construct the concept of the needs. However, the findings imply that the 'needs' might be differently interpreted and articulated in different contexts and by different respondents. Therefore, a further study addressing the nature of the needs would contribute to a better understanding of the diverse perception of firms and universities of government policies.

Thirdly, this research has identified and explored how the barriers to agency interaction and policy co-ordination occurred in the policy delivery system. However, this research did not examine agency behaviours to overcome the barriers. If further research were to investigate the behaviours to tackle problems occurring in the implementation process, this would contribute to the identification of agency practices that constitute and influence the policy process.

Lastly, the investigation of the Korean IAC programmes has shown the characteristics of a top-down delivery system. The empirical study indicated that agency interaction might differ between policy delivery systems. Policy delivery systems might vary from country to country in the sense that countries differ in important ways regarding administrative set-ups, socio-economic systems and cultures. Therefore, a further study comparing different policy delivery systems in different countries would produce a richer knowledge base about agency interaction in policy delivery systems.

Despite these limitations, this research has made a contribution to knowledge about the gaps between policy expectations and actions by understanding local agency interactions in the delivery system of national policies for regional innovation, using agency-structure relations, implementation models (including the typology of innovation support systems) and the concept of demand-side coherence.

Firstly, in order to understand the behaviours of different human agencies in the context of policy, this research used Giddens's view on agency-structure relations. By approaching the behaviours of local agencies in the perspective of agency-structure relations, this research provided knowledge about how organisational structures influenced the actions of human agencies operating within a policy context and how

the legitimate role of local agencies shaped their behaviours in the policy process. In particular, by analysing barriers to interaction between local agencies with different interests and acting organisational structures through agency-structure relations, the research contributed to knowledge about the individuals' tendency to pursue self-interest within the policy context and the limits of policy context to condition the conduct of local agencies. Understanding the behavioural characteristic of individuals in the policy process contributed to understanding gaps between policy expectations and actions.

Secondly, this research used implementation models and the typology of innovation support systems in order to understand the contextual construct of policy delivery systems within which local agencies acted. They provided knowledge about how the legitimate authority and roles of local agencies that influenced the actions of local agencies were constructed in the policy process. Also, this research expanded our knowledge about how a delivery system operated by strong national initiatives actually limited local agency engagement in the implementation process. In particular, this research contributed to the understanding of the change and problems in policy making in transition countries like South Korea which was attempting to move from a top-down to a bottom-up approach. Furthermore, this research methodologically adopted the views of a bottom-up and a top-down model in order to consider diverse factors to influence agency interaction in policy delivery systems such as central agency, policy objectives and instruments. This methodological consideration contributed to the analysis of the diversities and dynamics of agency interaction in policy delivery systems.

Thirdly, by applying 'demand-side coherence' as an empirical framework, this research contributed to the formulation of a methodology which could be used in the analysis of the interrelationships between the multiple agencies (e.g. firms, universities, local and central governments) involved in the implementation process of similar policies. Furthermore, as this framework included the dimensions of local economic structure and the local agencies' capacity to deal with the policy process in the analysis of empirical study, this research contributed to the development of a better understanding of the diverse factors that influenced agency interactions in the policy delivery system. By addressing the perception of target groups toward diverse

interaction in the policy process and policy implementation, this research contributed to the understanding of the actual gaps between policy expectation and policy actions perceived by target groups. This research showed that a normative policy construct based on a demand-oriented approach had limitations to achieving policy expectation in practice.

This research has accumulated knowledge about the nature of local agency interaction in the delivery system of national policies for regional innovation driven by strong national initiatives and it has also drawn out the problems of the behaviours of individuals that existed in the implementation process of SME innovation policies. Therefore, this research has developed a more detailed knowledge about the practical and actual gaps between policy expectations and actions in the context of national innovation policies in a transition country where a very normative policy approach based on a bottom-up perspective was emerging. Such findings and knowledge, based on the empirical study, provide meaningful insights for practitioners dealing with regional innovation policies in the sense that they were generated from practical problems in the implementation process.

1. Networking activities between industry and university in Daegu

This section is about your local networking activities with local universities in the Daegu City region. Please answer each question, basing your answer on your experience to date.

1.1 Do you have experiences of networking activities with local universities in the Daegu City region, excluding government support programmes for collaboration such as collaborative R&D, information/human resources exchange, technology transfer, etc?

- (1) Yes (2) No

1.2 (Only for respondents choosing (1) in question 1.1) To what extent have you been establishing collaborative networks with local firms in the Daegu City region, excluding government support programmes for collaboration?

- (1) Very much (2) Much (3) Average
 (4) Not much (5) Not at all (6) Don't know

1.3 To what extent does your firm need networking activities with local universities?

- (1) Very necessary (2) Necessary (3) Average
 (4) Not necessary (5) Not at all (6) Don't know

1.4 The following are factors that influence **local collaborative networking activities between industry and university**. From the list, which factors do you consider to be the three most important factors in facilitating networks between industry and university in the Daegu City region? Please choose three important factors. (), (), ()

- (1) Number of local universities and their organisations for collaboration
- (2) Local universities' human and material resources
- (3) Suitable match between the types of knowledge firms' requiring and the types of knowledge universities have
- (4) Universities' interest in the innovation or commercialisation problems of firms
- (5) Firm's proper expression of needs for collaboration
- (6) Establishment of interdependent relationship (e.g. give-and-take)
- (7) Local universities' activeness to networking activities
- (8) Balances between universities' capabilities and facilities
- (9) Obtaining information needed for contact with relevant academic organisations
- (10) Mutual trust between firms and universities
- (11) Intellectual property rights issues between firms and universities
- (12) Sharing common objectives for collaboration
- (13) Other(please specify _____)

1.5 The following are potential barriers to networking activities between industry and university in the Daegu city region. To what extent are they barriers in your networking activities with universities in the Daegu City region?

	Strong barrier	Weak barrier	Not a barrier	Don't know
(1) Small number of local universities and their organisations for collaboration	1	2	3	4
(2) Lack of universities' human and material resources	1	2	3	4
(3) Lack of local universities' specific knowledge that firms need	1	2	3	4
(4) Universities' small interest in firms' innovation/commercialisation	1	2	3	4
(5) Insufficient firms' expression of needs for collaboration	1	2	3	4
(6) Insufficient establishment of interdependent relationship (e.g. give-and-take)	1	2	3	4
(7) Insufficient local universities' activeness to IAC	1	2	3	4
(8) Gaps between local universities' capabilities and facilities	1	2	3	4
(9) Lack of information for contact with relevant academic organisations	1	2	3	4
(10) Lack of trust between firms and universities	1	2	3	4
(11) Conflict of intellectual property rights between firms and universities	1	2	3	4
(12) Different objectives in networking	1	2	3	4
(13) Other (please specify _____)	1	2	3	4

2. Experience of participation in Industry and Academia Collaboration

This section is asking you about your experiences in participating in national Industry and Academia Collaboration (IAC) programmes.

2.1 If you have experiences of occupation in those facilities, could you fill in how many years have you occupied?

Facilities	Years of occupation
(1) Techno-Park in university	
(2) Business Incubator in university	

2.2 The following are national IAC programmes implemented in Daegu city. Could you answer the programme that you have you participated in, since 2000 year?

Programme	The number of times of participation
(1) Technology Innovation Centre	
(2) Regional Research Centre	
(3) University, Industry and Research Institution Consortium	
(4) Central University Project for IAC	
(5) Other (_____)	

2.3 What are your main reasons of participation in the above national IAC programmes? (Please tick two most important reasons)

- | | |
|--|--|
| <input type="checkbox"/> (1) For obtaining research funding | <input type="checkbox"/> (2) For R&D collaboration |
| <input type="checkbox"/> (3) For using other organisations' R&D equipments | <input type="checkbox"/> (4) For using other organisations' facilities |
| <input type="checkbox"/> (5) For information exchange | <input type="checkbox"/> (6) For technology transfer |
| <input type="checkbox"/> (7) For management support | <input type="checkbox"/> (8) For human resources exchange |
| <input type="checkbox"/> (9) Other (_____) | |

3. Interactions between firms and universities in policy process

This section is asking you about your attitude toward relationships between firms and universities when participating in the IAC programmes.

3.1 In the IAC programmes, how do you assess collaborative relationships between firms and universities for successful programmes, based on your experience?

- (1) Very well (2) Well (3) Average
 (4) Not well (5) Not at all (6) Don't know

3.2 In the IAC programmes, could you identify three out of the following factors that are important for the successful implementation of programmes in terms of firm-university relationship? Please choose three important factors. (), (), ()

- (1) Previous experiences of local networking activities with universities
- (2) Mutual trust between firms and universities
- (3) Communication with universities
- (4) Contacts with universities
- (5) Exchanging of universities' information about programme implementation
- (6) Understanding of partner' characteristics
- (7) Firm's influence on universities
- (8) Firm's proper expression of needs for programmes
- (9) Sharing common objectives for programmes
- (10) Other (please specify _____)

3.3 The following are potential barriers to collaborative relationships between industry and university for successful implementation of programmes. To what extent are they barriers to your participation in the IAC programmes?

	Strong Barrier	Weak Barrier	Not a Barrier	Don't know
(1) Lack of experiences of networking activities with universities	1	2	3	4
(2) Lack of trust between firms and universities	1	2	3	4
(3) Lack of communication with universities	1	2	3	4
(4) Insufficient contacts with universities	1	2	3	4
(5) Insufficient exchange of universities' information about programme	1	2	3	4
(6) Lack of understanding of partner' characteristics	1	2	3	4
(7) Lack of firms' influence on universities	1	2	3	4
(8) Insufficient firms' expression of needs for programmes	1	2	3	4
(9) Insufficient sharing common objectives for programme	1	2	3	4
(10) Other (please specify _____)	1	2	3	4

4. Interactions between firms and government in policy process

This section is asking you about your attitude toward relationships between **firms and government** when participating in the IAC programmes.

4.1 In the IAC programmes, how do you assess collaborative relationships between firms and government for successful programmes, based on your experiences?

- (1) Very well (2) Well (3) Average
 (4) Not well (5) Not at all (6) Don't know

4.2 In the IAC programmes, could you identify three factors out of the following list that are important **for the successful implementation of programmes in terms of firm-government relationship**? Please choose three important factors. (), (), ()

- (1) Communication with government
- (2) Contacts with government
- (3) Government' channels for contact and communication with firms
- (4) Exchange of government's programme information
- (5) Understanding of mutual characteristics between firm and government
- (6) Firms' expression of needs for programmes
- (7) Firms' influence on government
- (8) Sharing common objectives for programme
- (9) Simplifying ministries dealing with IAC programmes
- (10) Government's flexibility to changing of firms' needs
- (11) Government's interest in firms' needs for collaboration with university
- (12) Active role of local government
- (13) Other (please specify _____)

4.3 The following are potential barriers to **collaborative relationships between industry and government** for successful implementation of programmes. To what extent are they barriers to your participation in the IAC programmes?

