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## THE EVOLUTION OF SOUTH KOREA'S BROADBAND CONVERGENCE NETWORK, 2004 – 2007

By

Siddhartha Shankar Menon

## A DISSERTATION

Submitted to Michigan State University in partial fulfillment of the requirements for the degree of

## DOCTOR OF PHILOSOPHY

Media and Information Studies

#### ABSTRACT

#### THE EVOLUTION OF SOUTH KOREA'S BROADBAND CONVERGENCE NETWORK, 2004 – 2007

By

#### Siddhartha Shankar Menon

Broadband holds a critical position in the progress of economic and social indicators by connecting consumers, businesses and governments. South Korea has consistently been the global leader in broadband deployment since 1999. In the last ten years the Korean government has pursued several strategies for its broadband policy. The purpose of this dissertation is to explore South Korea's implementation of its Broadband Convergence Network (BcN) project with special emphasis on its objectives of achieving media convergence, ubiquitous connectivity; and coordination among network stakeholders. The study uses the theoretical framework of institutionalism to identify factors that help explain how the policy agenda for the BcN was implemented.

The BcN is Korea's most recent high speed Internet infrastructure project and is envisioned as a conduit through which broadband services, applications and content will flow to reflect a robust high speed Internet infrastructure. This broadband infrastructure project began in 2004 as a consortium that includes the government and private sector firms. This infrastructure was launched as a three - phase project. The first phase of the BcN extended from 2004 through 2005, the second phase extended from 2006 through 2007 and the third phase extended from 2008 through 2010.

The study asks four specific research questions: 1) which institutional level factors best explain media convergence, ubiquitous connectivity and network stakeholder coordination?; 2) at the BcN level how do different factors explain media

convergence?; 3) at the BcN level how do different factors explain ubiquitous connectivity? 4) at the BcN level how do different factors explain network stakeholder coordination? To answer the questions the study adapts two central methodological approaches. The first entails a documentary research procedure of official policy documents published between 2004 and 2007. The texts are purposively selected on the basis of their relevance to the evolution of South Korea's policy agenda for the BcN. The second procedure involves fieldwork in South Korea comprising face - to - face interviews with key informants who have professional experience with the country's broadband policy. The informants were selected by a snowball sampling technique and they were drawn from universities, non – profit research institutes, private sector firms dealing with broadband and government bodies and agencies.

The study finds that of the ten key factors identified by policy planners of the BcN model, six of them were successfully implemented between 2004 and 2007. The factors where the objectives were met are: 1) the deployment of networks that integrate distinct media; 2) the integration of wireless and wired infrastructure; 3) upgrading IP platforms; 4) the role of stakeholders in providing resources or funding for R&D projects; 5) the role of stakeholders in identifying which platforms best fit with launching the BcN; 6) and the role of stakeholders in devising strategies for the pilot projects. The four areas where they failed to achieve success are: 1) the integration of telecommunications, broadcasting and information technology infrastructure; 2) promoting R&D projects to expand connectivity; 3) deploying wireless broadband access; 4) deploying Fiber - To -The Home (FTTH) / HFC (Hybrid Fiber and Cable) networks.

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## DEDICATION

This dissertation is dedicated to my mother and father for their financial and emotional support in my pursuit of my Ph.D., for which I am eternally grateful.

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#### **KEYS TO SYMBOLS OR ABBREVIATIONS**

- ASEAN Association of South East Asian Nations
- **CATV Cable Television**
- DMB Digital Multimedia Broadcasting or
- DSL Digital Subscriber Line
- **EPB Economic Planning Board**
- E-Health electronic health
- E-Learning electronic learning
- ETRI Electronics and Telecommunications Research Institute
- E-Life electronic life
- E-Work electronic work
- FCC Federal Communications Commission
- FTTH Fiber-To-The-Home
- **GDP** Gross Domestic Product
- HIS Health Information System
- HISP Health Information System Program
- HSDPA High Speed Download Packet Access
- HFC Hybrid Fiber and Cable
- ICTs Information and Communication Technologies
- IT information technology
- **IP** Internet Protocol
- **IPTV Internet Protocol Television**
- IPv6 Internet Protocol Version 6
- ITU International Telecommunications Union

- **KBC** Korea Broadcasting Commission
- KCC Korea Communications Commission -
- KETRI Korea Electronics and Telecommunications Research Institute
- KII Korea Information Infrastructure
- KISDI Korea Information Society Development Institute
- KIET Korea Institute of Electronics Technology
- KIST Korea Institute of Science and Technology
- KRNIC Korea Research Network Information Center
- **KT Korea Telecommunications**
- LAN Local Area Network
- LTE Long Term Evolution
- LG Lucky Goldstar
- MBPS Mega Bits Per Second
- MIC Ministry of Information and Communication
- **MOC** Ministry of Communications
- MOTIE Ministry of Trade, Industry, and Energy
- MSO Multiple Service Operator
- NBIS National Basic Information System
- NCA National Computerization Agency
- NCB National Computerization Board
- NII National Information Infrastructure
- NIA National Information Society Development Agency
- NIDA National Internet Development Agency
- NGN Next Generation Network
- NKN-G New Korea Network-Government

NKN-P - New Korea Network-Public

- NGO Non-Governmental Organization
- OECD Organization of Economic Cooperation and Development
- PECoM Planning Evaluation Commercialization & Marketing
- **PMs Project Managers**
- QoS Quality of Service
- **RFID Radio Frequency Identification**
- **R&D** Research and Development
- SO Service Operator
- SME Small and Medium-Sized Enterprises
- SCOT Social Construction of Technology
- SK Telecom South Korea Telecommunications
- SDO Standards Development Organization
- **3G Third Generation**
- Triple Play Service (TPS)
- U commerce Ubiquitous commerce
- U Korea Ubiquitous Korea
- USD United States Dollars
- VDSL Very High Bitrate Digital Subscriber Line
- VOD Video On Demand
- VoIP Voice over Internet Protocol
- Wi-Bro Wireless Broadband
- World Trade Organization (WTO)
- Worldwide Interoperability for Microwave Access (WiMax)

#### **DISSERTATION**

The Evolution of South Korea's Broadband Convergence Network, 2004-2007 CHAPTER 1 - INTRODUCTION

Broadband holds a critical position in the progress of economic and social indicators by connecting consumers, businesses and governments and by facilitating social interaction. In the last five to ten years the phenomenon of broadband Internet access has revolutionized the telecommunications industry and has profoundly transformed the impact the information and communications technologies have on everyday life. As Cambini & Jiang point out the phenomenon of broadband has ushered in a "worldwide synchronal experience of fast-growing high-speed Internet adoption (that) has led to 410.9 million total broadband subscribers or 7.1% of global inhabitants by the end of 2008. Compared with the situation in 2003, these numbers have more than quadrupled and are still rising ceaselessly" (2009, p. 559).

Investment in broadband infrastructure can contribute towards economic growth, particularly in today's information based society. Investment in Next Generation Networks (NGNs) that provide high-speed connection and broadband and ultrabroadband services is expected to be a significant contributor to economic growth (Koutroumpis, 2009). For this reason there is increasing concern with the relationship between investment and regulation in communication services (Lehr et. al., 2006).

Broadband penetration is an important feature in communications infrastructure policy and is treated as a key economic indicator today. Fornefeld, Delaunay, and Elixmann (2008) point out its strong impact on Gross Domestic Product (GDP), employment and productivity in all economic sectors. Their assessment of the annual broadband-related growth in those most advanced-knowledge countries in Europe is 0.89% of European gross value added, while this number is limited to 0.47% in countries with less developed broadband penetration. Hence governments and regulators are correctly induced to make every effort. In the US, Greenstein and McDevitt (2009) show that broadband accounted for \$28 billion of GDP in 2006, and they estimate that \$20-\$22 billion was associated with household use. Of this amount, they assess that the deployment of broadband infrastructure creates approximately \$8.3-\$10.6 billion of new GDP, which is approximately between 40% and 50% of measured total GDP in the same period.

East Asia holds a far-reaching position in the landscape of global broadband communications not only because it constitutes more than one third of international broadband users but also thanks to its two member countries – the Republic of Korea and Japan – which act a significant part in the worldwide broadband development (Crandall, 2006). South Korea poses a particular compelling case due to the speed of the adoption of broadband penetration as well as the government's unique approach to overseeing the country's broadband infrastructure. For example for the South Korean case in 2002 there were 21.9 subscribers of broadband Internet service per one hundred inhabitants and by 2007 this had climbed to 30.2 subscribers per one hundred inhabitants (Park, 2008). In 2002 there were 3,553,830 users of broadband Internet service using hybrid fiber and cable networks and by 2007 there were 5,098, 177 users of broadband via hybrid fiber and cable networks. This reflects a 43.5% increase in just five years (Park, 2008). Finally in 2002 broadband access over fiber networks was not widely available and in five years there were 926,633 users over these fiber networks. (Park, 2008)

#### **Dissertation Purpose**

The purpose of this dissertation is to study South Korea's policy objectives for the Broadband Convergence Network (BcN) between 2004 and 2007. The objectives of the BcN were three-fold: media convergence; ubiquitous connectivity; coordination among the network stakeholders. South Korea (Chung, 2006) has consistently been the global leader in broadband Internet deployment since 1999. In 2003, South Korea's broadband penetration was approximately 21%, significantly higher than that of the next country in line, Hong Kong (15%). Though the United States had the most broadband subscribers (20 million plus), its broadband penetration rate was ranked number 11 among all nations, behind countries such as Canada, Taiwan, Denmark, Belgium, Iceland, Sweden, the Netherlands, and Japan. By comparison, while 70% of South Korean Internet users connected via broadband access systems, only 39% of US Internet surfers used similar routes (Lee & Chan-Olmsted, 2004).

In the last ten years, the South Korean government has pursued a number of strategies for its broadband infrastructure including a Ubiquitous Korea Master Plan, a Master Plan for the Next Generation E-Government in South Korea, and an IT 839 Strategy. According to a report published by the South Korean Ministry of Information and Communication the U-Korea Master Plan's agenda "is to accelerate Korea's bid to become the world's first u-Society on the Best u-infrastructure. The Plan is the blueprint to achieve national level innovation to be the world's first information communication country by using information technology (IT), dealing with the economic and social demands, and reflecting a ubiquitous era during a changing informatization paradigm. The master plan's goals consist of five parts: government, national regions,

economy/industry, society, and personal living" (Ministry of Information and Communication, 2006, p.1). The agenda for the government's Master Plan on egovernment is to "accelerate government innovation and furthermore greatly contribute to improving national competitiveness by offering a demand – based vision and action plan utilizing ubiquitous technology. The aim is to offer efficient and user friendly services to the public" (Ministry of Government Administration and Home Affairs, 2007, p. 2).

The IT 839 Strategy is the government's most recent policy approach to promote the country's broadband infrastructure development. Compared to the Master Plan on egovernment, it is the more germane to this dissertation. It is dubbed 839 because it has three pillars – services, infrastructure, and new growth engines which have – eight services:

- •1) Wireless Broadband or Wi-Bro;
- •2) Digital Multimedia Broadcasting or DMB;
- •3) Home network;
- •4) Telematics;
- •5) Radio Frequency Identification or RFID;
- 6) High Speed Download Packet Access (HSDPA);
- •7) Terrestrial Digital TV;
- •8) Internet telephony;

three infrastructures:

- •1) Broadband convergence Network (BcN);
- •2) U-Sensor network,

•3) IPv6;

and nine new growth engines:

•1) Mobile handsets;

•2) digital televisions and broadcast devices;

•3) home network equipment;

•4) system-on-chip products;

•5) next-generation personal computers;

•6) embedded software;

•7) digital content and solutions;

•8) vehicle-based information equipment;

•9) intelligent robot products.

The IT839 project is designed to allow a myriad of current IT services and products to be consolidated and simplified into eight new services with a strategic and practical value. It builds out three types of infrastructure to serve as the foundation upon which these eight new services are delivered. These are networks for telecom, broadcasting, and Internet services, which create the backbone for IT services. The ultimate goal of nurturing these 8 services and 3 infrastructures is to allow the development of nine industrial sectors-new growth engines to fuel the economy and create jobs (Shin, 2007).

As Shin (2007) has suggested the underlying tenet of the IT839 project is that the deploying new infrastructure and application will generate investment in major industrial sectors, which will help develop key new growth engines. The IT839 strategy focuses on interconnectivity among infrastructure, services, and applications. The emphasis of IT839

is on promoting the marketability of South Korea's information technology industry (Shin & Venkatesh, 2008) and the BcN played a central role in this strategy.

This dissertation focuses on the BcN particularly with respect to three dimensions of policy objectives, namely media convergence, universal connectivity and network stakeholder coordination. The BcN represents one of the three infrastructures (the others being the U-Sensor network and IPv.6) and was started in 2004 by a consortium that included the Ministry of Information and Communication, and private sector telecommunication and cable firms including KT, SK / Hanaro Telecommunications and others.