	Strong Barrier	Weak Barrier	Not a Barrier	Don't know
(1) Lack of communication with government	1	2	3	4
(2) Insufficient contacts with government	1	2	3	4
(3) Lack of channels for contact and communication with firms	1	2	3	4
(4) Insufficient exchange of government's programme information	1	2	3	4
(5) Lack of understanding of mutual characteristics	1	2	3	4
(6) Insufficient firms' expression of needs for programmes	1	2	3	4
(7) Lack of firms' influence on government	1	2	3	4
(8) Insufficient sharing common interests for programme	1	2	3	4
(9) Dispersion of ministries dealing with IAC	1	2	3	4
(10) Lack of government's flexibility to changing of firms' needs	1	2	3	4
(11) Government's small interest in firms' needs	1	2	3	4
(12) Passive role of local government	1	2	3	4
(13) Other (please specify _____)	1	2	3	4

5. Linkage and coordination of IAC programmes

This section is asking you about your attitude toward linkage and coordination between different programmes in the IAC programmes.

5.1 In the IAC programmes, how do you assess linkage and coordination between different programmes, based on your experiences?

- (1) Very well (2) Well (3) Average
 (4) Not well (5) Not at all (6) Don't know

5.2 In the IAC programmes, could you identify three out of the following factors that are important **for increasing linkage and coordination between different programmes**? Please choose three important factors. (), (), ()

- (1) Considerable distinctions between programmes
- (2) Fulfilment of firms' diverse needs
- (3) Obtaining information about other IAC programmes
- (4) Exchange of information between programme managing organisations
- (5) Programme managing organisations' efforts to increase linkage with other programmes
- (6) Local government's efforts to increase linkage between programmes
- (7) Government's provision for incentives to increase linkage between programmes
- (8) Integration of organisations (e.g ministries) dealing with programmes
- (9) Other (please specify _____)

5.3 The following are potential barriers to **linkage and coordination between different programmes**. To what extent are they barriers in IAC programmes?

	Strong Barrier	Weak Barrier	Not a Barrier	Don't know
(1) Lack of distinctions between programmes	1	2	3	4
(2) Lack of fulfilment of firms' diverse needs	1	2	3	4
(3) Difficulty in obtaining information about other programmes	1	2	3	4
(4) Insufficient information exchanging between programme managing organisations	1	2	3	4
(5) Lack of programme managing organisations' efforts to increase linkage with other programmes	1	2	3	4
(6) Lack of local government's efforts to increase linkage between programmes	1	2	3	4
(7) Lack of government's provision for incentives to increase linkage between programmes	1	2	3	4
(8) Dispersion of government organisations dealing with programmes	1	2	3	4
(9) Other (please specify _____)	1	2	3	4

If you have any other opinions about IAC programmes, please describe them in the box. Thank you very much for your help.

Appendix B: University questionnaire

Survey regarding barriers in IAC programmes

Introduction (self introduction, research aim....)

General features			
University name		Respondent's name	
Department		E-mail	
Address			
Telephone		Fax	
Post	(1) Professor (2) Associate professor (3) Assistant professor (4) Full-time lecturer (5) Support staff (6) Other ()		
Working period in current university	(1) Below 5 years (2) 6-10 years (3) 11-15 years (4) 16-20 years (5) Over 20 years		
Major	(1) (2) (3) (4) (5) (6) (7) (8)		

1. Networking activities between industry and university in Daegu

This section is about your local networking activities with local firms in the Daegu City region regardless of policy programmes. Please answer each question, basing your answer on your experience to date.

1.1 Do you have experiences of networking activities with local firms in the Daegu City region, excluding government support programmes for collaboration, such as collaborative R&D, information/human resources exchange, technology transfer, etc?

- (1) Yes (2) No

1.2 (Only for respondents choosing (1) in question 1.1) To what extent have you been establishing collaborative networks with local firms in the Daegu City region, excluding government support programmes for collaboration?

- (1) Very much (2) Much (3) Average
 (4) Not much (5) Not at all (6) Don't know

1.3 To what extent do you need networking activities with local firms?

- (1) Very necessary (2) Necessary (3) Average
 (4) Not necessary (5) Not at all (6) Don't know

1.4 The following are factors that influence local collaborative networking activities between industry and university. From the list, which factors do you consider to be the three most important factors in facilitating networks between industry and university in the Daegu City region? Please choose three important factors. (), (), ()

- | |
|--|
| <p>(1) A high proportion of firms requiring collaboration with local universities in the region</p> <p>(2) Local firms' human and material resources</p> <p>(3) Suitable match between the types of knowledge firms' requiring and the types of knowledge universities have</p> <p>(4) Universities' interest in the innovation or commercialisation problems of firms</p> <p>(5) Firm's proper expression of needs for collaboration</p> <p>(6) Establishment of interdependent relationship (e.g. give-and-take)</p> <p>(7) Local firms' activeness to networking activities</p> <p>(8) Balances between universities' capabilities and facilities</p> <p>(9) Obtaining information needed for contact with relevant firms</p> <p>(10) Mutual trust between firms and universities</p> <p>(11) Intellectual property rights issues between firms and universities</p> <p>(12) Sharing common objectives and interests for collaboration</p> <p>(13) Other (please specify _____)</p> |
|--|

1.5 The following are potential barriers to networking activities between industry and university in the Daegu city region. To what extent are they barriers in your engaging in networking activities between industry and university in the Daegu City region?

	Strong barrier	Weak barrier	Not a barrier	Don't know
(1) A high proportion of small firms not needing collaboration with local universities in the region	1	2	3	4
(2) Lack of local firms' human and material resources	1	2	3	4
(3) Gaps between firms' knowledge requirement and the knowledge universities possess	1	2	3	4
(4) Universities' small interest in firms' innovation/commercialisation	1	2	3	4
(5) Insufficient firms' expression of needs for collaboration	1	2	3	4
(6) Insufficient establishment of interdependent relationship (e.g. give-and-take)	1	2	3	4
(7) Insufficient local firms' activeness to IAC	1	2	3	4
(8) Gaps between local universities' capabilities and facilities	1	2	3	4
(9) Lack of information for contact with relevant firms for collaboration	1	2	3	4
(10) Lack of trust between firms and universities	1	2	3	4
(11) Conflict of intellectual property rights between firms and universities	1	2	3	4
(12) Different objectives and interests in networking	1	2	3	4
(13) Other (please specify _____)	1	2	3	4

2. Experience of participation in Industry and Academia Collaboration

This section is asking you about your experiences in participating in national Industry and Academia Collaboration (IAC) programmes.

N.B If you have never participated in national IAC programmes, please go to question 3.1 without completing questions 2.1.

2.1 The following are national IAC programmes implemented in Daegu city. Could you answer the programme that you participated or are participating in from 2000 year to the present time?

(1) Occupation in Techno-Park	
(2) Occupation in Business Incubator	
(3) Regional Research Centre	
(4) Technology Innovation Centre	
(5) Central University Project for IAC	
(6) University, Industry and Research Institution Consortium	
(7) Other (_____)	

3. Interactions between firms and universities in policy process

This section is asking you about your attitude toward relationships between **firms and universities** when participating in the IAC programmes.

3.1 In the above IAC programmes, how do you assess collaborative relationships between firms and universities for successful programmes, based on your experience?

- (1) Very well (2) Well (3) Average
 (4) Not well (5) Not at all (6) Don't know

3.2 In the above IAC programmes, could you identify three out of the following factors that are important for the successful implementation of programmes in terms of firm-university relationship? Please choose three important factors. (), (), ()

- (1) Previous experiences of local networking activities with firms
- (2) Mutual trust between firms and universities
- (3) Communication with firms
- (4) Contacts with firms
- (5) Exchange of firms' information needed for programmes
- (6) Understanding of partners' characteristics
- (7) Universities' influence on firms
- (8) Firm's proper expression of needs for programmes
- (9) Sharing common objectives for programmes
- (10) Other (please specify _____)

3.3 The following are potential barriers to **collaborative relationships between industry and university** for successful implementation of programmes. To what extent are they barriers to your participation in the IAC programmes?

	Strong Barrier	Weak Barrier	Not a Barrier	Don't know
(1) Lack of experiences of networking activities with firms	1	2	3	4
(2) Lack of trust between firms and universities	1	2	3	4
(3) Lack of communication with firms	1	2	3	4
(4) Insufficient contacts with firms	1	2	3	4
(5) Insufficient exchange of firms' information needed for programmes	1	2	3	4
(6) Lack of understanding of partners' characteristics	1	2	3	4
(7) Lack of universities' influence on firms	1	2	3	4
(8) Insufficient firms' expression of needs for programmes	1	2	3	4
(9) Insufficient sharing common objectives for programme	1	2	3	4
(10) Other (please specify _____)	1	2	3	4

4. Interactions between universities and government in policy process

This section is asking you about your attitude toward relationships between universities and government when participating in the IAC programmes.

4.1 In the above IAC programmes, how do you assess collaborative relationships between universities and government for successful programmes?

- (1) Very well (2) Well (3) Average
 (4) Not well (5) Not at all (6) Don't know

4.2 In the IAC programmes, could you identify three factors out of the following list that are important for the successful implementation of programmes in terms of universities-government relationship? Please choose three important factors. (), (), ()

- (1) Communication with government
- (2) Contacts with government
- (3) Government's channels for contact and communication with universities
- (4) Exchanging of government's programme information
- (5) Understanding of mutual characteristics between firm and government
- (6) Universities' proper expression of needs for programmes
- (7) Universities' influence on government
- (8) Sharing common objectives for programme
- (9) Simplifying ministries dealing with IAC programmes
- (10) Government's flexibility to changing of universities' needs
- (11) Government's interest in universities' needs for collaboration
- (12) Active role of local government in policy process
- (13) Other (please specify _____)

4.3 The following are potential barriers to collaborative relationships between universities and government (including public agencies) for successful implementation of programmes. To what extent are they barriers to your participation in the IAC programmes?

	Strong Barrie r	Weak Barrier	Not a Barrie r	Don't know
(1) Lack of communication with government	1	2	3	4
(2) Insufficient contacts with government	1	2	3	4
(3) Lack of channels for contact and communication with universities	1	2	3	4
(4) Insufficient exchange of government's programme information	1	2	3	4
(5) Lack of understanding of mutual characteristics	1	2	3	4
(6) Insufficient universities' expression of needs for programmes	1	2	3	4
(7) Lack of universities' influence on government	1	2	3	4
(8) Insufficient sharing common interests for programme	1	2	3	4
(9) Dispersion of ministries dealing with IAC	1	2	3	4
(10) Lack of government's flexibility to changing of universities' needs	1	2	3	4
(11) Government's small interest in universities' needs	1	2	3	4
(12) Passive role of local government	1	2	3	4
(13) Other (please specify _____)	1	2	3	4

5. Linkage and coordination of IAC programmes

This section is asking you about your attitude toward linkage and coordination between different programmes in the IAC programmes.

5.1 In the above IAC programmes, how do you assess linkage and coordination between different programmes, based on your experiences?