#### The BcN in South Korea

The BcN is South Korea's most recent and high profile broadband infrastructure project and utilizes the phenomenon of media and information technology convergence to spur the development and provision of high speed Internet access. The BcN is envisioned as a new conduit through which an array of broadband services, applications and content will flow to reflect a robust high speed Internet infrastructure.

This BcN infrastructure was launched as a multi-year three-phase project. The first phase comprised approximately a two-year period from 2004 through 2005 and has been referred to as the "Foundation Phase" (National Computerization Agency, 2005). The primary agenda for the first phase was to launch the BcN. This entailed exploratory research and planning on intended goals, benefits and impacts for all the organizational actors involved in the BcN. In the first phase the government took the lead in terms of overseeing and funding the BcN, while industry and non-profit institutes played more of a secondary role. The government's plans included strategies for getting the private

sector to invest in the BcN and commissioning government affiliated non-profit research centers to do engineering and social science studies on the implementation and implications of the BcN. During this phase most of the investments came from the Ministry of Information and Communication.

The second phase occupied a roughly two-year period from 2006 through 2007 and has been referred to as the "Commercial Deployment Phase" (National Computerization Agency, 2006). The primary agenda for the second phase was to improve the BcN and to encourage the private sector to become the primary investor in the project. During this phase the private sector firms, not the government, were primarily responsible for investing in R & D projects that would serve as test beds for the BcN. The private sector was expected to assume the lead role in terms of implementing the BcN. While large corporations like KT and SK / Hanaro Telecom would provide a large share of the financial investment the government would play a role in assisting smaller firms and non-profits, that were interested in being involved with the BcN but could not afford to be involved, with the financing. The government affiliated non-profit research centers would be commissioned to conduct more advanced studies based on the experience with the BcN's first phase. The government, the private sector and other organizational actors would negotiate what core applications and technologies should be featured on the BcN.

The third phase is anticipated to last from 2008 through 2010 and has been referred to as the "Completion phase" (Korea Information Society Development Institute, 2008). At this point the government has a minimal role in leading the BcN except to provide strategic support and advice to the organizations running it. The private sector is

the principal financier and conducts all the R & D and operations. During this phase the marketing and deployment of the BcN will be finalized. The government affiliated non-profit research centers will continue to conduct studies on an ad hoc basis when either the regulatory body, the Korean Communications Commission, or the private sector request their support.

#### Structure of Dissertation

The second chapter of this dissertation presents this work's theoretical foundation. This conceptual framework refers to institutionalism, which embodies the interests and issues of formal and informal social stakeholders including government agencies, private sector firms, non-profit research institutes and universities. This chapter builds on the theoretical premises of institutionalism in order to analyze the BcN in the form of a BcN Communication Utility Model.

The third chapter provides a historical context on the general industrial development in South Korea that spans a 60 year period. This chapter also offers a treatment of the trajectory of the telecommunications sector focusing on developments over the last two decades. Moreover the chapter contains a discussion of the telecommunications sector's development in a comparative context that includes data in indicators from Japan, Singapore and the United States. The chapter analyzes the evolution of South Korea's communications regulatory agencies including the former Ministry of Information and Communication, the former Korea Broadcasting Commission and the current Korea Communications Commission. Finally this chapter considers the impact of regulation on South Korea's information infrastructure. The fourth chapter explores the structure of the Broadband Convergence Network (BcN). This involves providing a context for the genesis of the BcN and the overall IT839 strategy, which is a policy agenda that the government adopted to revitalize the nation's information technology sector. The Broadband Convergence Network is the central information infrastructure project of the IT 839 strategy. This chapter also focuses on the BcN and offers an introduction to this infrastructure, to its broader societal implications and also to how the infrastructure is designed to evolve over its two phases between 2004 and 2007. The chapter details the role of government organizations, private firms and non-profit non-governmental research institutes in shaping the development of the BcN. Finally the chapter poses this dissertation's research questions. These questions are:

- 1. Which sectoral level factors best explain media convergence, ubiquitous connectivity and network stakeholder coordination?
- 2. At the BcN level, how do different factors explain media convergence?
- 3. At the BcN level, how do different factors explain ubiquitous connectivity?
- 4. At the BcN level, how do different factors explain network stakeholder coordination?

The fifth chapter presents the dissertation's research methodology. This dissertation integrates at least two primary approaches. The first is documentary research and analysis of primary policy texts relating to the evolution of South Korea's Broadband Convergence Network (BcN) from 2004 to 2007. A total of 12 documents were analyzed, seven of which provide textual evidence from the policy documents and five of which provide statistical data on the outcomes of the policy objectives. Out of the seven

documents with the textual data three were published during the BcN's first phase (2004 -2005) and four were published during the second phase (2006 -2007). The five other documents were published between 2004 and 2008. A 2008 document was included because it contains data on the second phase of the BcN from 2007.

The second approach involves field interviews of key informants who are familiar with the policy agenda of the BcN in South Korea. 25 key informants were interviewed both at Michigan State University and in South Korea who have a strong understanding of the country's broadband policy. This includes key informants from four categories including: four academics in universities; four analysts in non-profit government affiliated research institutes, nine executives in firms that provide broadband in South Korea; and eight government officials who serve as regulators and policy staff.

The sixth chapter presents that key findings on the dissertation's research questions. This chapter integrates the data from the policy documents and key informant interviews in order to establish which factors play a role in explaining the media convergence, ubiquitous connectivity and network stakeholder coordination objectives of the BcN. The chapter also explores the outcomes of these policy objectives in terms of statistical indicators, specifically the number of subscribers or end users that the BcN has the capacity to accommodate and the capital expenditure and investment endowed in the broadband infrastructure project. The key findings draw on the relationships identified in the BcN Communication Utility Model.

The BcN's Communication Utility Model helps explain how three groups of stakeholders, specifically governmental bodies, private sector firms and non-profit institutes, via a variety of factors, impacts three key objectives of the BcN. This

dissertation contributes to field of knowledge by studying distinct aspects of South Korea's policy agenda for the BcN at the meso or sectoral level using distinct and discrete affirmative statements on the policy objectives of the BcN from the relevant documents and from interviews with key informants who are familiar with the policy implications of the BcN, as the primary unit of analysis.

The South Korean experience with the BcN has implications for broadband and new media infrastructure projects in other countries that are dealing with issues similar to those experienced in the development of the BcN. This infrastructure project could potentially serve as a model and its trajectory of development and implementation may provide insights for those leading similar projects in other countries so that policy makers and management can draw lessons on what decisions are likely to be successful and what decisions are likely to present pitfalls based on the BcN as a case study. Furthermore the BcN's mix of private and public sector stakeholders may have implications for incipient projects in terms of how to structure regulatory oversight for similar initiatives and how to determine the optimal level of government participation in similar broadband and new media infrastructures.

## CHAPTER 2 – THEORETICAL FRAMEWORK – INSTITUTIONALISM AND COMMUNICATION UTILITY MODEL

The primary theoretical approach used in this dissertation to study the evolution of the Broadband Convergence Network (BcN) involves institutionalism. Institutionalism refers to a theoretical perspective that embodies the interests and issues of formal and informal social organizations including corporations, regulated monopolies, standards setting bodies and industry groups, etc (Scott, 2001). The literature on institutions provides the conceptual foundations with which to analyze the policy objectives of the BcN. Moreover this research focuses on the relationship between several concepts of the theory and information and communication technologies (ICTs), including broadband.

The institutional model helps understand the role that different organizational actors play in the communication utility model and specifically in the design and implementation of the BcN in South Korea. The institutional perspective is critical in explaining the impact of the actors such as the regulatory bodies and private sector firms on the three policy objectives of the BcN namely media convergence, ubiquitous connectivity and network stakeholder coordination. Within the context of institutionalism three groups of actors played a critical role in explaining the evolution of the BcN. These groups are governmental bodies such as the Korea Communications Commission (KCC), private sector firms and non-profit institutes. The BcN represents a communication utility model, where there are three policy objectives - media convergence, ubiquitous connectivity and network stakeholder coordination – which are impacted by a number of factors such as tax incentives.

#### **Institutionalism**

Institutions represent groups of social actors with common social rules and continued interactions (Avgerou, 2002). King et al. (1994) refer to various actors or institutions of innovation including government authorities, international agencies, industry associations, corporations, financial institutions, and so on. These actors can influence or regulate practices, behavior, rules, and the belief systems of other actors. Within the context of this dissertation these practices, rules and systems are represented in the relationships presented in the communication utility model between meso or sectoral level governmental, private and non-profit actors and three objectives of the BcN via factors such research and development (R&D) pilot projects.

Within a certain institution, there are a set of values, norms, procedures, laws, beliefs and assumptions that justify their existence; these shared values differ by institution and result in differing sets of priorities and activities. This view of institutions is compatible with work within sociology on new institutionalism theory, (Powell & DiMaggio, 1991), and within economics on the role of institutions, (North, 1990).

According to North "if institutions are the rules of the game, organizations are the players (1990, p. 3). In terms of this dissertation institutions are reflected in discrete, distinct organizational actors that operate at a level where their individual or collective activity may have institutional efficacy in terms of shaping the rules of the game that impact the BcN's policy agenda. The stakeholders would be the governmental bodies that regulate the BcN as well as the private firms that provide broadband service. These rules can be in various forms, both formal and informal. With respect to this dissertation the formal and informal rules relate to expectations and beliefs expressed in the policy

statements and voiced by the key informants on the roles that the organizational actors in the private, public and non-profit sectors should fulfill in order to achieve the BcN's core objectives.

# <u>Theoretically Driven Literature on Institutionalism and New Information</u> Communication Technologies

There have been a number of studies that apply institutionalism to new information and communication technologies, which will be reviewed here. According to Mekonnen & Sahay (2008) the concept of organizational field from institutional theory is particularly insightful in analyzing the dynamics of rules in mediating the decisions of institutional actors. Their (2008) research seeks to understand how the organizational field is reflected in an institutional context that mediates processes of change, specifically related to the processes of interaction among organizational actors. According to the authors "institutional theory provides us with a set of concepts to help analyze the conditions and mechanisms that mediate the relationship between actors in an organizational field. Such an analysis will in turn help to shed light on why this relationship is not as straightforward and linear as is often assumed" (Mekonnen & Sahay, 2008, p.281). Within the context of this dissertation the communication utility model of the BcN serves as a manifestation of the organizational field.

Mekonnen & Sahay's findings on the utility of the organizational field concept are corroborated Avgerou (2002) who describes an organizational field to be constituted by "organizational actors competing in the production of similar products or services, consumers and regulatory agents" (p. 38). In an organizational field, there may be a principal actor who takes on a lead role by regulating technical exchanges and financial

transactions. They also seek to establish cognitive influences and contractual regulations to ensure that the actors follow the rules. The concept of organizational field emphasizes the multiplicity of organizations that jointly influence the establishment and implementation of institutions.

Mekonnen & Sahay's research provides an analysis of the University of Oslo's Health Information System Program (HISP) initiative ongoing in various developing countries, starting in South Africa in 1994. HISP is part of an action research tradition where the aim is to make improvements in the health information system (HIS), including cultivating the use of information at the origin of its generation. Action research has two main components: action and research (Carr & Kemmis, 1986; Baskerville, 1997). Being part of the action research project in Ethiopia, the key foci of our interventions were around the development of standards in the HIS (including data definitions, reporting formats and work practices), and scaling them to other facilities within the region and also to other regions. This project was carried out collaboratively with the regional health bureau of Addis Ababa, whose managers had previously identified the lack of standards and limited use of information to be key impediments to the implementation and use of effective HIS.

The aim of their data collection was to primarily understand from the respondent's perspective on what were the kinds of problems experienced, especially relating to standards and scale; how they were trying to address them; and how could interventions help in this regard. The multi-level and longitudinal research design helped them to understand both the formal institutions that the federal and regional levels were trying to prescribe, and the challenges arising from the local constraints in them being

adopted by the field staff. A number of participatory workshops were also conducted to get the different stakeholders together, understand the problems they experienced and to jointly identify solutions. This research is relevant to this dissertation in that it serves as an example of a study that analyzes the institutional dynamics and actors involved in the project specifically the University of Oslo's Health Information System Program (HISP) that integrates a number of diverse stakeholders, just like the BcN in South Korea.

Something becomes an institution when self – perpetuating internal social patterns reproduce themselves without the need of sustaining action or collective action by its members (Painter, 2002). Instead, routine procedures support and sustain the pattern, furthering its reproduction, unless collective action blocks or external shocks disrupt the pattern (Jepperson, 1991). Institutions arise due to enacted practices from which stable sets of structures evolve, with formalized rules and laws.

Institutionalization requires drivers, entrepreneurs, or champions who can respond to a critical event by bringing it to the attention of others and by proposing a response that carries weight (Frumpkin & Kaplan, 2005). Drivers lend legitimacy to the effort at hand. They can control powerful resources, but more importantly, they represent key players in the institutionalized landscape. They are often viewed as authorities and deferred to in matters of policy.

Sawyer & Tapia (2007) summarize the path toward becoming an institution as a concerted effort to:

1. Define the core and peripheral elements of the institution.

2. Identify leaders and fill critical leadership positions.

3. Formalize structures and processes of participation and inclusion.

4. Resolve (or accommodate) internal discord among key participants.

5. Communicate organizing values, principles and contributions to others (p. 267).

Shah & Kesan (2009) offer an analysis of how institutions shape communication technologies by providing a historical case study of cookie technology. Cookies allow websites to save information on their visitors. By maintaining this information over time and by combining this information with cookies from other websites, it is possible to develop a profile of a person's online activity. Both the academic and mainstream computing press have recognized the significant privacy and legal implications of cookies (Mayer-Schönberger, 1998). Legal scholars use cookies as an example of how privacy can be affected by the design of communication technology (Biegel, 2001; Lessig, 1999). Other scholars focus on the privacy aspects of cookies such as the role of consent (Lin & Loui, 1998), the user's control of cookie settings (Elmer, 2002), and privacy policies with cookies (Helling, 1998; Millett et al., 2001).

There are parallels between the role of these institutions on the cookie issue (Shah & Kesan, 2009) and the role of the public sector, private sector and non-profits in the development of the BcN. According to Shah & Kesan (2009) three different institutions have influenced the development of cookies: the university, firm and consortium. More importantly, the same set of programmers first worked within a university and later switched to developing cookies within a firm. This is a rare set of circumstances that highlights differences due to institutional norms and processes, as opposed to individual programmer differences. To understand these processes, this study combined original research with several other perspectives, including historical accounts by the author of

the cookies case study (Kristol, 2001), journalistic accounts (Schwartz, 2001), and more technical accounts (St Laurent, 1998).

Ultimately, this article provides a unique insight into the role of institutions in the development of communication technologies. The comparative examination highlights institutional tendencies or patterns in technological development. While their case study involves the social value of privacy, the analysis is relevant to a myriad of other societal issues. Through an understanding of these tendencies, policymakers may be able to assess better, predict and proactively influence the development of communication technologies in order to improve societal welfare.

Shah & Kesan (2009) raise a number of findings that are shaped by institutionalism. One key finding is that economic pressures dramatically influenced the development of cookies. Historically, firms such as Netscape have developed much of the software widely adopted in society. The authors argue that in our market driven economic system, the private sector develops the majority of software. Firms are driven by profit (Nelson, 1959). This institutional norm influenced the behavior of Netscape's employees. To begin with, the design of the software at Netscape emphasized features that supported commerce. This emphasis was necessary because Netscape believed that there were profits in Internet – based commerce. This emphasis led the same developers of cookie technology to focus their efforts on a different set of features for the web. One of the consequences was the creation and incorporation of cookie technology into its web browser. The design for cookies favored commerce by valuing persistence of data over competing designs that offered greater privacy.

Samarajiva & Shields (1997) discuss the development of telecommunications networks from an institutional perspective. According to Samarajiva & Shields (1997) institutional analysis provides knowledge of the social structures and institutions that are necessary conditions of human agency. In particular their analysis focuses on the introduction of call management services, which is a software package that runs on telecommunications networks to provide functions such as call identification, last call return and call tracing. The authors suggest that institutional analysis provides the guidelines for the investigation of this subject matter.

The findings of this research suggests how institutional analysis of the underlying political and economic forces shaping the development of the telecommunication infrastructure's functions such as call identification can begin with factors giving rise to the increasing informatization of society and changes in industrial structure and the regulation of the telecommunications industry (Beniger, 1986; Horwitz, 1989). For example the divestiture of the Bell system monopoly and the market entry of competitive long distance carriers led to a regulatory mandate that the local exchange carriers should provide facilities and interfaces, such as call identification, to competitive long distance carriers. Consequently this change in industry structure had an impact on the institutional norms for providing long distance service.

Hawkin's (1999) treatment of institutionalism entails a discussion of the rise of consortia in the information and communication industries. This is relevant to this dissertation because there were a consortium of public, private and non-profit groups that participated in the BcN. According to the author beginning in the late 1980s, a substantial number of firms in the telecommunication, computer, consumer electronics

and media industries began to become involved in an intriguing form of inter-firm collaboration commonly known as an industry consortium. Throughout the 1990s these organizations proliferated widely. Virtually all of the world's major information and communication technology (ICT) firms are now active across the consortia spectrum, and most of the significant smaller firms are active in selected consortia. Consortia have attracted members from large and small firms that are intensive users and/or in-house developers of ICT capabilities, as well as from suppliers of ICT products as such. The major consortia have also acquired significant international visibility and influence in policy contexts.

Most commentary on consortia activity tends to regard it as an adjunct or alternative to formal standardization processes as carried out in national and international standards development organizations (SDO). Certainly, some consortia work in tandem with the formal standardization system, and many SDOs have initiated formal cooperation agreements with selected consortia, ostensibly with the objective of making formal standardization processes more efficient and responsive to industry requirements. But the consortia are beginning to create an intricate network of tacit and explicit recognition and co-operation agreements among themselves.

Hawkin's (1999) study examines the origins and structures of the consortium phenomenon critically and identifying some of the implications for policy that emerge from consortia interactions with standardization processes. To this end, the paper concentrates on identifying collective characteristics and implications acknowledging the diversity of interests and agenda within the emerging consortia system rather than discussing it in detail. The paper is based largely on a comparative, critical survey of
consortia and SDO membership lists, contracts, rules of procedure, subject areas, work items, committee structures and so forth. Findings were validated and supplemented with information and insight gathered through personal discussions with senior technology managers and standards strategists in several major European and North American ICT firms over a number of years.

Hawkins (1999) defines a consortium as an informal alliance of firms, organizations, and sometimes individuals that is financed by membership fees for the purpose of coordinating technological and market development activities. Informality is a key characteristic as most conventional industrial networks operate through formal subcontracting arrangements, or through partnerships and joint ventures. Typically, consortia set out very explicit objectives and agendas, but pursue them through very informal working procedures. Consortia have most of the organizational characteristics of voluntary trade, professional and industry associations, and, indeed, some stakeholders engage in consortia-like activities within much broader agendas. Likewise, some consortia have adopted the same kinds of advisory, training and advocacy activities as commonly undertaken by trade and industry associations. Membership in some consortia is open to all interested parties, while membership in others can be restricted according to specific professional, industrial or commercial affiliations.

The author's findings suggest that the dynamics of the consortia phenomenon have become systemic. In practice, consortia are not stand-alone organizations. Instead, an international system has evolved in which communication and co-ordination is achieved primarily through inter-organizational alliances, and through cross-membership

by firms large enough to have the resources, technological scope, and logistical acumen to span the entire system. This has several immediate implications for policymakers.

Galperin (2004) examines the theoretical assumptions generally used in communication and information policy studies, and suggests that more attention to the institutional determinants of public policies is needed. According to him institutional analysis focuses attention on state actors and structures to explain public policies. It underscores how both formal and informal arrangements shape political interactions and influence the outcome of government action. In general terms institutions refer to the composite of rules, informal constraints norms of behavior and conventions and their enforcement characteristics. Together they define the humanly devised constraints that shape human interaction. They are the rules of the game and therefore define the way the game is played.

Hall (1992) further distinguishes three layers. At the more general level lie the basic organizational arrangements associated with the state for example, a democratic political system, and the economy, for example market capitalism. This is the level at which classical political economists and contemporary neo-Marxist work. Second follows the more specific organizational arrangements of the modern state, such as regime type, for example parliamentary vs. presidential systems, the organization of interest groups, the electoral system, and the regulatory design. There is a growing body of work that demonstrates the analytical strength of these variables to explain communication and information policies, particularly in comparative perspective. For example, Noll and Rosenbluth (1995) find that the differences in telecommunications reforms adopted in Japan and the United States can be traced back to their distinct political arrangements: In

Japan, centralized decision making and a single legislative body elected in multimember districts stacked the deck in favor of piecemeal deregulation to protect large domestic equipment manufacturers, while the American system of federal government, separation of powers, and legalized rulemaking created less opportunities for managing market entry and exit, thus favoring more rapid liberalization.

At the lowest level of generalization are the standard procedures and operational routines of bureaucratic agencies. These include both formal rules for example, mandatory consultation procedures, and informal patterns of behavior, such as standard recruiting practices. These variables have also proved fertile for policy analysis. For example, Noll (1986) suggests that the complex, evidence-based procedure for rulemaking and the adjudication of disputes that the Federal Communications Commission (FCC) must follow, while minimizing bureaucratic discretion, also tends to benefit stakeholders with significant informational and organizational resources. This tends to inhibit new technology adoption because the agency is often reluctant to endorse technologies that well-organized incumbents could challenge in the courts or Congress.

An institutional approach does not ignore ideological factors or interest-group pressure as important determinants of policy outcomes. It nonetheless suggests that a complex web of institutions mediates between these and government officials, filtering ideas and pressure in specific ways. As noted, policymakers make choices within an institutional structure that defines the information available to them, the policy instruments at hand, the way interest groups are organized, the costs and rewards associated with alternative courses of actions, and the legacy of past policies. This structure not only determines the capabilities and constraints of those who *make* policy

but also of those who try to *influence* policy. Thus the choice of institutional design affects the ability of different interests to influence outcomes. As we discuss in the conclusion, this has been at the core of debates about the emerging governance regime for the global Internet.

Another strength of institutional analysis is the internalization of so-called pathdependency effects. These result when long-term commitments made by individuals or firms constrain future policy trajectories (Krasner, 1989; North, 1993). Because these commitments often represent sunk costs, market actors tend to resist policies that significantly alter the established rules of the game, thus facilitating policy choices consistent with the existing institutional regime and inhibiting those deflecting from it. Changes are possible at the margin, but major shifts require the mobilization of considerable political resources, and often side payments to compensate losses incurred by individuals or stakeholders. These conceptual tools, borrowed from the work of economic historians (David, 1986; Arthur, 1989), have been increasingly applied to understand the evolution of policy in communication and information industries, where sunk costs in infrastructure, research and development (R&D), and so forth can be substantial. For example, Benkler (1998) finds that spectrum management policies in the United States solidified a model of infrastructure development dependent on large investments by a handful of licensees, which over time has inhibited alternative models based on unlicensed spectrum bands and small-scale operators.

According to Galperin (2004) the institutionalism approach thus provides a solid conceptual foundation to examine the determinants of communication and information policies, and is particularly useful for international comparisons and the study of longterm policy patterns. It fills significant theoretical gaps in the field by redirecting attention to the institutional context within which public policies emerge. The following section provides an abbreviated example of such approach. It examines long-term trends in spectrum licensing policies in the United States, with particular attention to the licensing of digital terrestrial broadcasting in the mid-1990s, and discusses alternative explanations for the observed bias in favor of incumbent local broadcasters. A more exhaustive elaboration of the argument can be found in Galperin (2004).

Galperin's (2004) findings suggest that institutionalism has much to offer to communication and information policy scholars at a time when the governance regime for new technologies is growing in complexity. Today, the rules created and enforced by traditional regulatory bodies on a national scale are now only part of a multilayered regime that includes international treaties, voluntary self-regulation, and semipublic cooperative arrangements under the umbrella of a vast collection of organizations (Marsden, 2000; Drake, 2001). This opens a fertile new territory for institutional analysis, for it provides the conceptual tools to investigate the implications of different institutional designs for the global governance of new information and communication technologies.

Galperin (2004) concludes that an important component of this research agenda will be to map out the changing balance of power resulting from this transformation in the global communication order. As noted, an important contribution of institutional analysis has been to reveal the structural barriers faced by public interest groups in communication and information policymaking at the national level, among them lack of bureaucratic transparency particularly in developing nations, complex rulemaking processes, and lengthy consultation and appeal procedures, all of which militates against

representation of diffused interests. Generally speaking, traditional rulemaking bodies, at both the national and international level, were not designed to accommodate participation by nontraditional political actors such as non-governmental organizations (NGOs). As new policymaking arenas emerge and old ones are reconfigured, an institutional perspective could similarly contribute to detect new mechanisms of exclusion, and hence could inform the creation of arrangements that enable broader participation by new actors in the governance of global communications.

# Theoretically Driven Literature on Institutionalism and South Korea's Experience with Broadband

There have been studies that compare broadband policy in South Korea with international cases (Frieden, 2005; Fransman, 2006; Lee & Chan-Olmsted, 2004). This dissertation focuses on South Korea as a case study. Since the BcN was only started in early 2004 there is no developed literature base (Lee et. al., 2007) that systematically focuses exclusively on the origins of the BcN, and how and why it was started and developed.