- (1) Very well (2) Well (3) Average
 (4) Not well (5) Not at all (6) Don't know

5.2 In the above IAC programmes, could you identify three out of the following factors that are important **for increasing linkage and coordination between different programmes**? Please choose three important factors. (), (), ()

(1) Considerable distinctions between programmes
(2) Fulfilment of demanders' diverse needs
(3) Obtaining information about other IAC programmes
(4) Exchange information between programme managing organisations
(5) Programme managing organisations' efforts to increase linkage with other programmes
(6) Local government's efforts to increase linkage between programmes
(7) Government's provision for incentives to increase linkage between programmes
(8) Integration of organisations (e.g ministries) dealing with programmes
(9) Other (please specify _____)

5.3 The following are potential barriers to **linkage and coordination between different programmes**. To what extent are they barriers in IAC programmes?

	Strong Barrier	Weak Barrier	Not a Barrier	Don't know
(1) Lack of distinctions between programmes	1	2	3	4
(2) Lack of fulfilment of firms' diverse demanders	1	2	3	4
(3) Difficulty in obtaining information about other programmes	1	2	3	4
(4) Insufficient information exchange between programme managing organisations	1	2	3	4
(5) Lack of programme managing organisations' efforts to increase linkage with other programmes	1	2	3	4
(6) Lack of local government's efforts to increase linkage between programmes	1	2	3	4
(7) Lack of government's provision for incentives to increase linkage between programmes	1	2	3	4
(8) Dispersion of government organisations dealing with programmes	1	2	3	4
(9) Other (please specify _____)	1	2	3	4

If do you have any other opinions about IAC programmes, please describe them in the box. Thank you very much for your help

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Appendix C: Interviewee List

Group	Interviewees
Firms	Owner of internet commerce firm
	Owner of IT consulting firm
	Owner of software development firm
	Owner of machinery firm
	Owner of electronics firm
	Staff member of medical equipment firm
	Owner of display manufacturing firm
	Owner of metal firm
Heads of programmes	Head of the CUIAC programme in Kyungbuk University
	Head of the BI programme in Daegu Polytechnic College
	Head of the TIC programme in Yeungjin University
	Head of the RRC programme in Keimyung University
	Head of the UIRIC programme in Kyungbuk University
Central government officers	Direct of Industry-Academia Collaboration Division in MOEHRD
	Deputy direct of Human resources Development for Industrial Technology Division in MOCIE
	Direct Of Industry-Academia Collaboration Team in SMBA
Public institute officers	Staff member of the KOTEF
	Staff member of the
Daegu City government officers	Director of New Industries Division
	Former director of Science and Technology Division
	Deputy director of Science and Technology Division
	Former deputy director of Science and Technology Division
Others	Staff member of Daegu TP Foundation
	Director of Daegu Regional Innovation
	Direct of centre for supporting industry in Kyungbuk University

Appendix D: A sample of interview question

Interviewee: Owners of firms

1. General questions

How many times have you participated in IAC programmes?

What kinds of IAC programmes have you participated in?

2. Questions regarding barriers in each element

Have you established collaborative networks with local universities in the Daegu City region excluding government support programmes?

- In local networking activities with local universities, what are the main barriers? Why?

In the IAC programmes, do you have dense interactions with universities?

- What are the important factors for the successful implementation of programmes in terms of firm-university relationships? Why?
- Does previous experience of local networking activities with universities influence firm-university relationships in the IAC programmes? Why?
- How does the local culture of networking activities between firm and university influence firm-university relationships in the IAC programmes?

Do you often contact government officers in the IAC programmes?

- What are the main barriers in working with governments? Why?
- What are the problems of the current administrative system in the programmes? Why?
- To what extent does the administrative system influence interaction with government?

Do you think that various IAC programmes are well-coordinated?

- What is the main barrier to coordination between programmes? Why?
- How well is government managing coordination between programmes?

3. Questions regarding concrete and practical meanings of various barriers used in the survey (in the case that concrete and practical meanings do not arise during the interview)

3.1 Local networking activities

- Are a number of local universities important for facilitating collaboration sufficient? Why?
- What kind of specific knowledge do you want universities to have?
- What are common objectives and interests for collaboration?
- Why is it difficult to establish interdependent relationships between them?

3.2 Interactions between firms and universities in the policy process

- Do you think universities are reliable in the policy process or not? Why?
- What kind of characteristics are to be understood between firms and universities?
- Who is the more powerful in the firms-universities relationship in the policy process?

- Why are there gaps between them in common objectives and interests for programmes?

3.3 Interactions between firms and government in the policy process

- What kind of their characteristics are to be understood between them?
- To what extent does government have power in the policy process?
- What are common objectives and interests for programmes?
- How flexible is government to firms' changing needs? Why is not it flexible?
- What roles of local government in the policy process are needed?

3.4 Linkage and coordination of IAC programmes

- What kinds of needs do you have toward IAC programmes?
- What kinds of government efforts and incentives are needed for coordination?

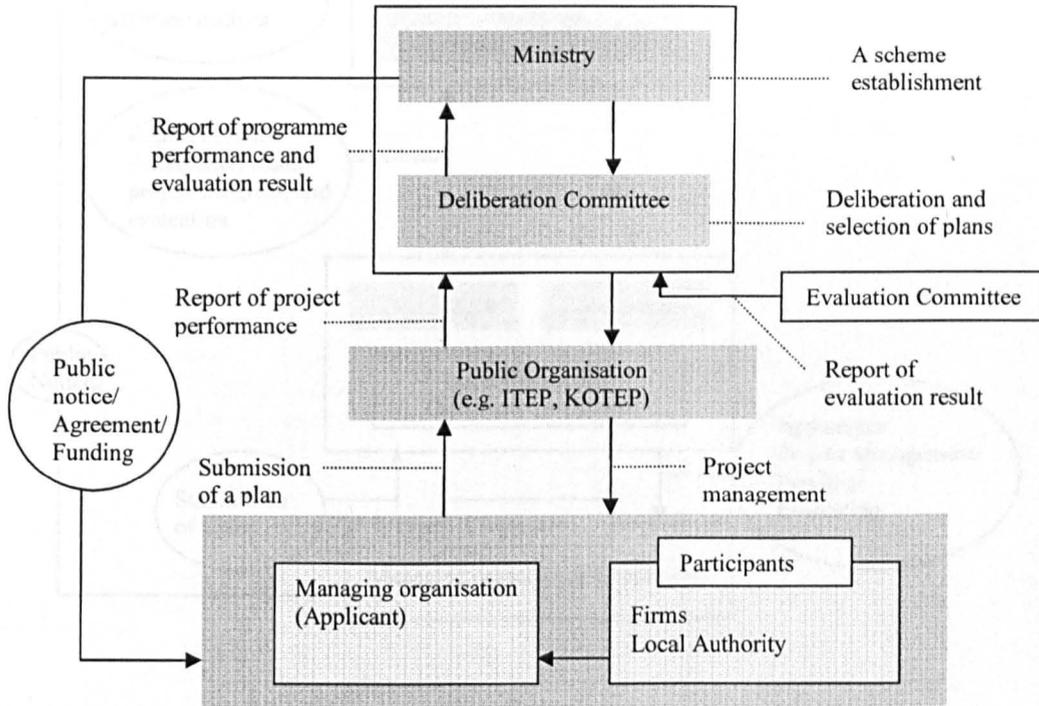
4. Spatial Issues (in the case that the issues do not arise during the interview)

4.1 Does the industrial structure dominated by textile industry impede facilitation of R&D collaboration between universities and industries?

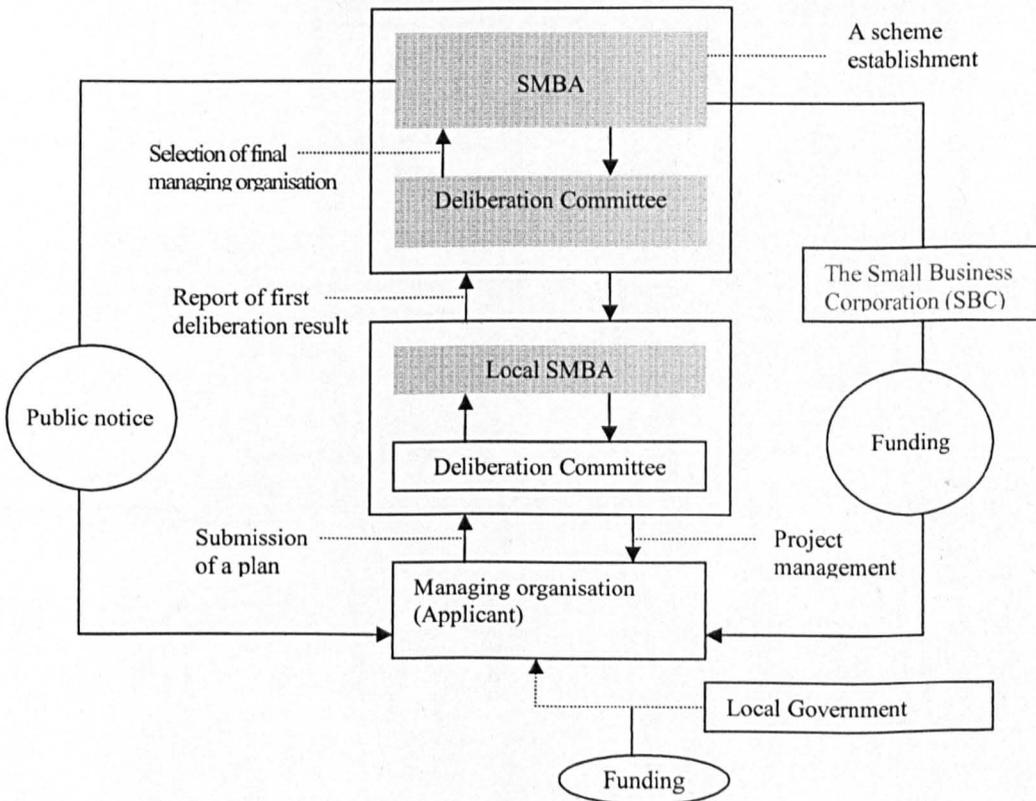
4.2 To what extent is the region providing environments for the growth of research-intensive or high-tech small firms and their networking activities?