However there is an advanced and fast paced body of scholarship that suggests how South Korea's policies on broadband have contributed to the success in the development of the country's ICT infrastructure. Each of the works included in this review present a unique and distinct perspective and methodological approach on the regulation of the broadband infrastructure in South Korea. Focusing on this underlying principle as a normative framework, Shin (2007) investigates the role of the South Korean government in helping South Korea forge its path into the next generation of the information society. It focuses on the processes involved in the planning of the National

Information Infrastructure (NII) projects and evaluates its prospects by tracing various views from different stakeholders. It examines the direction, nature, and future of IT839 by focusing on the political economy of informatization. Drawing on theoretical perspectives from the theory of Social Construction of Technology (SCOT), Shin (2007) collected qualitative data primarily through in-depth interviews with diverse stakeholders: policy and regulation groups, user groups, industry, and research institutions. In a subsequent paper Shin & Venkatesh (2008) trace the process of convergence in terms of politics, regulation, and policy, and examines how the stakeholders' interests are aligned and coordinated in the process of convergence in South Korea.

Adopting an international political economy perspective Jin (2005) explores key aspects of broadband services in South Korea and its implications for the information economy. The article examines why and how South Korea has developed broadband service by examining several institutional factors. It also analyses whether government ICT policy frameworks have contributed to economic and social development. Then, Jin (2005) investigates how the government neoliberal economic policies have influenced the transnationalization of the broadband service market and the impact on the information economy.

Forge & Bohlin (2008) add to this discussion by suggesting that managed innovation with long term programs is the key to South Korea's transition towards a knowledge based society. The authors (2008) explore the drivers of broadband development in the South Korean case which involves an in depth treatment of the country's unique historical and socio-economic context and the implications of this

background on South Korea's modern new media structures. The results find that elements of the South Korean model of innovation and its application are specific to South Korea's socio-political condition and cannot be replicated, while others offer opportunities for new thinking on long-term policy, especially in telecommunications.

Lau et. al. (2005) argue that it is useful to examine the policy steps that the South Korean government has taken to shape market structures and stimulate user demand for broadband service. Their study explores the economic and public policy factors that have contributed to South Korea's global leadership in broadband adoption, employing a conceptual framework explicating the triangular relationship between the government, service providers, and users. Based on government statistics, company-published information, and secondary sources their analysis suggests that the South Korean government's cyber vision plan has provided an open market that encourages competition. The dramatic growth of the broadband market in South Korea is the culmination of appropriate government policy, growing demand and fierce market competition based on responsive supply. In addition their results suggest that operators can benefit from consolidation as well as multiple revenue sources generated by new services in order to remain competitive.

Finally there has been a concerted effort in the research base that identifies factors which explain the remarkable level of broadband penetration in a short amount of time, from a regulatory perspective (Kelly et. al., 2003, Kim et. al., 2008, Kim, 2008). Choudrie & Lee (2004) investigate how South Korea achieved such a relatively fast penetration rate in a time span of approximately four years. Using documentary secondary data such as, written documents published materials, and primary data, such as

interviews, the paper explores and presents the factors contributing to this development. The factors covered include government leadership, fierce competition, low prices due to the competition, cultural aspects, and geographic and demographic aspects. In this vein Choudrie et. al. (2003) outline how the strategies pursued by a government acting as the key stakeholder affected the diffusion of broadband. The analysis is based on a theoretical framework derived from innovation diffusion and stakeholder theories. The empirical evidence comes from a study of broadband development in South Korea. A web of stakeholders and strategies is drawn in order to identify the major stakeholders involved and highlight their relations.

# <u>Contribution of this Dissertation to Institutionalism – The Communication Utility</u> <u>Model</u>

By and large the existing literature on the institutional perspective and new information and communication technologies examines the relationships between actors at the institutional or macro level. In this literature institutions or organizations are the key unit of analysis. However the BcN's communication utility model provides an additional intermediate level of analysis at the meso or sectoral level. This model helps explain how three groups of institutions, specifically governmental bodies, private sector firms and non-profit institutes, via a variety of factors, impacts three objectives of the BcN. The three primary objectives of the BcN are media convergence, ubiquitous connectivity and network stakeholder coordination.

The data to support the relationships between various factors and objectives of the BcN represented in the communication utility model manifest in the form of policy documents and interviews with the experts on the subject matter, which function at the

meso or sectoral level. This dissertation contributes to field of knowledge by studying institutional aspects of South Korea's policy agenda for the BcN using statements on the policy objectives of the BcN from the relevant documents and from interviews with key informants who are familiar with the policy implications of the BcN, as the primary unit of analysis.

# Broadband Convergence Network (BcN) Communication Utility Model

While the Communication Utility Model has been designed to map out the meso or sectoral level dynamics that shape the Broadband Convergence Network in South Korea between 2004 and 2007, it is important to connect the term "communication utility" with the literature on information utility (Zhao et. al., 2002). This literature has its origins in the computing research from the 1960s (Parkhill, 1966). It addresses advanced information services within the context of public utilities. Interest in this area has re-emerged with the current interest in cloud computing, which harnesses and integrates data that transcends the borders of communications and public utility networks.

According to Chen et. al. (2009) "in the early 1970s, futurists at the Rand Corporation and Stanford University proposed the creation of information utilities – the provision of computing and information service by a utility in the form of a national network where any person desiring information could gain access – much like gas and electric utilities, but on a national scale (Sackmann & Nie, 1970; Sackman & Boehm 1972). Not to be left out, the idea was also promoted by the Computer Usage Development Institute in Japan, the British Post Office in the UK, and Bell Canada and the Telecommunications Board in Canada" (p. 1). Press (1974) claims that the idea was so revolutionary at the time that at least one critic called for a moratorium on the development of information utilities until the year 2000 so that research could indicate what the social impacts might be. This dissertation implicitly borrows from this notion of an information utility in conceptualizing the BcN. This tacit borrowing of the concept of information utility is perhaps most evident in the BcN's objective of ubiquitous connectivity since utilities are typically conceived to be ubiquitous public goods. However it is not clear from the policy documents and interviews with the key informants on whether the stakeholders of the BcN viewed this infrastructure project as an information utility as the term is defined in the literature.

### **Three Policy Objectives in the Communication Utility Model**

The three objectives of the BcN, specifically media convergence, ubiquitous connectivity and stakeholder network coordination, are represented in this model (See Figure 1). Media convergence refers to the integration of all electronically mediated communication including broadcasting, voice, and data across multiple distribution channels such as dsl, cable, and wireless among others. Ubiquitous connectivity refers to a policy goal for the provision of anytime anywhere service regardless of access device or network. Stakeholder network coordination pertains to the interaction between a diverse group of actors including those from the public and private sectors as well as organizational actors that function in non-profit capacities such as research centers and institutes and universities.

## Factors in the Communication Utility Model

The model presents a number of factors that correspond to and explain each objective of the BcN. These ten factors were selected based on the relevant official policy documents and the interviews with key informants (See Figure 1).

### **Factors on Media Convergence**

The factors relevant to the media convergence objective include: 1) the deployment of networks that integrates voice, video and data media content; 2) the integration of wireless and wired infrastructure; 3) the integration of telecommunications, broadcasting and information technology infrastructure (See Figure 1).

It is important to clarify the factor of integrating distinct media content. The policy documents and key informants described this factor in terms of open networks. These networks would function as a website or portal that you provide a centralized location where users can access video files, audio technologies such as mp3 files and voice based telephony services and text or data media such as instant messenger and text message applications. Even though I was not able to get a clear and concrete description of exactly how these networks work, these networks were not designed to integrate video files with audio content into a single media form. Instead these networks merely provided a location with which to access distinct media. This factor is distinguished from the integration of telecommunications, broadcasting and information technology infrastructure factor, in that the integration of content factor requires less resources to establish and can be created via a website or portal on-line. Comparatively the integration of telecommunications, broadcasting and information technology infrastructure factor requires considerably more resources. Specifically it requires existing television and radio broadcast networks, traditional phone lines and Internet subscriber lines to be completely overhauled so that each traditional and discrete infrastructure would be interconnected.

### Factors on Ubiquitous Connectivity

The factors relevant to the ubiquitous connectivity include: 1) upgrading IP platforms; 2) promoting research and development projects to expand connectivity; 3) deploying wireless broadband access; 4) deploying Fiber-To-The-Home (FTTH) / Hybrid Fiber and Cable (HFC) networks (See Figure 1).

#### **Factors on Network Stakeholder Coordination**

The factors relevant to the network stakeholder coordination objective include: 1) the role of stakeholders in providing resources or funding for research and development projects; 2) the role of stakeholders in identifying which platforms, applications and services are the best fit with launching the BcN; 3) and the role of stakeholders in devising strategies for the infrastructure that utilize the BcN's pilot projects (See Figure 1).

Having discussed the three fundamental objectives of the BcN, it is important to clarify the relationships between these objectives in terms of whether the stakeholders of the BcN, either deliberately or tacitly, ascribed a priority or hierarchy in the schematic ordering of the policy goals. The empirical evidence from both the policy documents and the key informant interviews suggest that the organizational actors involved in the BcN did not ascribe a priority or hierarchy to any of the three objectives. Each policy goal was described as being equally critical to achieving the BcN's policy agenda. Many of the key informants pointed out that the term "convergence" has been included in the title of the project, the BcN, but insisted that ubiquitous connectivity and network stakeholder coordination were just as crucial to the agenda and had a negligible role in the order with which the BcN was implemented.

However at a more tacit or implicit level intuitive logic might suggest that network stakeholder coordination is an essential prerequisite for implementation relative to the other two objectives. Moreover in terms of the logistics of deploying the BcN once network stakeholder coordination has been established ubiquitous connectivity would assume precedence over media convergence. In other words the intuitive logic would suggest a progression in the sequence of objectives based on the necessity of needing to start with network stakeholder coordination in order to get the BcN started followed by the need to establish a ubiquitous infrastructure which would be followed by media convergence. So while the documents and key informants do not acknowledge this progression of objectives on a deliberate or manifest level, it is possible that at a more tacit or latent level the objectives were conceived in a progression as a matter of necessity in order launch the BcN in practical terms.

# Outcomes

The outcomes of the BcN's policy objectives are represented in the communication utility model (See Figure 1). These are outcomes that are represented at the top of the model. The first outcome reflects the capacity of the BcN to accommodate subscribers between 2004 and 2007. The second outcome refers to the capital expenditure and investment that the stakeholders in the government, private and non-profit sectors endowed into the BcN during its first two phases.

# FIGURE 1





wireless infrastructure

FIGURE 1 (CON'T)



designed to expand connectivity

# **BcN (Communication Utility Model)**



**Network Stakeholder Coordination** 



resources in R&D projects

Role of stakeholders in identifying platforms, applications & services to launch the BcN

# **BcN** (Communication Utility Model)



**COMMUNICATION** UTILITY LEVEL

Media Convergence



Network Stakeholder Coordination



**INSTITUTIONAL LEVEL ACTORS** 

government regulatory agencies (KCC, NIA)

private sector firms (KT, Hanaro Telecom) (KISDI, ETRI)

non – profit research institutes

# CHAPTER 3 – A BACKGROUND ON BROADBAND INFRASTRUCTURE DEVELOPMENT IN A COMPARATIVE CONTEXT

#### <u>Historical Context</u>

#### **General Industrial Infrastructure Development**

Twentieth Century history has shaped the economic rise of South Korea, beginning with the reaction to the trauma of the Japanese occupation of the Korean Peninsula from 1910 to 1945. Although the North and the South have constantly discussed reunification, the legacy of the 1950–1953 war combined with differing outlooks and political systems have not so far been resolved. In recovering from the widespread economic and industrial destruction of 1953, South Korea has built a leading role in the information society; its economy is the 16th largest in the world, while having the 26 largest population.

Recent economic history has in some ways mirrored post-war Japan rebuilding a destroyed economy and moving first from heavy engineering, with shipbuilding exports, into lighter manufacturing. It has progressively entered the same markets as Japan - cars, domestic appliances, heavy construction equipment, electronic goods, semi-conductors and ICTs such as mobile phones. Samsung and Hynix (formerly part of the Hyundai group, or 'chaebol') are now the two largest suppliers of semiconductors worldwide (Lee & Chan-Olmstead, 2004).

This is largely because South Korea's progress as described above stems from its socio-economic experience of the last one hundred years. It has been one of struggle, first military and political, and then economic. The shadow of Japan with its close geographic and cultural position as colonial invader and enemy and subsequently as competitor, investor and role model has made a deep impression on South Korean society's cultural-

economic mindset. One can trace the origins of certain drivers to succeed using high technology in the push against dominating adversity, initially external, then internal. The business model of large industrial groupings and government guidance is closer to Japan's than any other economic model within or outside the Organization of Economic Cooperation and Development (OECD). This struggle has instilled discipline for organized action in both the national and personal character, often led by government, which supported the formative industrial structures such as the chaebol (conglomerate groupings), and more recently limited them, to ensure better freedom for the economy to move forward. But the reshaping of the industrial economic direction catalyzed by the recession of 1997/8 enabled a further revolution in economic policy. The latter has been crucial to today's progress at the national economic level (Shin, 2007).

South Korean society over the past 100 years has experienced occupation, repression and war during the first half of the period, but over the last 50 years, the Republic of Korea has discovered a proven and successful growth model (Forge & Bohlin, 2008). At first growth was slow - in 1960, South Korea had a per capita income of less than USD\$ 100. During the following forty years, South Korea's economy averaged an annual growth rate of 8 per cent, driving per capita income in terms of purchasing power parity to USD \$17,800, reclassifying South Korea among the World Bank rankings to be one of the high-income economies (ITU, 2005).

After the Korean War, the government, influenced by previous years of the occupying Japanese, favored the model of 'Zaibatsu', conglomerates controlled by one family, and known in South Korea as the 'chaebol', which included Daewoo, Hyundai and Samsung. Their power and position is different to the current Japanese corporate

'families' centered on a bank, the Keiretsu. The chaebol seem more akin to the Keiretsu's pre-war antecedents, the family owned 'Zaibatsu' who supported and financed Japan's war effort in the 1940's under its army faction party.

Together with government support for industry using the chaebol, and through cheap state credit, and a protectionist stance, South Korea gained a global competitive edge in heavy industry and some consumer goods such as cars. South Korea became the world's most successful shipbuilder, with 45% of the market due to its combination of high quality, low price and rapid delivery. Government investment in the education system has produced South Korea's outstanding workforce for the chaebol, skilled and well-educated but cheaper than Japan's. South Korea's growth slowed in the early 1990's - to 4.8% in 1992, poor by South Korean standards – and then increased again, until the late 1990's and the Asian crash (Shin, 2007).

Based on centralized planning, between the 1950s and 1990s the South Korean economic miracle came into being, exploiting high protective barriers for strategic industries such as cars that largely excluded imports. Strong demand from China for South Korean goods, particularly cars, developed from the late 1980s. Benefits of a highly valued Japanese Yen from the 1970s to the 1990s against a managed valuation of the South Korean Won also helped to make South Korean exports more competitive than Japan's.

## **Telecommunication Sector Development**

South Korea's telecommunication history began in August 1885 when a telegraph line was installed between Seoul and Inchon. The first telephones were installed in 1902 and the first automatic exchange introduced in 1935. South Korea joined the International Telecommunication Union in 1952. By the end of the 1980s, South Korea had achieved a high level of universal service. It signed the World Trade Organization (WTO) agreement on basic telecommunication services that became effective in November 1997, committing the country to liberalization of its telecommunication sector.

The nation's historical operator is Korea Telecom Corporation (KT). It began as the government-owned Korea Telecom Authority in January 1982 (Jin, 2005). KT's status was changed in 1989 allowing it to be privatized and in November 1993 the government began selling its shares in the company. Ten additional share sales ensued over the next decade with the final one in May 2002 when the government fully divested itself of the company (Jin, 2005).

South Korea progressively liberalized its telecommunication sector during the 1990s. The first market segment to be opened was international long distance with the entry of Dacom in December 1991. Onse Telecom entered the market in October 1997 (Forge & Bohlin, 2008). National long distance services were opened to competition in January 1996 when Dacom extended its services to this sector of the market (followed by Onse in December 1999). Finally, local telephone services were opened in April 1999 with the entry of SK / Hanaro (Shin, 2007). This was notable as it would prove to have a major impact on South Korea's broadband development. Though KT is still dominant, its market share has dropped, particularly in international long distance.

Telecommunications operators in South Korea are classified into three groups, facilities-based service providers such as wire-line operators, specialized service providers such as Internet telephony, and value-added service providers such as those offering broadband Internet connection. Based on the classifications, the telecom firms

are governed by different regulatory systems with various entry conditions and limitations (Article 7 of the Framework Act on Telecommunications and Articles 4, 5, and 6 of the Telecommunications Business Act). For example, facilities-based telecommunications service providers are required to provide interconnection from the local exchange and long distance exchange. Specifically, only Korea Telecom (KT) is subject to mandatory interconnection from the local exchange and long distance exchange, but all other facilities-based service providers should, when requested, provide an interconnection agreement. In contrast, value-added service providers, including those offering broadband Internet access, have no entry regulation or unbundling requirement. Now that South Korea has opened the broadband Internet access market fully to competition, it also means minimal regulation for broadband Internet connection providers.

## **Telecommunications Development in a Comparative Context**

How do the major new information and communication indicators that define the broadband infrastructure development in South Korea compare to developments in other countries? In order to answer this question is it crucial to have a comparative perspective that facilitates an understanding of how South Korea fared compared to other similarly placed countries on the eve of the broadband revolution. This perspective makes it is possible to evaluate the progress of the Broadband Convergence Network (BcN) in obtaining its policy objectives between 2004 and 2007. Two of these countries are OECD members specifically the United States and Japan. The other country, Singapore, is a member of the Association of South East Asian Nations (ASEAN), and like South Korea is internationally recognized as a global leader in the high technology sector

including information and communication technologies in the Asia Pacific region (Kuo & Low, 2000; Kuo et. al., 2002).

This dissertation considers data collected by the International Telecommunications Union (ITU) starting in 1990, when data on new information and communication technologies were first collected at an international level, at five year intervals, up until 2003, which is a year before the Broadband Convergence Network (BcN) was initially launched. This will provide a good idea of the new media landscape into which the BcN was introduced. This dissertation includes seven indicators on new media statistics for the five countries between 1990 and 2003. These indicators relate to the communication utility model's policy objectives of media convergence, ubiquitous connectivity and network stakeholder coordination as well as to the factors that correspond to the respective policy objectives of the BcN. For example, with respect to the Broadband Convergence Network (BcN) policy objective of media convergence, the relevant factors include the integration of diverse platforms such as those that support cable television subscribers and cable modern Internet subscribers.

The ubiquitous connectivity objective is impacted by factors such as setting subscriber targets for the BcN's coverage and the deployment of wireless broadband access technologies. Therefore the data for South Korea and the four other countries includes indicators such as Internet users per 100 inhabitants, Digital Subscriber Line (DSL) Internet subscribers and digital mobile cellular telephone subscribers. Finally the network stakeholder coordination objective is impacted by factors such as the role of the stakeholders in funding the BcN and its research and development pilot projects as well as the implementation and operation of the BcN. The data for South Korea and the four

other countries includes indicators that illustrate this financial commitment and return on investment specifically annual telecommunications investment and telecommunication service revenue.

The data that offers an assessment of broadband and new media infrastructure development in South Korea and three other countries between 1990 and 2003 is presented in the charts below. These graphs reveal how the data on the indicators from the South Korean case are in – line with other advanced countries.

TABLE 1

Internet Users Per	1990	1995	2000	2003
100 Inhabitants				
Japan	0	2	30	n/a
Singapore	0	3	32	55
South Korea	0	1	41	60
United States	1	9	44	n/a
SOURCE: ITU, 2004				
Cable Modem	1990	1995	2000	2003
Internet Subscribers				
Japan	n/a	n/a	784,000	2,578,000
Singapore	n/a	n/a	33,000	165,700
South Korea	n/a	n/a	1,319,309	3,828,166
United States	n/a	n/a	3.582,874	15,777,000
SOURCE: ITU, 2004				
Digital Cellular				
Mobile Telephone Subscribers	1990	1995	2000	2003
Japan	0	6,828,381	66,783,376	n/a
Singapore	0	172,000	2,747,400	3,577,500
South Korea	0	0	26,816,398	n/a
United States	0	50,000	78,824,184	148,209,184
SOURCE: ITU,2004				

# TABLE 1 (CON'T)

Annual				
Telecommunications	1990	1995	2000	2003
Investment (SUS)				
Japan	15,653,014,52 <b>8</b>	35,113,758,720	32,680,708,096	n/a
Singapore	250,522,480	435,939,040	<b>465,116,288</b>	n/a
South Korea	2,967,787,008	4,369,416,704	7,766,359,552	n/a
United States	20,600,000,512	23,570,200,576	2 <b>8,788,9</b> 36,704	n/a
SOURCE: ITU,2004				
Digital Subscriber				
Line	1990	1995	2000	2003
Internet Subscribers				
Japan	n/a	n/a	70,655	11,196,830
Singapore	n/a	n/a	36,000	256,100
South Korea	n/a	n/a	2,541,948	6,435,955
United States	n/a	n/a	1,977,101	9,333,000
SOURCE: ITU,2004				
Cable Television Subscribers	1990	1995	2000	2003
Japan	6.767.537	11.004.653	18,705,320	n/a
Singapore	0,707,007	24 027	255 000	n/a
South Korea	n/a	7.053.000	8.392.000	n/a
United States	54.871.328	62,956,472	69,297,288	n/a
SOURCE: ITU,2004	.,			
Total Telecommunication Service Revenue (SUS)	1990	1995	2000	2003
Japan	43,623,17 <b>8</b> ,240	93,622,157,312	122,050,945,024	n/a
Singapore	1,057,726,336	2,539,861,760	3,124,418,560	n/a
South Korea	5,074,344,448	10,622,739,456	17,674,774,528	n/a
United States	133,836,996,608	174,773,993,472	292,761,993,216	n/a
SOURCE: ITU,2004				

In 2008, four years after the launch of the Broadband Convergence Network (BcN), the data on new media and information and technology indicators suggests that South Korea has kept pace with Japan, Singapore and the United States. For the indicator of Internet **subscribers** per 100 inhabitants in 2004, the data for Japan was not available; there were 32.14 in South Korea, 23.91 in Singapore and 23.56 in the United States (ITU, 2004). In terms of Internet **users** per 100 inhabitants in 2004, there were 75.40 in Japan, 75.16 in South Korea, 73.02 in Singapore and 74 in the United States (ITU, 2004). With respect to the indicator of broadband subscriber per 100 inhabitants in 2004, there were 23.65 in Japan, 32.14 in South Korea, 21.74 in Singapore and 23.46 in the United States (ITU, 2004). Finally in terms of the mobile cellular subscriptions per 100 inhabitants in 2004, there were 86.73 in Japan, 94.71 in South Korea, 138.15 in Singapore since such a large portion of the population had multiple subscriptions and 86.79 in the United States (ITU, 2004).

While telecommunication and information and communication penetration levels provide a comparative perspective, this dissertation's ultimate focus is on the South Korean government's ability to fulfill self identified goals. These goals or policy objectives such as media convergence and ubiquitous connectivity are not defined in terms of penetration rates, but in terms of the ability of the organizations that provide broadband infrastructure to effectively coordinate. This coordination, in addition to the ITU data on penetration rates, provides lessons for other countries that are in the process of developing their broadband infrastructures.

## The Evolution of South Korea's Communication Regulatory Agencies

There are a number of regulatory agencies in South Korea which oversee and regulate the nation's communication sector. This section offers a clear time line for how these regulatory stakeholders evolved, the areas that they covered and the functions and purposes that they served.

### **Ministry of Information and Communication**

The MIC was established in March of 1992 as an independent regulatory agency and ceased to function as a regulatory organization in 2008 when it was reorganized as part of the newly formed Korea Communication Commission (KCC) along with the Korea Broadcasting Commission (KBC). The Ministry's main founding responsibility has been to review major policies of government on information and telecommunications, which includes licensing of telecommunications service carriers, many of which are involved in broadband provision.

The MIC has its origins in the South Korean postal service. This service began with the inception of the Directorate General of Posts in 1884 (Forge & Bohlin, 2008). With this organization as its predecessor, the Ministry of Communications (MOC) was established on November 11, 1984 to take care of postal services, telecommunications, life insurance, postal pension and government financial accounts (Forge & Bohlin, 2008). In December 1994, the MOC was expanded to the Ministry of Information and Communication (MIC) to unify the scattered functions of IT related works and strategically nurture the IT industry as an engine of the nation's economic growth (Lee et al., 2003).

The MIC, the KCC's predecessor, was the traditional administrative ministry in the telecommunications field. The MIC, which governed the overall policy-making and administration related to telecommunications, had multiple goals for promoting the IT industry, and deregulated the telecommunications market and securing effective competition. To promote the IT industry, the MIC initiated and implemented research and development (R&D) programs, industrial policies for venture business and foreign investments and international trade (Forge & Bohlin, 2008). In addition, the MIC (which was in existence from 1992 – 2008) regulated the telecommunications services market to ensure fair competition and to enhance transparent corporate governance.