Appendix E: Implementation structures and processes of the selected programmes

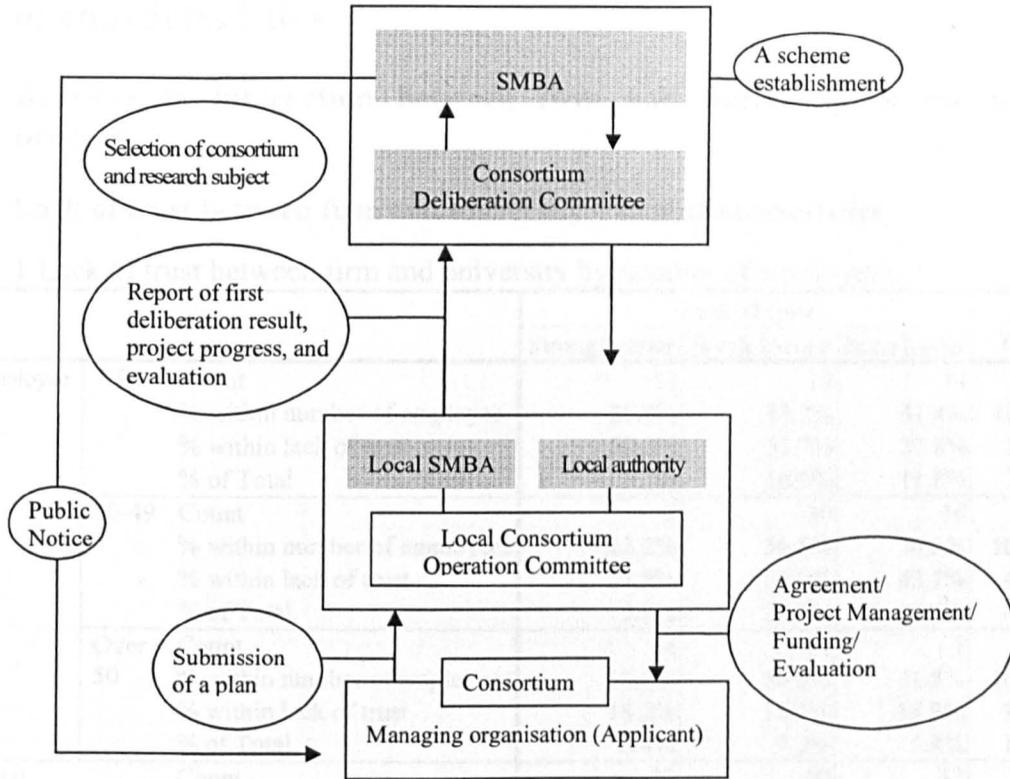
Type 1: The TIC, RRC and CUIAC programmes



Type 2: The BI programme



Type 3: The UIRIC programme



1.1.2 Lack of trust between firm and university by R&D expenditure ratio of turnover

R&D expenditure ratio of turnover	Less than 3%	Count	Lack of trust			Total
			Strongly trust	Weak trust	Not a sign	
less than 3%			10.7%	80.3%	9.0%	100.0%
	% within R&D expenditure		31.8%	48.1%	20.1%	48.3%
	% within lack of trust		4.2%	24.0%	30.2%	48.3%
	% of Total		12.2%	24.0%	36.2%	48.3%
more than 3%			23.4%	66.3%	10.3%	100.0%
	% within R&D expenditure		86.2%	66.3%	66.3%	51.7%
	% within lack of trust		12.2%	24.0%	30.2%	51.7%
	% of Total		12.2%	24.0%	36.2%	51.7%
Total			34.1%	73.3%	19.3%	100.0%
	% within R&D expenditure		12.2%	24.0%	36.2%	74.0%
	% within lack of trust		12.2%	24.0%	36.2%	74.0%
	% of Total		12.2%	24.0%	36.2%	74.0%

Appendix F: Cross – tabulations of barriers perceived by firm characteristics

1. Barriers to interaction between firm and university in the policy process

1.1 Lack of trust between firm and university – firm characteristics

1.1.1 Lack of trust between firm and university by number of employees

			Lack of trust			Total
			Strong barrier	Weak barrier	Not a barrier	
Employee	1-9	Count	11	19	14	44
		% within number of employee	25.0%	43.2%	31.8%	100.0%
		% within lack of trust	50.0%	31.7%	37.8%	37.0%
		% of Total	9.2%	16.0%	11.8%	37.0%
	10-49	Count	7	30	16	53
		% within number of employees	13.2%	56.6%	30.2%	100.0%
		% within lack of trust	31.8%	50.0%	43.2%	44.5%
		% of Total	5.9%	25.2%	13.4%	44.5%
	Over 50	Count	4	11	7	22
		% within number of employees	18.2%	50.0%	31.8%	100.0%
		% within lack of trust	18.2%	18.3%	18.9%	18.5%
		% of Total	3.4%	9.2%	5.9%	18.5%
Total	Count	22	60	37	119	
	% within number of employees	18.5%	50.4%	31.1%	100.0%	
	% within lack of trust	100.0%	100.0%	100.0%	100.0%	
	% of Total	18.5%	50.4%	31.1%	100.0%	

$$\chi^2 = 2.695, P(0.610) > .05$$

1.1.2 Lack of trust between firm and university by R&D expenditure ratio of turnover

			Lack of trust			Total
			Strong barrier	Weak barrier	Not a barrier	
R&D expenditure ratio of turnover	less than 5%	Count	7	28	20	55
		% within R&D expenditure	12.7%	50.9%	36.4%	100.0%
		% within lack of trust	31.8%	49.1%	57.1%	48.2%
		% of Total	6.1%	24.6%	17.5%	48.2%
	more than 6	Count	15	29	15	59
		% within R&D expenditure	25.4%	49.2%	25.4%	100.0%
		% within lack of trust	68.2%	50.9%	42.9%	51.8%
		% of Total	13.2%	25.4%	13.2%	51.8%
Total	Count	22	57	35	114	
	% within R&D expenditure	19.3%	50.0%	30.7%	100.0%	
	% within lack of trust	100.0%	100.0%	100.0%	100.0%	
	% of Total	19.3%	50.0%	30.7%	100.0%	

$$\chi^2 = 3.505, P(0.173) > .05$$

1.1.3 Lack of trust between firm and university by number of experiences of programmes

		Lack of trust			Total	
		Strong barrier	Weak barrier	Not a barrier		
number of experiences of programmes	once	Count	13	35	20	68
		% within number of experiences	19.1%	51.5%	29.4%	100.0%
		% within lack of trust	59.1%	58.3%	54.1%	57.1%
	% of Total	10.9%	29.4%	16.8%	57.1%	
	Over 2 times	Count	9	25	17	51
		% within number of experiences	17.6%	49.0%	33.3%	100.0%
% within lack of trust		40.9%	41.7%	45.9%	42.9%	
% of Total	7.6%	21.0%	14.3%	42.9%		
Total	Count	22	60	37	119	
	% within number of experiences	18.5%	50.4%	31.1%	100.0%	
	% within lack of trust	100.0%	100.0%	100.0%	100.0%	
	% of Total	18.5%	50.4%	31.1%	100.0%	

$$\chi^2 = 0.213, P(0.899) > .05$$

1.1.4 Lack of trust between firm and university by firm age

		Lack of trust			Total	
		Strong barrier	Weak barrier	Not a barrier		
The year of firm establishment	Before 1999	Count	9	30	18	57
		% within firm age	15.8%	52.6%	31.6%	100.0%
		% within lack of trust	40.9%	50.0%	48.6%	47.9%
	% of Total	7.6%	25.2%	15.1%	47.9%	
	After 2000	Count	13	30	19	62
		% within firm age	21.0%	48.4%	30.6%	100.0%
% within lack of trust		59.1%	50.0%	51.4%	52.1%	
% of Total	10.9%	25.2%	16.0%	52.1%		
Total	Count	22	60	37	119	
	% within firm age	18.5%	50.4%	31.1%	100.0%	
	% within lack of trust	100.0%	100.0%	100.0%	100.0%	
	% of Total	18.5%	50.4%	31.1%	100.0%	

$$\chi^2 = 0.545, P(0.761) > .05$$

1.1.5 Lack of trust between firm and university by industrial sector

		Lack of trust			Total	
		Strong barrier	Weak barrier	Not a barrier		
Industrial sector	Manufacturing	Count	14	50	33	97
		% within industrial sector	14.4%	51.5%	34.0%	100.0%
		% within lack of trust	63.6%	83.3%	89.2%	81.5%
	% of Total	11.8%	42.0%	27.7%	81.5%	
	Service	Count	8	10	4	22
		% within industrial sector	36.4%	45.5%	18.2%	100.0%
% within lack of trust		36.4%	16.7%	10.8%	18.5%	
% of Total	6.7%	8.4%	3.4%	18.5%		
Total	Count	22	60	37	119	
	% within industrial sector	18.5%	50.4%	31.1%	100.0%	
	% within lack of trust	100.0%	100.0%	100.0%	100.0%	
	% of Total	18.5%	50.4%	31.1%	100.0%	

$$\chi^2 = 6.244, P(0.044) < .05$$

1.2 Insufficient contact with university

1.2.1 Insufficient contact with university by number of employees

			Insufficient contact with university			Total
			Strong barrier	Weak barrier	Not a barrier	
employees	1-9	Count	4	23	18	45
		% within number of employees	8.9%	51.1%	40.0%	100.0%
		% within insufficient contact	30.8%	34.3%	41.9%	36.6%
		% of Total	3.3%	18.7%	14.6%	36.6%
	10-49	Count	5	30	20	55
		% within number of employees	9.1%	54.5%	36.4%	100.0%
		% within insufficient contact	38.5%	44.8%	46.5%	44.7%
		% of Total	4.1%	24.4%	16.3%	44.7%
	Over 50	Count	4	14	5	23
		% within number of employees	17.4%	60.9%	21.7%	100.0%
		% within insufficient contact	30.8%	20.9%	11.6%	18.7%
		% of Total	3.3%	11.4%	4.1%	18.7%
Total	Count	13	67	43	123	
	% within number of employees	10.6%	54.5%	35.0%	100.0%	
	% within insufficient contact	100.0%	100.0%	100.0%	100.0%	
	% of Total	10.6%	54.5%	35.0%	100.0%	

$$x^2 = 3.021, P(0.554) > .05$$

1.2.2 Insufficient contact with university by R&D expenditure ratio of turnover

			Insufficient contact with university			Total
			Strong barrier	Weak barrier	Not a barrier	
R&D expenditure ratio of turnover	less than 5%	Count	6	32	21	59
		% within R&D expenditure	10.2%	54.2%	35.6%	100.0%
		% within insufficient contact	50.0%	49.2%	50.0%	49.6%
		% of Total	5.0%	26.9%	17.6%	49.6%
	more than 6	Count	6	33	21	60
		% within R&D expenditure	10.0%	55.0%	35.0%	100.0%
		% within insufficient contact	50.0%	50.8%	50.0%	50.4%
		% of Total	5.0%	27.7%	17.6%	50.4%
Total	Count	12	65	42	119	
	% within R&D expenditure	10.1%	54.6%	35.3%	100.0%	
	% within insufficient contact	100.0%	100.0%	100.0%	100.0%	
	% of Total	10.1%	54.6%	35.3%	100.0%	

$$x^2 = 0.007, P(0.997) > .05$$

1.2.3 Insufficient contact with university by number of experiences of programmes

			Insufficient contact with university			Total
			Strong barrier	Weak barrier	Not a barrier	
number of experiences of programmes	once	Count	6	40	26	72
		% within number of experiences	8.3%	55.6%	36.1%	100.0%
		% within insufficient contact	46.2%	59.7%	60.5%	58.5%
		% of Total	4.9%	32.5%	21.1%	58.5%
	Over 2 times	Count	7	27	17	51
		% within number of experiences	13.7%	52.9%	33.3%	100.0%
		% within insufficient contact	53.8%	40.3%	39.5%	41.5%
Total	Count	% within number of experiences	10.6%	54.5%	35.0%	100.0%
		% within insufficient contact	100.0%	100.0%	100.0%	100.0%
		% of Total	10.6%	54.5%	35.0%	100.0%

$$x^2 = 0.925, P(0.630) > .05$$

1.2.4 Insufficient contact with university by firm age

			Insufficient contact with university			Total
			Strong barrier	Weak barrier	Not a barrier	
The year of firm establishment	Before 1999	Count	8	35	19	62
		% within firm age	12.9%	56.5%	30.6%	100.0%
		% within insufficient contact	61.5%	52.2%	44.2%	50.4%
		% of Total	6.5%	28.5%	15.4%	50.4%
	After 2000	Count	5	32	24	61
		% within firm age	8.2%	52.5%	39.3%	100.0%
		% within insufficient contact	38.5%	47.8%	55.8%	49.6%
Total	Count	% within firm age	10.6%	54.5%	35.0%	100.0%
		% within insufficient contact	100.0%	100.0%	100.0%	100.0%
		% of Total	10.6%	54.5%	35.0%	100.0%

$$x^2 = 1.400, P(0.497) > .05$$

1.2.5 Insufficient contact with university by industrial sector

			Insufficient contact with university			Total
			Strong barrier	Weak barrier	Not a barrier	
Industrial sector	Manufacturing	Count	9	51	41	101
		% within industrial sector	8.9%	50.5%	40.6%	100.0%
		% within insufficient contact	69.2%	76.1%	95.3%	82.1%
		% of Total	7.3%	41.5%	33.3%	82.1%
	Service	Count	4	16	2	22
		% within industrial sector	18.2%	72.7%	9.1%	100.0%
		% within insufficient contact	30.8%	23.9%	4.7%	17.9%
Total	Count	% within industrial sector	10.6%	54.5%	35.0%	100.0%
		% within insufficient contact	100.0%	100.0%	100.0%	100.0%
		% of Total	10.6%	54.5%	35.0%	100.0%

$$x^2 = 8.237, P(0.016) < .05$$

1.3 Insufficient firms' expression of needs for programmes

1.3.1 Insufficient firms' expression of needs for programmes by number of employees

			Insufficient firms' expression			Total
			Strong barrier	Weak barrier	Not a barrier	
employees	1-9	Count	5	23	14	42
		% within number of employees	11.9%	54.8%	33.3%	100.0%
		% within insufficient expression	25.0%	37.1%	38.9%	35.6%
		% of Total	4.2%	19.5%	11.9%	35.6%
	10-49	Count	10	25	18	53
		% within number of employees	18.9%	47.2%	34.0%	100.0%
		% within insufficient expression	50.0%	40.3%	50.0%	44.9%
		% of Total	8.5%	21.2%	15.3%	44.9%
	Over 50	Count	5	14	4	23
		% within number of employees	21.7%	60.9%	17.4%	100.0%
		% within insufficient expression	25.0%	22.6%	11.1%	19.5%
		% of Total	4.2%	11.9%	3.4%	19.5%
Total	Count	20	62	36	118	
	% within number of employees	16.9%	52.5%	30.5%	100.0%	
	% within insufficient expression	100.0%	100.0%	100.0%	100.0%	
	% of Total	16.9%	52.5%	30.5%	100.0%	

$$\chi^2 = 3.305, P(0.508) > .05$$

1.3.2 Insufficient firms' expression of needs for programmes by R&D expenditure ratio of turnover

			Insufficient firms' expression			Total
			Strong barrier	Weak barrier	Not a barrier	
R&D expenditure ratio of turnover	less than 5%	Count	8	27	19	54
		% within R&D expenditure	14.8%	50.0%	35.2%	100.0%
		% within insufficient expression	44.4%	45.8%	52.8%	47.8%
	more than 6%	Count	10	32	17	59
		% within R&D expenditure	16.9%	54.2%	28.8%	100.0%
		% within insufficient expression	55.6%	54.2%	47.2%	52.2%
	Total	Count	18	59	36	113
		% within R&D expenditure	15.9%	52.2%	31.9%	100.0%
% within insufficient expression		100.0%	100.0%	100.0%	100.0%	
	% of Total	15.9%	52.2%	31.9%	100.0%	

$$\chi^2 = 0.537, P(0.765) > .05$$

1.3.3 Insufficient firms' expression of needs for programmes by experiences of programmes

			Insufficient firms' expression			Total
			Strong barrier	Weak barrier	Not a barrier	
Number of experiences of programmes	once	Count	12	33	25	70
		% within number of experiences	17.1%	47.1%	35.7%	100.0%
		% within insufficient expression	60.0%	53.2%	69.4%	59.3%
	% of Total	10.2%	28.0%	21.2%	59.3%	
	Over 2 times	Count	8	29	11	48
		% within number of experiences	16.7%	60.4%	22.9%	100.0%
% within insufficient expression		40.0%	46.8%	30.6%	40.7%	
% of Total	6.8%	24.6%	9.3%	40.7%		
Total	Count	20	62	36	118	
	% within number of experiences	16.9%	52.5%	30.5%	100.0%	
	% within insufficient expression	100.0%	100.0%	100.0%	100.0%	
	% of Total	16.9%	52.5%	30.5%	100.0%	

$$x^2 = 2.487, P(0.288) > .05$$

1.3.4 Insufficient firms' expression of needs for programmes by firm age

			Insufficient firms' expression			Total
			Strong barrier	Weak barrier	Not a barrier	
The year of firm establishment	Before 1999	Count	12	29	19	60
		% within firm age	20.0%	48.3%	31.7%	100.0%
		% within insufficient expression	60.0%	46.8%	52.8%	50.8%
	% of Total	10.2%	24.6%	16.1%	50.8%	
	After 2000	Count	8	33	17	58
		% within firm age	13.8%	56.9%	29.3%	100.0%
% within insufficient expression		40.0%	53.2%	47.2%	49.2%	
% of Total	6.8%	28.0%	14.4%	49.2%		
Total	Count	20	62	36	118	
	% within firm age	16.9%	52.5%	30.5%	100.0%	
	% within insufficient expression	100.0%	100.0%	100.0%	100.0%	
	% of Total	16.9%	52.5%	30.5%	100.0%	

$$x^2 = 1.136, P(0.567) > .05$$

1.3.5 Insufficient firms' expression of needs for programmes by industrial sector

			Insufficient firms' expression			Total
			Strong barrier	Weak barrier	Not a barrier	
Industrial sector	Manufacturing	Count	13	49	35	97
		% within industrial sector	13.4%	50.5%	36.1%	100.0%
		% within insufficient expression	65.0%	79.0%	97.2%	82.2%
	% of Total	11.0%	41.5%	29.7%	82.2%	
	Service	Count	7	13	1	21
		% within industrial sector	33.3%	61.9%	4.8%	100.0%
% within insufficient expression		35.0%	21.0%	2.8%	17.8%	
% of Total	5.9%	11.0%	.8%	17.8%		
Total	Count	20	62	36	118	
	% within industrial sector	16.9%	52.5%	30.5%	100.0%	
	% within insufficient	100.0%	100.0%	100.0%	100.0%	
	% of Total	16.9%	52.5%	30.5%	100.0%	

$$x^2 = 10.023, P(0.007) < .05$$

2. Barriers to interaction between firm and government in the policy process

2.1 Insufficient firms' expression of needs for programmes – firm characteristics

2.1.1 Insufficient firms' expression of needs for programmes by number of employees

			Insufficient firms' expression of needs			Total
			Strong barrier	Weak barrier	Not a barrier	
employees	1-9	Count	8	21	11	40
		% within number of employees	20.0%	52.5%	27.5%	100.0%
		% within insufficient expression	47.1%	32.3%	32.4%	34.5%
		% of Total	6.9%	18.1%	9.5%	34.5%
	10-49	Count	5	31	19	55
		% within number of employees	9.1%	56.4%	34.5%	100.0%
		% within insufficient expression	29.4%	47.7%	55.9%	47.4%
		% of Total	4.3%	26.7%	16.4%	47.4%
	Over 50	Count	4	13	4	21
		% within number of employees	19.0%	61.9%	19.0%	100.0%
		% within insufficient expression	23.5%	20.0%	11.8%	18.1%
		% of Total	3.4%	11.2%	3.4%	18.1%
Total	Count	17	65	34	116	
	% within number of employees	14.7%	56.0%	29.3%	100.0%	
	% within insufficient expression	100.0%	100.0%	100.0%	100.0%	
	% of Total	14.7%	56.0%	29.3%	100.0%	

$$x^2 = 3.751, P(0.441) > .05$$

2.1.2 Insufficient firms' expression of needs for programmes by R&D expenditure ratio of turnover

			Insufficient firms' expression of needs			Total
			Strong barrier	Weak barrier	Not a barrier	
R&D expenditure ratio of turnover	less than 5%	Count	4	35	16	55
		% within R&D expenditure	7.3%	63.6%	29.1%	100.0%
		% within insufficient expression	26.7%	55.6%	48.5%	49.5%
		% of Total	3.6%	31.5%	14.4%	49.5%
	more than 6%	Count	11	28	17	56
		% within R&D expenditure	19.6%	50.0%	30.4%	100.0%
		% within insufficient expression	73.3%	44.4%	51.5%	50.5%
		% of Total	9.9%	25.2%	15.3%	50.5%
Total	Count	15	63	33	111	
	% within R&D expenditure	13.5%	56.8%	29.7%	100.0%	
	% within insufficient expression	100.0%	100.0%	100.0%	100.0%	
	% of Total	13.5%	56.8%	29.7%	100.0%	

$$x^2 = 4.066, P(0.131) > .05$$

2.1.3 Insufficient firms' expression of needs for programmes by number of experiences of programmes

			Insufficient firms' expression of needs			Total
			Strong barrier	Weak barrier	Not a barrier	
number of experiences of programmes	once	Count	9	41	20	70
		% within number of experiences	12.9%	58.6%	28.6%	100.0%
		% within insufficient expression	52.9%	63.1%	58.8%	60.3%
		% of Total	7.8%	35.3%	17.2%	60.3%
	Over 2 times	Count	8	24	14	46
		% within number of experiences	17.4%	52.2%	30.4%	100.0%
		% within insufficient expression	47.1%	36.9%	41.2%	39.7%
		% of Total	6.9%	20.7%	12.1%	39.7%
Total	Count	17	65	34	116	
	% within number of experiences	14.7%	56.0%	29.3%	100.0%	
	% within insufficient expression	100.0%	100.0%	100.0%	100.0%	
	% of Total	14.7%	56.0%	29.3%	100.0%	

$$x^2 = 0.625, P(0.732) > .05$$

2.1.4 Insufficient firms' expression of needs for programmes by firm age

			Insufficient firms' expression of needs			Total
			Strong barrier	Weak barrier	Not a barrier	
The year of firm establishment	Before 1999	Count	8	33	15	56
		% within firm age	14.3%	58.9%	26.8%	100.0%
		% within insufficient expression	47.1%	50.8%	44.1%	48.3%
		% of Total	6.9%	28.4%	12.9%	48.3%
	After 2000	Count	9	32	19	60
		% within firm age	15.0%	53.3%	31.7%	100.0%
		% within insufficient expression	52.9%	49.2%	55.9%	51.7%
		% of Total	7.8%	27.6%	16.4%	51.7%
Total	Count	17	65	34	116	
	% within firm age	14.7%	56.0%	29.3%	100.0%	
	% within insufficient expression	100.0%	100.0%	100.0%	100.0%	
	% of Total	14.7%	56.0%	29.3%	100.0%	