## Korea Broadcasting Commission

The Korea Broadcasting Commission (KBC) was a regulatory agency established to oversee television and radio broadcasting that was established in 1979. The KBC was created as an independent Commission by the Directorate General of Posts which was first established in 1884. The KBC's primary duties were to regulate radio and television broadcast licenses and its oversight is of tangential importance to this dissertation in comparison to the role that the MIC played as a regulatory body. However it is important to point out that the reorganization of the Korea Broadcasting Commission (KBC), which entails broadcast media, and the Ministry of Information and Communication (MIC), which entails telecommunication media, is significant to this dissertation. After the South Korean Presidential elections of January 2008 the Administration of Presidentelect Lee Myung-bak decided to merge the MIC and KBC in recognition of the phenomenon of media convergence. Within the context of this dissertation media convergence is recognized as a key policy objective of the Broadband Convergence Network (BcN).

### Korea Communications Commission

The Korea Communications Commission (KCC) was established on February 29, 2008 after the former Ministry of Information and Communication (MIC) and the former Korean Broadcasting Commission (KBC) were consolidated into one regulatory agency. South Korea initiated the reorganization of the government agency responsible for broadcasting and communications policies and regulations, recognizing the fact that the boundary between the broadcasting and communications sector has been blurred. The newly established KCC, under the office of the president, aims to manage broadcasting and communications with full authority, promote the convergence process between broadcasting and telecommunications, as well as mitigate government regulations.

The KCC is designed to embrace the core function of the former Korean Broadcasting Commission and the Ministry of Information and Communication, serving as an integrated organization responsible for both policy-making and regulation. With purposes to encourage fair competition, develop technologies and services, and foster universal service and user benefits in the broadcasting and communications sector, the KCC consists of five permanent commissioners including the chairman. Among the five permanent commissioners, two are appointed by the president and one of them has been inaugurated as the Chairman of the KCC on March 26, 2008. The chairman's position is a ministry level appointment. The other three members have been recommended by the national assembly, one by the president's party and the others by the opposition parties.

The KCC organizational structure is composed of two offices (planning and coordination office, broadcasting and communications convergence policy office) and three bureaus (broadcasting policy bureau, telecommunications policy bureau, user

network bureau). In addition, there are two subsidiary organizations, namely, the Radio Research Laboratory and the Central Radio Management Office.

The KCC envisions an increase of production in broadcasting and communications industries including services, devices, and software by \$USD 102.65 billion, from \$USD 225.83 billion last year to \$USD 328.48 billion by the year 2012 (Jin, 2005). It also seeks to create 291,000 new jobs, an increase from the current 757,000 jobs to 1.04 million, over the next five years (Shin, 2007). The Commission also plans to increase production of the broadcasting and communications service industry including IPTV by 6.8% to \$USD 478.88 billion, and create 40,000 quality jobs that are attractive to the young generation (Shin, 2007). The KCC has identified four corner stone policy goals: 1) concentrate efforts on the convergence of broadcasting and communications services, 2) enhancement of broadcasting service market, 3) facilitation of investment in communications services, 4) expansion into overseas markets.

## Impact and Regulation of the South Korean Information Infrastructure

The concept of an information infrastructure has been promoted in South Korea during the past three decades by both government and segments of the private sector through a national computerization project called the National Basic Information System (NBIS) project, which began in 1987. This project suffered from weaknesses including insufficient funding, a lack of strong industry capability, decreasing government support and failure to stimulate domestic demand. These weaknesses generated a widespread consensus on the need to reform the NBIS project, and a second stage of the project was begun in 1992. Nevertheless, problems remained, and inadequate funding led to shortfalls in the expected benefits. Further reconsideration created a demand for new policy actions. This occurred at about the time the United States and Japan were announcing plans for a national information infrastructure (NII). The result was an effort to build a South Korean NII, which has become known as the Korean information infrastructure (KII). The KII and NBIS were discontinued in 2003 when an IT 839 strategy was adopted which will be discussed in the ensuing chapter.

The KII movement arose from an established desire to exploit information technology and a new fear that a failure to build an information infrastructure would hurt South Korea's basic industries to , the point that they might not be able to compete in the global marketplace, leaving the nation farther behind the developed countries. This concern extended to production industries such as computers, telecommunications, components and semi-conductors - all of which might be left behind by the global production system, with a subsequent loss of export and import substitution opportunities. In addition, there was concern that the consumer service industries would not be able to gain quick access to the latest technologies and would become less competitive.

According to Jeong & King (1997) the KII arose from both the efforts of the National Basic Information System (NBIS) project and the response of national policy leaders to NII initiatives in the developed countries, particularly the United States and Japan. South Korea, like other countries, is eager to achieve competitive advantage through the use of information technologies. The KII initiative was part of South Korea's well-established economic policy that was defined by government-driven five-year economic development plans. There were several five-year plans since the early 1960s. Most were executed very successfully, producing economic prosperity. These plans can

be described as industrial policies targeting specific economic sectors, based on private sector investment and production, with a decisive role for the government. Strategic industries were targeted by specific legislation, as illustrated by the Industrial Machinery Promotion Act (1967), the Shipbuilding Industry Promotion Act (1967), the Electronics Industry Promotion Act (1969) and the Steel Industry Promotion Act (1970).

The economic policy of the five-year plans traditionally focused, on supporting large enterprises. Jeong & King (1997) point out that as a result, small and medium-sized enterprises (SMEs) were relegated to a disadvantageous position throughout the 1960s and 1970s, which resulted in weaknesses in the overall South Korean economic structure. The high technology industries such as IT were particularly hard hit since changes in technology development and applications occur so rapidly that small companies have advantages over large companies in responding to market opportunities, interacting closely with customers, having timely access to technology and market information, and producing new products. The South Korean government realized the importance of SMEs in the 1980s, and made strengthening them a key economic policy goal. The Small and Medium Industry Promotion Act was enacted in 1982 in order to establish a fund for promoting SMEs and to build an industrial complex for SMEs. In 1986, the Small and Medium Industry Startup Promotion Act was prepared to help entrepreneurs start SMEs through tax incentives and financial support. Nevertheless, SMEs remained weak in South Korea, not because of inadequate legal and administrative provisions of these acts, but mainly because the government was unprepared to pay the short-run cost of a structural adjustment to the economy.

Jeong & King (1997) suggest that the South Korean economic policy in the late 1980s and early 1990s began to shift toward economic liberalization and promotion of technology-intensive industries. This shift was brought about in part by recognition of the domestic and in international pressures facing the country. The economic strategy reflected in the seventh five-year economic plan (1992-1997) was a response to "problems" that had accumulated during the decades of tremendous growth. Increasing public demands for a higher standard of living have been joined by radical increases in international technology competition and demands for market liberalization by trade partners. The seventh five-year plan adopted three major strategies: strengthening the competitiveness of industry, enhancing equity and balanced development, and pursuing internationalization and liberalization. Industry, the South Korean leadership realized, can no longer rely on low wages for competitive advantage. Thus the 1992-1997 plan called for human resources development and the promotion of technological development and innovation to keep pace with .the Information Age.

The Korean Information Infrastructure (KII) was based on a vision of information and communications infrastructure as a key factor in South Korea's successful transition to an advanced economy. A pivotal underpinning of the KII was that in an advanced economy, economic growth and market competition will be based on the creation, movement and application of information. Moreover the rationale for the KII was that information infrastructure will also play a substantial role in achieving the national goal of "transparent society" that is free from political and bureaucratic corruption.

The goal of Korea's information infrastructure initiative was the construction of an advanced national information infrastructure consisting of communications networks,

Internet services, application software, computers and operating systems, and information products and services. The KII of the 21st century was expected to enable all South Koreans to access information and communicate with anyone, anytime, anywhere. The KII, much like the Broadband Convergence Network of 2004 – 2010 that followed it, intended to facilitate all information and communications services in voice, data and video will be provided easily, reliably, securely, in a timely manner and cost effectively.

The establishment of the KII involved more than a plan to put additional cable in the ground and more computers into offices and homes. It incorporated the notion of a new social infrastructure, ranging from the establishment of a rich social and cultural environment to the development of hardware and software facilities that are conducive to a seamless flow of information. In order to achieve this, the KII assumed that the general public must be prepared to use the new technologies and services so that they can benefit from the enhanced capabilities. The government was expected to be a leading user of the infrastructure to conduct administrative operations and deliver public services more effectively and efficiently, thus demonstrating the capabilities of IT applications. The government was also expected to create a favorable environment for financing that encourages investment and innovation.

The KII consisted of high-speed government and public information networks. The New Korea Net-Government (NKN-G), funded by the government, will be constructed to provide government agencies and public stakeholders, including research institutes and universities, with information and communications services at a low cost. Application services and key technologies were developed in collaboration with industry, universities and government laboratories. After these technologies and their applications
were tested and deployed over NKN-G, they were commercialized on the New Korea Net-Public (NKN-P).

The NKN-G was intended to improve the efficiency of government operations and the delivery of public services. It was designed to connect central and local government agencies and various public organizations, including schools and libraries, mainly through fiber optics. Standards for interconnectivity and interoperability with the existing computer networks at the time were created by the National Basic Information System (NBIS) project as part of a program to create an integrated network. Construction and operation of the NKN-G took place in three stages: groundwork (1995-1997), diffusion (1998-2002), and completion (2003-2010). In the first two stages, network capabilities and switching technology were specified. However in 2003 the South Korean government decided to adopt a new strategy and the third phase was discontinued and the government embarked on an IT839 strategy which will be discussed in detail in the next chapter.

The objective of the NKN-P was to provide interactive broadband multimedia information services to users in the private sector by wiring offices and homes with fiberoptic cables. In the early stages of the plan, the NKN-P targeted urban offices and apartments that were likely to have heavy traffic. The NKN-P was designed to be implemented in same three stages as the NKN-G and the NKN-P was also discontinued in 2003 in favor of the IT839 strategy.

According to Jeong & King (1997) the KII plan reflected the belief of the South Korean government and industry that the key technologies of the National Information Infrastructure (NII) were powerful forces of competitive advantage in the developing

global information economy. This issue drew considerable attention in South Korea since economic signals suggested that South Korea's competitive position in the world market was declining. For example, in the early 1990s there was a decrease in the production and export of South Korean information technology (IT) products, and domestic and overseas reports suggested a weakening of South Korea's competitive position (Dedrick and Kraemer, 1995; WEF & IMD, 1994, 1995). The government emphasized catching up in competitiveness in the global market, and IT and its applications were regarded as key tools in these efforts.

Many of the Korea Information Infrastructure (KII) plan's strategy and action programs reinforces the importance and priority of information infrastructure. As with most National Information Infrastructures (NII) initiatives, the KII initiative was concerned with the far reaching economic and social ramifications of information infrastructure. Some of the planning was quite detailed, but overall, the KII plan was vague about how, when, and by whom it would be implemented. Jeong & King (1997) expressed concerns as to whether the development of the KII was sufficiently guided by an understanding of how networks would be designed, constructed and maintained in balance with existing infrastructure, as well as an understanding of how environmental factors evolved for products and network services of the infrastructure to be efficiently utilized. The authors (1997) suggested that institutions such as the legal system should have been more properly aligned in order to effectively deploy the infrastructure and efficiently utilize its services. In addition, a long-term funding schedule for the KII project should have been more deliberately established.

Jeong & King (1997) posit that perhaps the greatest challenge of the KII plan was achieving coordination among the parties with a stake in the process of network deployment and service provision. Different stakeholders have different levels and kinds of risks and incentives to consider, and it is doubtful that anyone scheme will meet all parties' needs. The KII required coordination between the government and the private sector and governmental agencies. According to Jeong & King (1997) "coordination of NII issues will require smooth communication and interaction among stakeholders whose welfare is dependent on effective interoperability" (p. 131).

The Korean Information Infrastructure (KII) involved many stakeholders, and required coordination among industries, governmental agencies, research institutes, universities and the general public. South Korea's powerful tradition of central government coordination makes top-down planning of the KII somewhat easier than might be the case in more decentralized countries. A growing number of players outside the government had the power to influence policy, or ignore policies they do not agree with. Coordination between the private and public sectors and coordination within governmental agencies poses new challenges.

Strong government leadership in the past provided prompt solutions to serious conflicts among stakeholders. The government set goals and private industries ran their businesses in accordance with regulations. The government was able to enforce its strategies through effective tools such as special financing schedules, granting or withholding permission for particular firms to enter an industry, and the establishment of rules of competition in the market. This model was intended for the KII plan, but the trend toward liberalization and deregulation made that strategy unworkable except in a

few cases, such as network deployment and funding of key technology research in which centralized government authority remains advantageous. The government's role in establishing technical specifications for network standards was key, though somewhat indirect, through coordinating and supporting the efforts of private companies.