$$x^2 = 0.407, P(0.816) > .05$$

2.1.5 Insufficient firms' expression of needs for programmes by industrial sector

			Insufficient firms' expression of needs			Total
			Strong barrier	Weak barrier	Not a barrier	
Industrial sector	Manufacturing	Count	9	55	31	95
		% within industrial sector	9.5%	57.9%	32.6%	100.0%
		% within insufficient expression	52.9%	84.6%	91.2%	81.9%
		% of Total	7.8%	47.4%	26.7%	81.9%
	Service	Count	8	10	3	21
		% within industrial sector	38.1%	47.6%	14.3%	100.0%
		% within insufficient expression	47.1%	15.4%	8.8%	18.1%
		% of Total	6.9%	8.6%	2.6%	18.1%
Total	Count	17	65	34	116	
	% within industrial sector	14.7%	56.0%	29.3%	100.0%	
	% within insufficient expression	100.0%	100.0%	100.0%	100.0%	
	% of Total	14.7%	56.0%	29.3%	100.0%	

$$x^2 = 11.912, P(0.003) < .05$$

2.2 The lack of understanding of mutual characteristics

2.2.1 Lack of understanding of mutual characteristics by number of employees

		Lack of understanding of partner			Total	
		Strong barrier	Weak barrier	Not a barrier		
employees	1-9	Count	5	27	9	41
		% within number of employees	12.2%	65.9%	22.0%	100.0%
		% within lack of understanding	35.7%	37.0%	28.1%	34.5%
		% of Total	4.2%	22.7%	7.6%	34.5%
	10-49	Count	6	32	18	56
		% within number of employees	10.7%	57.1%	32.1%	100.0%
		% within lack of understanding	42.9%	43.8%	56.3%	47.1%
		% of Total	5.0%	26.9%	15.1%	47.1%
	Over 50	Count	3	14	5	22
		% within number of employees	13.6%	63.6%	22.7%	100.0%
		% within lack of understanding	21.4%	19.2%	15.6%	18.5%
		% of Total	2.5%	11.8%	4.2%	18.5%
Total	Count	14	73	32	119	
	% within number of employees	11.8%	61.3%	26.9%	100.0%	
	% within lack of understanding	100.0%	100.0%	100.0%	100.0%	
	% of Total	11.8%	61.3%	26.9%	100.0%	

$$x^2 = 1.529, P(0.822) > .05$$

2.2.2 Lack of understanding of mutual characteristics by R&D expenditure ratio of turnover

		Lack of understanding of partner			Total	
		Strong barrier	Weak barrier	Not a barrier		
R&D expenditure ratio of turnover	less than 5%	Count	8	34	17	59
		% within R&D expenditure	13.6%	57.6%	28.8%	100.0%
		% within lack of understanding	57.1%	49.3%	54.8%	51.8%
		% of Total	7.0%	29.8%	14.9%	51.8%
	more than 6%	Count	6	35	14	55
		% within R&D expenditure	10.9%	63.6%	25.5%	100.0%
		% within lack of understanding	42.9%	50.7%	45.2%	48.2%
		% of Total	5.3%	30.7%	12.3%	48.2%
Total	Count	14	69	31	114	
	% within R&D expenditure	12.3%	60.5%	27.2%	100.0%	
	% within lack of understanding	100.0%	100.0%	100.0%	100.0%	
	% of Total	12.3%	60.5%	27.2%	100.0%	

$$x^2 = 0.451, P(0.798) > .05$$

2.2.3 Lack of understanding of mutual characteristics by number of experiences of programmes

			Insufficient firms' expression of needs			Total
			Strong barrier	Weak barrier	Not a barrier	
number of experiences of programmes	once	Count	8	42	20	70
		% within number of experiences	11.4%	60.0%	28.6%	100.0%
		% within lack of understanding	57.1%	57.5%	62.5%	58.8%
		% of Total	6.7%	35.3%	16.8%	58.8%
	Over 2 times	Count	6	31	12	49
		% within number of experiences	12.2%	63.3%	24.5%	100.0%
		% within lack of understanding	42.9%	42.5%	37.5%	41.2%
		% of Total	5.0%	26.1%	10.1%	41.2%
Total	Count	14	73	32	119	
	% within number of experiences	11.8%	61.3%	26.9%	100.0%	
	% within insufficient expression	100.0%	100.0%	100.0%	100.0%	
	% of Total	11.8%	61.3%	26.9%	100.0%	

$$x^2 = 0.245, P(0.885) > .05$$

2.2.4 Lack of understanding of mutual characteristics for programmes by firm age

			Insufficient firms' expression of needs			Total
			Strong barrier	Weak barrier	Not a barrier	
The year of firm establishment	Before 1999	Count	7	38	16	61
		% within firm age	11.5%	62.3%	26.2%	100.0%
		% within lack of understanding	50.0%	52.1%	50.0%	51.3%
		% of Total	5.9%	31.9%	13.4%	51.3%
	After 2000	Count	7	35	16	58
		% within firm age	12.1%	60.3%	27.6%	100.0%
		% within lack of understanding	50.0%	47.9%	50.0%	48.7%
		% of Total	5.9%	29.4%	13.4%	48.7%
Total	Count	14	73	32	119	
	% within firm age	11.8%	61.3%	26.9%	100.0%	
	% within lack of understanding	100.0%	100.0%	100.0%	100.0%	
	% of Total	11.8%	61.3%	26.9%	100.0%	

$$x^2 = 0.048, P(0.976) > .05$$

2.2.5 Lack of understanding of mutual characteristics for programmes by industrial sector

			Insufficient firms' expression of needs			Total
			Strong barrier	Weak barrier	Not a barrier	
Industrial sector	Manufacturing	Count	9	61	29	99
		% within industrial sector	9.1%	61.6%	29.3%	100.0%
		% within lack of understanding	64.3%	83.6%	90.6%	83.2%
		% of Total	7.6%	51.3%	24.4%	83.2%
	Service	Count	5	12	3	20
		% within industrial sector	25.0%	60.0%	15.0%	100.0%
		% within lack of understanding	35.7%	16.4%	9.4%	16.8%
		% of Total	4.2%	10.1%	2.5%	16.8%
Total	Count	14	73	32	119	
	% within industrial sector	11.8%	61.3%	26.9%	100.0%	
	% within lack of understanding	100.0%	100.0%	100.0%	100.0%	
	% of Total	11.8%	61.3%	26.9%	100.0%	

$$x^2 = 4.851, P(0.088) > .05$$

3. Barriers to policy co-ordination in the policy process

3.1 Difficulty in obtaining information

3.1.1 Difficulty in obtaining information by number of employees

		Difficulty in obtaining information			Total	
		Strong barrier	Weak barrier	Not a barrier		
Employee	1-9	Count	5	28	10	43
		% within number of employees	11.6%	65.1%	23.3%	100.0%
		% within difficulty obtaining information	25.0%	39.4%	38.5%	36.8%
		% of Total	4.3%	23.9%	8.5%	36.8%
	10-49	Count	11	29	13	53
		% within number of employees	20.8%	54.7%	24.5%	100.0%
		% within difficulty obtaining information	55.0%	40.8%	50.0%	45.3%
		% of Total	9.4%	24.8%	11.1%	45.3%
	Over 50	Count	4	14	3	21
		% within number of employees	19.0%	66.7%	14.3%	100.0%
		% within difficulty obtaining information	20.0%	19.7%	11.5%	17.9%
		% of Total	3.4%	12.0%	2.6%	17.9%
Total	Count	20	71	26	117	
	% within number of employees	17.1%	60.7%	22.2%	100.0%	
	% within difficulty obtaining information	100.0%	100.0%	100.0%	100.0%	
	% of Total	17.1%	60.7%	22.2%	100.0%	

$$x^2 = 2.531, P(0.639) > .05$$

3.1.2 Difficulty in obtaining information by R&D expenditure ratio of turnover

		difficulty in obtaining information			Total	
		Strong barrier	Weak barrier	Not a barrier		
R&D expenditure ratio of turnover	less than 5%	Count	9	36	10	55
		% within R&D expenditure	16.4%	65.5%	18.2%	100.0%
		% within difficulty obtaining information	52.9%	52.2%	40.0%	49.5%
		% of Total	8.1%	32.4%	9.0%	49.5%
	more than 6%	Count	8	33	15	56
		% within R&D expenditure	14.3%	58.9%	26.8%	100.0%
		% within difficulty obtaining information	47.1%	47.8%	60.0%	50.5%
		% of Total	7.2%	29.7%	13.5%	50.5%
Total	Count	17	69	25	111	
	% within R&D expenditure	15.3%	62.2%	22.5%	100.0%	
	% within difficulty obtaining information	100.0%	100.0%	100.0%	100.0%	
	% of Total	15.3%	62.2%	22.5%	100.0%	

$$x^2 = 1.180, P(0.554) > .05$$

3.1.3 Difficulty in obtaining information by number of experiences of programmes

		Insufficient firms' expression of needs			Total	
		Strong barrier	Weak barrier	Not a barrier		
Number of experiences of programmes	once	Count	16	39	16	71
		% within number of experiences	22.5%	54.9%	22.5%	100.0%
		% within difficulty obtaining information	80.0%	54.9%	61.5%	60.7%
	% of Total	13.7%	33.3%	13.7%	60.7%	
Over 2 times	Over 2 times	Count	4	32	10	46
		% within number of experiences	8.7%	69.6%	21.7%	100.0%
		% within difficulty obtaining information	20.0%	45.1%	38.5%	39.3%
	% of Total	3.4%	27.4%	8.5%	39.3%	
Total	Total	Count	20	71	26	117
		% within number of experiences	17.1%	60.7%	22.2%	100.0%
		% within difficulty obtaining information	100.0%	100.0%	100.0%	100.0%
		% of Total	17.1%	60.7%	22.2%	100.0%

$$x^2 = 4.121, P(0.127) > .05$$

3.1.4 Difficulty in obtaining information for programmes by firm age

		Insufficient firms' expression of needs			Total	
		Strong barrier	Weak barrier	Not a barrier		
The year of firm establishment	Before 1999	Count	10	38	9	57
		% within the year of firm establishment	17.5%	66.7%	15.8%	100.0%
		% within difficulty obtaining information	50.0%	53.5%	34.6%	48.7%
	% of Total	8.5%	32.5%	7.7%	48.7%	
	After 2000	Count	10	33	17	60
		% within the year of firm establishment	16.7%	55.0%	28.3%	100.0%
% within difficulty obtaining information		50.0%	46.5%	65.4%	51.3%	
% of Total	8.5%	28.2%	14.5%	51.3%		
Total	Total	Count	20	71	26	117
		% within the year of firm establishment	17.1%	60.7%	22.2%	100.0%
		% within difficulty obtaining information	100.0%	100.0%	100.0%	100.0%
		% of Total	17.1%	60.7%	22.2%	100.0%