The government was supposed to support the Korea Information Infrastructure (KII) by giving up some of its influence by removing regulations hindering privatization of public corporations, and redirecting its influence by setting fair rules of market competition. The government's responsibility was increasingly seen as that of maintaining a sound economic climate for private investment and a regulatory framework that encouraged fair and open competition among equipment and service providers. The KII vision included multiple networks with different functions, capabilities and patterns of ownership and use. Assuring the interconnectivity and interoperability of these networks was an important role of government at all levels, so that the maximum benefits of investments can be gained for both New Korea Net-Government (NKN-G) and New Korea Net-Public (NKN-P).

Jeong & King (1997) argue that there was increasing agreement that the traditional role of the South Korean government in industrial and economic policy should change, but bureaucratic attitudes change slowly. For that matter, the private sector itself showed mixed feelings, preferring the liberalization of business environments, on the one hand, yet seeking continued direct government funding and regulatory support, on the other. The challenge facing South Korea in the Korea Information Infrastructure (KII) was how to create harmony between the government and the private sectors so that each can do what it does best, but it was not yet clear how that challenge will be met.

The policy-making process in South Korea has frequently been interrupted by bureaucratic rivalry among ministries with a stake in particular' issues. The scope of information infrastructure cuts across several governmental bodies. Even if the government's role could be clearly constructed in balance with the private sector, the KII initiative still faced considerable problems of coordination within the government. The process of drafting the Informatization Promotion Act illustrates this problem. When the implementation of the National Basic Information System (NBIS) administration's information systems project was overseen by the National Computerization Board (NCB) in the Office of the president, things went smoothly. But when the National Computerization Board (NCB) was moved to a lower-status position in the government hierarchy, implementation of the project faltered.

Jeong & King (1997) point out that this problem was recognized, and in an attempt to alleviate it, a high-level steering committee was formed at the inter-ministerial level to resolve controversies among government agencies involved in KII projects. The steering committee was headed by the prime minister, and included the ministers of related ministries and representatives from the National Assembly and the Supreme Court. In addition, the Ministry of Communications (MoC) was reorganized into the Ministry of Information and Communications (MIC) in the 1994 to avoid past conflicts by consolidating authority. Nevertheless, resolution of the controversies in the KII plan required a series of debates within the ministries. For example, proponents of IT projects tend to push for action given the successes in economic development in the past 30 years, but the Economic Planning Board (EPB), which controls the nation's budget office, is very conservative about allocating money for IT projects. The EPB has established

guidelines for budget allocations based on cost-benefit analysis, and most analyzes show IT projects in the public sector to have weak cost-benefit justification. Proponents of IT projects have conducted research to demonstrate the economic payoff or productivity impact of IT investments, but without much success.

The Ministry of Trade, Industry, and Energy (MOTIE) and Ministry of Information and Communication (MIC) clashed over which industries best represent the field of IT. MOTIE is still responsible for industrial policy including the computer industries, whereas MIC regulated communications. The MIC gained management control over the KII plan through the Informatization Promotion Act and the 1994 reformulation of the central administration, but MOTIE argued that most equipment for networks, homes and offices specified in the KII plan fell under MOTIE's jurisdiction. MIC thus emphasized a network perspective that put it in charge, whereas MOTIE took a manufacturing perspective that fit with its established authority in carrying out South Korea's industrial policy.

## **Research Questions**

This study's research questions are as follows:

- 1. Which sectoral level factors best explain media convergence, ubiquitous connectivity and network stakeholder coordination?
- 2. At the BcN level, how do different factors explain media convergence?
- 3. At the BcN level, how do different factors explain ubiquitous connectivity?
- 4. At the BcN level, how do different factors explain network stakeholder coordination?

# CHAPTER 4 – THE DEVELOPMENT OF SOUTH KOREA'S BROADBAND CONVERGENCE NETWORK: A HISTORY

The purpose of this chapter is to provide an in – depth treatment of the anatomy of the Broadband Convergence Network (BcN). The first section of the chapter is designed to provide a context for the genesis of the BcN. This entails a discussion of the IT839 strategy, which is a policy agenda that the government adopted to revitalize the nation's information technology sector. The Broadband Convergence Network is the central information infrastructure project of the IT 839 strategy. The second section focuses on the BcN and offers an introduction to this infrastructure, to its broader societal implications and also to how the infrastructure is designed to evolve over its three phases between 2004 and 2010. The third section details the role of government stakeholders, private firms and non-profit non-governmental research institutes in shaping the development of the BcN. The fourth section details this dissertation's research questions.

## IT 839 Strategy

The IT 839 strategy is designed to allow a myriad of emerging information technology services and products to be consolidated and simplified into eight new services with the potential to drive growth in the South Korean information technology sector. The IT 839 strategy also builds out three types of infrastructure to serve as the foundation upon which these eight new services are delivered. These are networks for telecommunications, broadcasting and Internet services which create the backbone for the information technology sector. The ultimate goal of nurturing these eight services and three infrastructures is to allow the development of nine new growth engines to fuel the economy and create jobs.

### **Broadband Convergence Network**

In 2004 the Broadband Convergence Network (BcN) was started as a consortium that was established and initially funded by the Ministry of Information and Communication (MIC). In 2008 MIC was reorganized into the Korea Communication Commission, which regulates the BcN. A wide diversity of actors and players from the private sector were also founding members that funded the consortium composed of Korea Telecom (KT), SK / Hanaro Telecom, and LG Powercom. The policy impetus for the BcN is the phenomenon of digital convergence, which brings together the industries of telecommunications, broadcasting and the Internet. Essentially the Broadband convergence Network (BcN) is an integrated next-generation network that provides seamless, safe, and quality-guaranteed broadband multimedia services anytime and anywhere. South Korea has been striving to construct a BcN architecture based on a commitment to the concepts of digital convergence and ubiquitous networks.

The government also claims to be cognizant of the broader social and technological implications and impacts of the BcN (Ministry of Communications, 2003, p. 18). The government envisions that this network will make it possible to reform the government's civil service by achieving full openness in e-government. The government hopes the BcN will become the foundation of participatory democracy, as it will help provide people with multiple means of participation into the government, e.g. e-voting, online surveys of public opinion, and e-hearings (Ministry of Communications, 2003, p. 21). The BcN has been designed promote a wider diffusion of e-transactions with quality and security guaranteed no matter where and when the user may make use of the service. The concept of virtual offices and e-logistics will actually come true, prompting the

spread of IT across the industries. It will also bring the concept of e-life, e-work, elearning and e-health closer to reality, as the network will be breaking down restrictive barriers on time, place and telecom environments.

This BcN infrastructure was launched as a multi-year three-phase project. The first phase comprised approximately a two-year period from 2004 through 2005 and has been referred to as the "Foundation Phase" (National Computerization Agency, 2005). The primary agenda for the first phase was to launch the BcN. This entailed exploratory research and planning on intended goals, benefits and impacts for all the organizations involved in the BcN. In the first phase the government took the lead in terms of overseeing and funding the BcN, while industry and non-profit played more of a secondary role. The government's plans included strategies for getting the private sector to invest in the BcN and commissioning government affiliated non-profit research centers to do engineering and social science studies on the implementation and implications of the BcN. During this phase most of the investments came from the Ministry of Information and Communication.

The second phase occupied a roughly two-year period from 2006 through 2007 and has been referred to as the "Commercial Deployment Phase" (National Computerization Agency, 2006). The primary agenda for the second phase was to improve the BcN and to encourage the private sector to become the primary investor in the project. During this phase the private sector firms, not the government, were primarily responsible for investing in R & D projects that would serve as test beds for the BcN. While large corporations like KT and SK / Hanaro Telecom would provide a large share of the financial investment the government would play a role in assisting smaller

firms and non-profits, that were interested in being involved with the BcN but could not afford to be involved, with the financing. The government affiliated non-profit research centers would be commissioned to conduct more advanced studies based on the experience with the BcN's first phase.

The third phase is anticipated to last from 2008 through 2010 and has been referred to as the "Completion phase" (Korea Information Society Development Institute, 2008). The primary agenda for this phase is the implementation of the BcN. At this point the government has a minimal role in leading the BcN except to provide strategic support and advice to the stakeholders running it. The private sector is the principal financier and conducts all the R & D and operations. During this phase the marketing and deployment of the BcN will be finalized and the organizations involved will identify the applications and other services that will ultimately determine if the BcN is a success. The government affiliated non-profit research centers will continue to conduct studies on an ad hoc basis when either the regulatory body, the Korean Communications Commission, or the private sector request their support.

# <u>Role of Stakeholders in Shaping the Development of the Broadband Convergence</u> <u>Network (BcN)</u>

# Role of Government Affiliated Stakeholders in Shaping the Development of the Broadband Convergence Network (BcN)

The Ministry of Information and Communication was the primary governmental body that along with private sector stakeholders founded and provided the initial funding for the Broadband Convergence Network (BcN). When the BcN was reorganized into the Korea Communications Commission (KCC), the KCC became the primary regulatory body overseeing the BcN. However there are two other government affiliated bodies which provide consulting services on how to deploy the BcN strategically in order to pursue the government's objectives for the broadband infrastructure. These two agencies are the National Information Society Development Agency and the National Internet Development Agency.

# Background on the National Information Society Development Agency (NIA) and the National Internet Development Agency (NIDA)

The National Information Society Development Agency (NIA) is a statutory agency established in 1987 and was charged with the task of constructing the National Basic Information System (NBIS) which is the nation's information infrastructure. The agency responsible for "the implementation and support of the information needs of the country, building upon the knowledge and expertise accumulated over the years in the society, and bringing new opportunities and possibilities offered by information technology to the nation and society by providing optimal methodologies and solutions to national agencies, local autonomies and public enterprises" (MIC, 1996, p.6). According to Article 10 of the "Framework Act on Informatization Promotion" the National Information Society Development Agency (NIA) is responsible for "managing and operating information networks of public stakeholders, supporting information communication standardization, developing/maintaining information systems for interagency information sharing, supporting information resource management in the public sector, supporting supervision, standardization and evaluation of public informatization businesses and providing IT consulting services to developing nations" (MIC, 1996, p.6).

The National Internet Development Agency (NIDA) was established to develop and manage Internet address resources which make up today's essential infrastructure of the country as well as the future society based on knowledge and information. Since taking over for its predecessor, the Korea Network Information Center (KRNIC) which itself was established in 1999, the NIDA has consolidated its areas of operation and plays a leadership role in managing South Korea's Internet address resources. KRNIC was reborn into NIDA as public corporation responsible for managing Internet in 2004 as the Internet has been recognized as a public resource. In addition to managing Internet address resources, NIDA also develops new projects to promote the Internet, conducts and assists in Internet-related research, leads efforts to standardize Internet resources, conducts policy research aimed at further developing and promoting the use of Internet address resources, and cooperates with international organizations concerning Internet governance. Tasked with all of these missions, NIDA has virtually become synonymous with Internet promotion in South Korea.

### **Oversight of NIA and NIDA**

During the first two phases of the Broadband Convergence Network (BcN) the National Information Society Development Agency (NIA) planned to develop core technologies such as quality guaranteed switching technology and traffic management technology to guarantee end-to-end quality of service (QoS) regardless of time, place and terminals. The NIA also built and operates a quality management system to certify and evaluate quality of service for the BcN (Ministry of Information and Communication, 2004b). This system is still being constructed in the BcN's third phase in 2008 (KISDI, 2008a, p. 89).

The National Internet Development Agency (NIDA) provided consulting services to precipitate coordination among the network's stakeholders during the first two phases of the BcN (2004 – 2007) and has continued these support services during the third phase of the infrastructure. As a means to build the BcN, during the first two phases of the BcN the NIDA worked with the private sector to develop a roadmap plan. Based on this roadmap, the two sides set out a strategy to build a high-tech R&D network through which they will standardize technologies and services for application to commercial networks. The private sector assumed the cost of building commercial networks and developing commercial technologies. Specifically during the first phase of the BcN the Ministry of Information and Communication (MIC) would provide some of the initial funding, but the private sector would assume the primary investment responsibility in the second and third phases of the BcN (2007 – 2010).

During the first two phases of the BcN the NIDA is focused on strategies to promote investment in the building and operating of high-tech R&D networks needed to encourage private investment to create a virtuous circle of supply and demand. This work still continues into the BcN's third phase (2008 – 2010). Between 2004 and 2007 NIDA embarked on a campaign to stimulate investment in developing fundamental technologies and conducting BcN pilot projects. Core BcN pilot projects are still being developed with the focus on voice/data, wired/wireless, telecommunication / broadcasting, users business, QoS, security, telematics, home network and ubiquitous commerce (u – commerce) that can create a new service market and create a large demand base in the new IT growth engine sectors, even in the BcN's third phase. The NIA is behind schedule for this goal, but it is much closer to achieving this goal than it was in 2006 (NIA, 2009, p. 89).