$$x^2 = 2.739, P(0.254) > .05$$

3.1.5 Difficulty in obtaining information by industrial sector

		Insufficient firms' expression of needs			Total	
		Strong barrier	Weak barrier	Not a barrier		
Industrial sector	Manufacturing	Count	18	57	23	98
		% within industrial sector	18.4%	58.2%	23.5%	100.0%
		% within difficulty obtaining information	90.0%	80.3%	88.5%	83.8%
		% of Total	15.4%	48.7%	19.7%	83.8%
	Service	Count	2	14	3	19
		% within industrial sector	10.5%	73.7%	15.8%	100.0%
		% within difficulty obtaining information	10.0%	19.7%	11.5%	16.2%
		% of Total	1.7%	12.0%	2.6%	16.2%
Total	Total	Count	20	71	26	117
		% within industrial sector	17.1%	60.7%	22.2%	100.0%
		% within difficulty obtaining information	100.0%	100.0%	100.0%	100.0%
		% of Total	17.1%	60.7%	22.2%	100.0%

$$x^2 = 1.627, P(0.443) > .05$$

3.2 Insufficient information exchange

3.2.1 Insufficient information exchange by number of employees

			insufficient information exchange			Total
			Strong barrier	Weak barrier	Not a barrier	
Employees	1-9	Count	8	27	8	43
		% within number of employees	18.6%	62.8%	18.6%	100.0%
		% within insufficient information	40.0%	38.0%	33.3%	37.4%
		% of Total	7.0%	23.5%	7.0%	37.4%
	10-49	Count	7	33	14	54
		% within number of employees	13.0%	61.1%	25.9%	100.0%
		% within insufficient information	35.0%	46.5%	58.3%	47.0%
		% of Total	6.1%	28.7%	12.2%	47.0%
	Over 50	Count	5	11	2	18
		% within number of employees	27.8%	61.1%	11.1%	100.0%
		% within insufficient information	25.0%	15.5%	8.3%	15.7%
		% of Total	4.3%	9.6%	1.7%	15.7%
Total	Count	20	71	24	115	
	% within number of employees	17.4%	61.7%	20.9%	100.0%	
	% within insufficient information	100.0%	100.0%	100.0%	100.0%	
	% of Total	17.4%	61.7%	20.9%	100.0%	

$$x^2 = 3.363, P(0.499) > .05$$

3.2.2 Insufficient information exchange by R&D expenditure ratio of turnover

			insufficient information exchange			Total
			Strong barrier	Weak barrier	Not a barrier	
R&D expenditure ratio of turnover	less than 5%	Count	9	36	11	56
		% within R&D expenditure	16.1%	64.3%	19.6%	100.0%
		% within insufficient information	50.0%	52.2%	47.8%	50.9%
		% of Total	8.2%	32.7%	10.0%	50.9%
	more than 6%	Count	9	33	12	54
		% within R&D expenditure	16.7%	61.1%	22.2%	100.0%
		% within insufficient information	50.0%	47.8%	52.2%	49.1%
		% of Total	8.2%	30.0%	10.9%	49.1%
Total	Count	18	69	23	110	
	% within R&D expenditure	16.4%	62.7%	20.9%	100.0%	
	% within insufficient information	100.0%	100.0%	100.0%	100.0%	
	% of Total	16.4%	62.7%	20.9%	100.0%	

$$x^2 = 0.138, P(0.934) > .05$$

3.2.3 Difficulty in obtaining information by number of experiences of programmes

			Insufficient information exchange			Total
			Strong barrier	Weak barrier	Not a barrier	
Number of experiences of programmes	once	Count	13	41	15	69
		% within number of experiences	18.8%	59.4%	21.7%	100.0%
		% within insufficient information	65.0%	57.7%	62.5%	60.0%
	% of Total	11.3%	35.7%	13.0%	60.0%	
	Over 2 times	Count	7	30	9	46
		% within number of experiences	15.2%	65.2%	19.6%	100.0%
% within insufficient information		35.0%	42.3%	37.5%	40.0%	
% of Total	6.1%	26.1%	7.8%	40.0%		
Total	Count	20	71	24	115	
	% within number of experiences	17.4%	61.7%	20.9%	100.0%	
	% within insufficient information	100.0%	100.0%	100.0%	100.0%	
	% of Total	17.4%	61.7%	20.9%	100.0%	

$$x^2 = 0.421, P(0.810) > .05$$

3.2.4 Difficulty in obtaining information for programmes by firm age

			Insufficient information exchange			Total
			Strong barrier	Weak barrier	Not a barrier	
The year of firm establishment	Before 1999	Count	8	40	8	56
		% within firm age	14.3%	71.4%	14.3%	100.0%
		% within insufficient information	40.0%	56.3%	33.3%	48.7%
	% of Total	7.0%	34.8%	7.0%	48.7%	
	After 2000	Count	12	31	16	59
		% within firm age	20.3%	52.5%	27.1%	100.0%
% within insufficient information		60.0%	43.7%	66.7%	51.3%	
% of Total	10.4%	27.0%	13.9%	51.3%		
Total	Count	20	71	24	115	
	% within firm age	17.4%	61.7%	20.9%	100.0%	
	% within insufficient information	100.0%	100.0%	100.0%	100.0%	
	% of Total	17.4%	61.7%	20.9%	100.0%	

$$x^2 = 4.532, P(0.104) > .05$$

3.2.5 Difficulty in obtaining information by industrial sector

			Insufficient information exchange			Total
			Strong barrier	Weak barrier	Not a barrier	
Industrial sector	Manufacturing	Count	17	59	20	96
		% within industrial sector	17.7%	61.5%	20.8%	100.0%
		% within insufficient information	85.0%	83.1%	83.3%	83.5%
	% of Total	14.8%	51.3%	17.4%	83.5%	
	Service	Count	3	12	4	19
		% within industrial sector	15.8%	63.2%	21.1%	100.0%
% within insufficient information		15.0%	16.9%	16.7%	16.5%	
% of Total	2.6%	10.4%	3.5%	16.5%		
Total	Count	20	71	24	115	
	% within industrial sector	17.4%	61.7%	20.9%	100.0%	
	% within insufficient information	100.0%	100.0%	100.0%	100.0%	
	% of Total	17.4%	61.7%	20.9%	100.0%	

$$x^2 = 0.041, P(0.980) > .05$$

4. Barriers to networks between industry and university in Daegu City

4.1 Lack of trust between firms and universities

4.1.1 Lack of trust between firms and universities by number of employees

			Lack of trust			Total	
			Strong barrier	Weak barrier	Not a barrier		
Employees	1-9	Count	10	19	15	44	
		% within number of employees	22.7%	43.2%	34.1%	100.0%	
		% within lack of trust	50.0%	38.8%	28.8%	36.4%	
	% of Total			8.3%	15.7%	12.4%	36.4%
	10-49	Count	7	20	29	56	
		% within number of employees	12.5%	35.7%	51.8%	100.0%	
		% within lack of trust	35.0%	40.8%	55.8%	46.3%	
	% of Total			5.8%	16.5%	24.0%	46.3%
	Over 50	Count	3	10	8	21	
% within number of employees		14.3%	47.6%	38.1%	100.0%		
% within lack of trust		15.0%	20.4%	15.4%	17.4%		
% of Total			2.5%	8.3%	6.6%	17.4%	
Total	Count		20	49	52	121	
	% within number of employees		16.5%	40.5%	43.0%	100.0%	
	% within lack of trust		100.0%	100.0%	100.0%	100.0%	
	% of Total		16.5%	40.5%	43.0%	100.0%	

$$\chi^2 = 4.230, P(0.376) > .05$$

4.1.2 Lack of trust between firms and universities by R&D expenditure ratio of turnover

			Lack of trust			Total	
			Strong barrier	Weak barrier	Not a barrier		
R&D expenditure ratio of turnover	less than 5%	Count	9	22	28	59	
		% within R&D expenditure	15.3%	37.3%	47.5%	100.0%	
		% within lack of trust	47.4%	45.8%	56.0%	50.4%	
	% of Total			7.7%	18.8%	23.9%	50.4%
	more than 6%	Count	10	26	22	58	
		% within R&D expenditure	17.2%	44.8%	37.9%	100.0%	
% within lack of trust		52.6%	54.2%	44.0%	49.6%		
% of Total			8.5%	22.2%	18.8%	49.6%	
Total	Count		19	48	50	117	
	% within R&D expenditure		16.2%	41.0%	42.7%	100.0%	
	% within lack of trust		100.0%	100.0%	100.0%	100.0%	
	% of Total		16.2%	41.0%	42.7%	100.0%	

$$\chi^2 = 1.097, P(0.578) > .05$$

4.1.3 Lack of trust between firms and universities by number of experiences of programmes

			Lack of trust			Total
			Strong barrier	Weak barrier	Not a barrier	
Number of experiences of programmes	once	Count	12	25	33	70
		% within number of experiences	17.1%	35.7%	47.1%	100.0%
		% within lack of trust	60.0%	51.0%	63.5%	57.9%
		% of Total	9.9%	20.7%	27.3%	57.9%
	Over 2 times	Count	8	24	19	51
		% within number of experiences	15.7%	47.1%	37.3%	100.0%
		% within lack of trust	40.0%	49.0%	36.5%	42.1%
Total	Count	% within lack of trust	6.6%	19.8%	15.7%	42.1%
		% of Total	20	49	52	121
		% within number of experiences	16.5%	40.5%	43.0%	100.0%
		% within lack of trust	100.0%	100.0%	100.0%	100.0%
	% of Total	16.5%	40.5%	43.0%	100.0%	

$$x^2 = 1.647, P(0.439) > .05$$

4.1.4 Lack of trust between firms and universities for programmes by firm age

			Lack of trust			Total
			Strong barrier	Weak barrier	Not a barrier	
The year of firm establishment	Before 1999	Count	10	21	31	62
		% within the firm age	16.1%	33.9%	50.0%	100.0%
		% within lack of trust	50.0%	42.9%	59.6%	51.2%
		% of Total	8.3%	17.4%	25.6%	51.2%
	After 2000	Count	10	28	21	59
		% within the firm age	16.9%	47.5%	35.6%	100.0%
		% within lack of trust	50.0%	57.1%	40.4%	48.8%
Total	Count	% within lack of trust	8.3%	23.1%	17.4%	48.8%
		% of Total	20	49	52	121
		% within firm age	16.5%	40.5%	43.0%	100.0%
		% within lack of trust	100.0%	100.0%	100.0%	100.0%
	% of Total	16.5%	40.5%	43.0%	100.0%	

$$x^2 = 2.850, P(0.240) > .05$$

4.1.5 Lack of trust between firms and universities by industrial sector

			Lack of trust			Total
			Strong barrier	Weak barrier	Not a barrier	
Industrial sector	Manufacturing	Count	14	40	47	101
		% within industrial sector	13.9%	39.6%	46.5%	100.0%
		% within lack of trust	70.0%	81.6%	90.4%	83.5%
		% of Total	11.6%	33.1%	38.8%	83.5%
	Service	Count	6	9	5	20
		% within industrial sector	30.0%	45.0%	25.0%	100.0%
		% within lack of trust	30.0%	18.4%	9.6%	16.5%
Total	Count	% within lack of trust	5.0%	7.4%	4.1%	16.5%
		% of Total	20	49	52	121
		% within industrial sector	16.5%	40.5%	43.0%	100.0%
		% within lack of trust	100.0%	100.0%	100.0%	100.0%
	% of Total	16.5%	40.5%	43.0%	100.0%	

$$x^2 = 4.522, P(0.103) > .05$$

4.2 Conflict of intellectual property right (IPR)

4.2.1 Conflict of intellectual property right by number of employees

			Conflict of IPR			Total
			Strong barrier	Weak barrier	Not a barrier	
employees	1-9	Count	4	22	14	40
		% within number of employees	10.0%	55.0%	35.0%	100.0%
		% within conflict of IPR	36.4%	51.2%	24.6%	36.0%
		% of Total	3.6%	19.8%	12.6%	36.0%
	10-49	Count	4	15	33	52
		% within number of employees	7.7%	28.8%	63.5%	100.0%
		% within conflict of IPR	36.4%	34.9%	57.9%	46.8%
		% of Total	3.6%	13.5%	29.7%	46.8%
	Over 50	Count	3	6	10	19
		% within number of employees	15.8%	31.6%	52.6%	100.0%
		% within conflict of IPR	27.3%	14.0%	17.5%	17.1%
		% of Total	2.7%	5.4%	9.0%	17.1%
Total	Count	11	43	57	111	
	% within number of employees	9.9%	38.7%	51.4%	100.0%	
	% within conflict of IPR	100.0%	100.0%	100.0%	100.0%	
	% of Total	9.9%	38.7%	51.4%	100.0%	

$$x^2 = 8.790, P(0.067) > .05$$

4.2.2 Conflict of intellectual property right by R&D expenditure ratio of turnover

			Conflict of IPR			Total
			Strong barrier	Weak barrier	Not a barrier	
R&D expenditure ratio of turnover	less than 5%	Count	3	20	29	52
		% within R&D expenditure	5.8%	38.5%	55.8%	100.0%
		% within conflict of IPR	30.0%	48.8%	51.8%	48.6%
		% of Total	2.8%	18.7%	27.1%	48.6%
	more than 6%	Count	7	21	27	55
		% within R&D expenditure	12.7%	38.2%	49.1%	100.0%
		% within conflict of IPR	70.0%	51.2%	48.2%	51.4%
		% of Total	6.5%	19.6%	25.2%	51.4%
Total	Count	10	41	56	107	
	% within R&D expenditure	9.3%	38.3%	52.3%	100.0%	
	% within conflict of IPR	100.0%	100.0%	100.0%	100.0%	
	% of Total	9.3%	38.3%	52.3%	100.0%	

$$x^2 = 1.613, P(0.446) > .05$$

4.2.3 Conflict of intellectual property right by number of experiences of programmes

			Conflict of IPR			Total
			Strong barrier	Weak barrier	Not a barrier	
Number of experiences of programmes	once	Count	6	24	33	63
		% within number of experiences	9.5%	38.1%	52.4%	100.0%
		% within conflict of IPR	54.5%	55.8%	57.9%	56.8%
	% of Total	5.4%	21.6%	29.7%	56.8%	
	Over 2 times	Count	5	19	24	48
		% within number of experiences	10.4%	39.6%	50.0%	100.0%
% within conflict of IPR		45.5%	44.2%	42.1%	43.2%	
% of Total	4.5%	17.1%	21.6%	43.2%		
Total		Count	11	43	57	111
		% within number of experiences	9.9%	38.7%	51.4%	100.0%
		% within conflict of IPR	100.0%	100.0%	100.0%	100.0%
		% of Total	9.9%	38.7%	51.4%	100.0%

$$x^2 = 0.068, P(0.967) > .05$$

4.2.4 Conflict of intellectual property right for programmes by firm age

			Conflict of IPR			Total
			Strong barrier	Weak barrier	Not a barrier	
The year of firm establishment	Before 1999	Count	5	18	31	54
		% within firm age	9.3%	33.3%	57.4%	100.0%
		% within conflict of IPR	45.5%	41.9%	54.4%	48.6%
	% of Total	4.5%	16.2%	27.9%	48.6%	
	After 2000	Count	6	25	26	57
		% within firm age	10.5%	43.9%	45.6%	100.0%
% within conflict of IPR		54.5%	58.1%	45.6%	51.4%	
% of Total	5.4%	22.5%	23.4%	51.4%		
Total		Count	11	43	57	111
		% within firm age	9.9%	38.7%	51.4%	100.0%
		% within conflict of IPR	100.0%	100.0%	100.0%	100.0%
		% of Total	9.9%	38.7%	51.4%	100.0%

$$x^2 = 1.589, P(0.452) > .05$$

4.2.5 Conflict of intellectual property right by industrial sector

			Conflict of IPR			Total
			Strong barrier	Weak barrier	Not a barrier	
Industrial sector	Manufacturing	Count	8	35	49	92
		% within industrial sector	8.7%	38.0%	53.3%	100.0%
		% within conflict of IPR	72.7%	81.4%	86.0%	82.9%
	% of Total	7.2%	31.5%	44.1%	82.9%	
	Service	Count	3	8	8	19
		% within industrial sector	15.8%	42.1%	42.1%	100.0%
% within conflict of IPR		27.3%	18.6%	14.0%	17.1%	
% of Total	2.7%	7.2%	7.2%	17.1%		
Total		Count	11	43	57	111
		% within industrial sector	9.9%	38.7%	51.4%	100.0%
		% within conflict of IPR	100.0%	100.0%	100.0%	100.0%
		% of Total	9.9%	38.7%	51.4%	100.0%

$$x^2 = 1.248, P(0.536) > .05$$

4.3 Different objectives in networking

4.3.1 Different objectives in networking by number of employees

			Different objectives in networking			Total
			Strong barrier	Weak barrier	Not a barrier	
Employees	1-9	Count	7	19	11	37
		% within number of employees	18.9%	51.4%	29.7%	100.0%
		% within different objectives	41.2%	34.5%	26.2%	32.5%
		% of Total	6.1%	16.7%	9.6%	32.5%
	10-49	Count	5	29	22	56
		% within number of employees	8.9%	51.8%	39.3%	100.0%
		% within different objectives	29.4%	52.7%	52.4%	49.1%
		% of Total	4.4%	25.4%	19.3%	49.1%
	Over 50	Count	5	7	9	21
		% within number of employees	23.8%	33.3%	42.9%	100.0%
		% within different objectives	29.4%	12.7%	21.4%	18.4%
		% of Total	4.4%	6.1%	7.9%	18.4%
Total	Count	17	55	42	114	
	% within number of employees	14.9%	48.2%	36.8%	100.0%	
	% within different objectives	100.0%	100.0%	100.0%	100.0%	
	% of Total	14.9%	48.2%	36.8%	100.0%	

$$x^2 = 4.850, P(0.303) > .05$$

4.3.2 Different objectives in networking by R&D expenditure ratio of turnover

			Different objectives in networking			Total
			Strong barrier	Weak barrier	Not a barrier	
R&D expenditure ratio of turnover	less than 5%	Count	4	28	20	52
		% within R&D expenditure	7.7%	53.8%	38.5%	100.0%
		% within different objectives	25.0%	52.8%	50.0%	47.7%
		% of Total	3.7%	25.7%	18.3%	47.7%
	more than 6%	Count	12	25	20	57
		% within R&D expenditure	21.1%	43.9%	35.1%	100.0%
		% within different objectives	75.0%	47.2%	50.0%	52.3%
		% of Total	11.0%	22.9%	18.3%	52.3%
	Total	Count	16	53	40	109
		% within R&D expenditure	14.7%	48.6%	36.7%	100.0%
% within different objectives		100.0%	100.0%	100.0%	100.0%	
% of Total		14.7%	48.6%	36.7%	100.0%	

$$x^2 = 3.949, P(0.139) > .05$$

4.3.3 Different objectives in networking by number of experiences of programmes

			Different objectives in networking			Total
			Strong barrier	Weak barrier	Not a barrier	
Number of experiences of programmes	once	Count	11	30	25	66
		% within number of experiences	16.7%	45.5%	37.9%	100.0%
		% within different objectives	64.7%	54.5%	59.5%	57.9%
	% of Total	9.6%	26.3%	21.9%	57.9%	
	Over 2 times	Count	6	25	17	48
		% within number of experiences	12.5%	52.1%	35.4%	100.0%
% within different objectives		35.3%	45.5%	40.5%	42.1%	
% of Total	5.3%	21.9%	14.9%	42.1%		
Total	Count	17	55	42	114	
	% within number of experiences	14.9%	48.2%	36.8%	100.0%	
	% within different objectives	100.0%	100.0%	100.0%	100.0%	
	% of Total	14.9%	48.2%	36.8%	100.0%	

$$x^2 = 0.622, P(0.733) > .05$$

4.3.4 Different objectives in networking by firm age

			Different objectives in networking			Total
			Strong barrier	Weak barrier	Not a barrier	
The year of firm establishment	Before 1999	Count	8	27	24	59
		% within firm age	13.6%	45.8%	40.7%	100.0%
		% within different objectives	47.1%	49.1%	57.1%	51.8%
	% of Total	7.0%	23.7%	21.1%	51.8%	
	After 2000	Count	9	28	18	55
		% within firm age	16.4%	50.9%	32.7%	100.0%
% within different objectives		52.9%	50.9%	42.9%	48.2%	
% of Total	7.9%	24.6%	15.8%	48.2%		
Total	Count	17	55	42	114	
	% within firm age	14.9%	48.2%	36.8%	100.0%	
	% within different objectives	100.0%	100.0%	100.0%	100.0%	
	% of Total	14.9%	48.2%	36.8%	100.0%	

$$x^2 = 0.795, P(0.672) > .05$$

4.3.5 Different objectives in networking by industrial sector

			Different objectives in networking			Total
			Strong barrier	Weak barrier	Not a barrier	
Industrial sector	Manufacturing	Count	12	44	36	92
		% within industrial sector	13.0%	47.8%	39.1%	100.0%
		% within different objectives	70.6%	80.0%	85.7%	80.7%
	% of Total	10.5%	38.6%	31.6%	80.7%	
	Service	Count	5	11	6	22
		% within industrial sector	22.7%	50.0%	27.3%	100.0%
% within different objectives		29.4%	20.0%	14.3%	19.3%	
% of Total	4.4%	9.6%	5.3%	19.3%		
Total	Count	17	55	42	114	
	% within industrial sector	14.9%	48.2%	36.8%	100.0%	
	% within different objectives	100.0%	100.0%	100.0%	100.0%	
	% of Total	14.9%	48.2%	36.8%	100.0%	

$$x^2 = 1.811, P(0.404) > .05$$

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