Both the NIA and NIDA oversee a range of societal impacts of the BcN. According to the government the BcN will make it possible to reform the government civil service by achieving a full openness in e-government under its envisioned mgovernment and t-government (Ministry of Information and Communication, 2003). The BcN is intended to become a foundation of participatory democracy, as it will help provide people with multiple means of participation into the government, e.g. e-voting, online surveys of public opinion, and e-hearings. The NIA and NIDA are obliged to help promote a wider diffusion of e-transactions with quality and security guaranteed no matter where and when the user may make use of the service. The intent here is to bring the concept of e-life, e-work, e-learning and e-health closer to reality, as the BcN is intended to break down restrictive barriers on time, place and telecommunications environments (Ministry of Information and Communication, 2003).

## Role of Private Sector Stakeholders in Shaping the Development of the BcN

The private sector organizational stakeholders in the BcN, namely KT, SK / Hanaro Telecom and LG Powercomm, have engaged in their own proprietary projects as part of their participation in the network infrastructure. Each of these firms operate separate projects and they do not collaborate on individual projects even though all their projects are designed for the BcN. However each of the private sector stakeholders do coordinate with the government and research institutes for support and consulting purposes in order to maximize the profitability and ubiquity of their broadband projects. Each organizational stakeholder runs multiple concurrent projects at one time and the

objectives and purposes of these projects change over time in accordance with the firm's broadband strategies. Korea Telecom (KT) which is the largest individual organizational stakeholder in the BcN has operated over 20 projects since the BcN began. One example is a project entitled Octave, which started in October 2005 with 600 subscribers in three cities, Seoul, Daejeon and Daegu (National Computerization Agency, 2006, p. 42). Octave offers 22 broadband enabled applications including digital phone service and Internet Protocol Television (IPTV) service among others. By 2008 Octave had over one million subscribers around the country and the number of applications and services has grown exponentially (National Computerization Agency, 2008b, p. 43).

Similarly UbiNet is an example of a SK / Hanaro Telecom project that was started in September 2005 also with 600 subscribers in three cities, Seoul , Daejeon and Daegu. Rather than the Octave, the KT project, which focused on residential broadband access, UbiNet focused on mobile applications and services targeted to cell phone devices. By 2008 UbiNet reached over one million subscribers nationally (National Computerization Agency, 2008b, p. 43). Finally Kwanggaeto is an example of a project developed by LG Powercomm which was launched in July of 2005 with 350 subscribers in 5 areas, Seoul, Kyungi, Buchun, Busan and Kwangju (National Computerization Agency, 2006, p. 42). By 2008 Kwanggaeto reached over one million subscribers nationally. This project distinguished itself from the other projects by focusing on convergence between the telecommunications and television infrastructure. Given LG's advantage as a consumer electronic firm it focused on the high end market and provided new video on demand services that could be tied in with its high end consumer electronics products.

# Role of Non-Profit Government Affiliated Research Institute Stakeholders in Shaping the Development of the BcN

### **Electronics and Telecommunications Research Institute**

The Electronics and Telecommunications Research Institute (ETRI) is a leading South Korean developer of technological innovations in the field of information and communications. In December 1976, the Korea Electronics and Telecommunications Research Institute (KETRI), an affiliate of the Korea Institute of Science and Technology (KIST), and the Korea Institute of Electronics Technology (KIET) were independently founded. The main focus of KETRI was to develop transmission systems, commercialize optical transmission systems, and develop mobile communication technology, while KIET was to focus on semi-conductor design technology in addition to the development of domestic hardware and software production.

Each organization successfully implemented R&D fundamentals for the South Korean electronics and communications industry. In March 1985, the two institutes merged to continue this effort in research and development under the name of KETRI. In 1997, the institute was endowed with its current name, ETRI. In 1999, it was placed under the South Korea Research Council for Industrial Science and Technology led by the Prime Minister. Since 2004, the affiliation has changed once again, and presently ETRI is under the Ministry of Science and Technology. Recently, the organization has been restructured to focus on new IT Growth Engines: new technology for economic growth, IT convergence with components technology, and commercialization enhancement.

Over the past thirty years, the Electronics and Telecommunications Research Institute (ETRI) has contributed to the nation's economic and social development by creating and developing new knowledge and technology in the Information and communications industry. Recently, ETRI has obtained numerous intellectual property rights in addition to training top-notch personnel to step forward within the country's best IT research institute. ETRI's mission seeks to contribute to economic and social development by creating and developing new knowledge and technology as a member institute of the Korea Research Council for Industrial Science & Technology. To meet this goal, the value of ETRI's existence lies in its ability to enhance national economic value by creating and advancing knowledge and technology, conjointly conducting researches on information security and technology standardization while providing technology-related information to the industry. ETRI began with the understanding that the primary source of future competence lies in nurturing research and development in information technology capital management and development.

The Electronics and Telecommunications Research Institute (ETRI) consists of human capital (based on competence, attitude, and satisfaction), structural capital (based on culture, R&D process, and intellectual property rights) and relational capital (based on customer satisfaction, technology transfer, and R&D value creation) divisions. Each division's current status and future direction is checked and measured on a regular basis. The structural capital and relational capital divisions have been particularly instrumental in the development of the BcN.

Structural capital, which is created by members of an organization but owned by the concern itself, refers to the ability to manage an organization. This provides evidence

for judging how efficiently the operating system of an establishment is managed in terms of developing customer value, an important and unique component of holding a competitive advantage over others within the industry. Structural capital includes not only a physical infrastructure, such as information systems and databases, but also softer resources, such as the organizational, human resource management, and R&D processes. Management emphasizes the most recent kinds of structural capital, including technology innovation, policy development, and organizational culture, in order to maximize the individual competencies within the organization itself, rather than on traditional assets such as intellectual property rights.

With respect to the BcN, the structural capital division has put out an annual report on the efficacy of the BcN for every year from 2004 through 2007. According to the 2007 study drafted by ETRI, during the first two phases of the BcN "organizational efficiency of the BcN in the pursuit of its mid- and long-term strategies increased by 11%, showing a consistent improvement for the past three years" (ETRI, 2007, p. 10). Moreover the "policy planning efficiency indicators surrounding the BcN also increased by 5% from the previous year, which is due to an improved cooperation between administrative departments and research sectors" (ETRI, 2007, p. 11). Examples of these indicators include: research and development investment in new technology, managerial efficiency, information systems satisfaction and organizational culture. According to the report (2007) "the continued 5% and 4% steady growth in the sound judgment of managerial efficiency in eh pursuit of the BcN's agenda reflect an increased fairness in the organizational management of the BcN's policy agenda (ETRI, 2007, p. 11).

In terms of ETRI's relational capital division relational capital refers to the value created by relationships outside of the organization. At the core of relational capital lies value to the information technology infrastructure created through continuing interactions between government ministries, strategic R&D partners such as ETRI in the non-profit sector, and actors in the private sector such as licensees, and outsourced vendors. ETRI seeks to increase its national competitiveness by transferring and diffusing its knowledge and technologies across diverse organizational stakeholders.

. In 2008 ETRI drafted a study on the BcN's research and development pilot projects. The findings of this study showed that " the ratio of R&D budgets funded by governments to total R&D budget for the BcN, an indicator for measuring network diversity, increased by 1.3 percentage points, to reach 87.6 percentage points between 2004 and 2005" (ETRI, 2008, p. 12). According to the report "this shows a slightly increased dependence on government funding in terms of investments in the BcN, and also represents a low level of collaboration between the BcN's private sectors" (ETRI, 2008, p. 12). However between 2006 and 2007 "this ratio substantially decreased by 20% to 67.6% in 2007" (ETRI, 2008, p. 13).

This dramatic difference in three years indicates that the coordination among the network stakeholders of the BcN dramatically improved using investment coordination patterns as a measure. Moreover according to this study the number of government licenses for the BcN's services and number of projects that the private sector requested consultancy on from the non-profit sector "increased by 50.6 percent between 2004 and 2007" (ETRI, 2008, p. 13). According to this study this increase suggests "that more

than half are sustaining cooperative relationships between government, private firms and consultancies such as ETRI" (ETRI, 2008, p. 13).

#### Korea Information Society Development Institute

The Korea Information Society Development Institute(KISDI) was established in 1985, as one of the nation's IT research institutes affiliated to the Ministry of Information and Communication (MIC), and currently a government-run institute under the umbrella of the Office of the Prime Minister. Over the past two decades, KISDI has played a pivotal role in making South Korea and IT powerhouse by researching and developing national policies for informatization, the ICT industry, the convergence of telecommunications and broadcasting, fair competition, international cooperation on information and communication, and postal services. Since KISDI's inception it has aimed to explore breakthrough development opportunities in the IT industry in a broad sense that include telecommunications and broadcasting, a prerequisite for designing future South Korea in the 21 Century, the Institute has so far made great contributions to developing the national economy and enhancing the quality of life in the process of building an IT-based "U-society" in a situation where South Korea puts high priority on the IT industry as a growth engine in the 21st century.

While serving as a leading IT think-tank, KISDI initiates coordination among a number of network stakeholder in the BcN such as government, enterprises in order to help these stakeholders meet their needs not only by recognizing the convergent trend between industries and between telecoms and broadcasting, but also by devoting themselves to policy research with the aim of bolstering the competitiveness of the overall IT industry, laying the foundation for its growth of the BcN, and performing

necessary tasks in the IT arena that are critical in allowing the BcN to achieve its policy objectives.

KISDI has a number of strategic goals with respect to the development of the BcN. For example, these include "To serve an advisory role on national agenda for the construction of a Broadband Convergence Network information infrastructure that reflects an advanced information society, to conduct advanced research on all IT policy issues of the BcN and to strengthen the advisory role of stakeholders in the BcN in order to support this national initiative" (KISDI, 2008b, p. 9). Another set of key goals of KISDI with respect to the BcN is to "coordinate role in the policy making process surrounding the BcN, formulate the overall IT policy strategy of the BcN through cooperation with policy implementation agencies, private enterprises such as IT vendors and consultancies, strengthen the support for all stages of IT policy making process for the BcN from planning to implementation to evaluation" (KISDI, 2008b, p.

9). Consequently the research institute voiced a commitment to ensure the strong growth and development of information technologies in South Korea, helping organizational stakeholders such as government, industry, academia and private sector to better prepare for the future and eventually contributing to the realization of the information society via the BcN. KISDI, 2008b, p. 12).

There are four divisions of KISDI, IT Industry Policy, Future Information Society Policy, Telecommunications and Broadcast Policy, Fair Competition Policy, which are relevant to the development of the Broadband Convergence Network. The IT Industry Division performs studies on market prospects, industrial policy and market analysis of each sector in the IT industry that is recognized as the new growth engine of the South

Korean economy in the 21st century. With a focus on ICT equipments (information equipment, communications equipment, broadcasting equipment and major parts), software, digital contents and new media, KISDI's "research works put emphasis on analyzing the current status of the BcN, strengthening the competitiveness of the services involved in the BcN and the cooperation among the BcN's stakeholders, based on an analysis of emerging trends and industry competitiveness (KISDI, 2007b, p. 10). Moreover KISDI's IT Industry Division is pursuing studies on "policies for facilitating the growth of the BcN's small to mid-sized venture companies and incentivizing investment in the BcN" (KISDI, 2007b, p. 10). These policy recommendations for the development of emerging IT in the BcN entail analyzing future market demand, the industry competitiveness, and growth strategy. KISDI is interested in "providing the BcN's stakeholders in the public and private sector with mid to long-term market analysis and research materials through data collection, analysis and representation" (KISDI, 2007b, p. 10).

The Future Information Society Policy Division of KISDI is charged with" the research goal of examining the vision and direction of the BcN, a framework for a healthy information society, and the full-fledged realization of the knowledge-based society via the BcN" (KISDI, 2007b, p. 13). This division's research entails "establishing a national strategy for the BcN that upgrades the country's knowledge-based society and assesses the potential direction that the BcN could take in the long run" (KISDI, 2007b, p. 13). For the establishment of the vision and direction for the BcN's future, studies are being conducted "on megatrends ubiquitous society via the BcN, future information society from the legal and institutional perspective, and the BcN's institutional

framework for IT infrastructure" (KISDI, 2007b, p. 13). According to the Future Information Society Policy Division of KISDI's mandate, as IT has became the basic infrastructure of society, there is a growing need to develop a national strategy with a long-term view for continued national development at a time when South Korean society is experiencing rapid changes with the paradigm shift. For this purpose, a wide network of researchers and experts has been formed for long – term cooperative and systematic research endeavors "to enhance understanding of the technological changes in the BcN and its implications for (South Korean) society as well as creating a clear vision for South Korea in the future" (KISDI, 2007b, p. 13).

The Telecommunications and Broadcasting Policy division of KISDI is responsible for "challenges of the new telecom environments that impact the BcN and research efforts are being made to forecast the future of the this infrastructure project and to revise the existing regulatory framework so that it is conducive to the BcN's ubiquitous communications environments which means convergence of fixed and wireless as well as telecommunications and broadcasting" (KISDI, 2007b, p. 14). The relevant research studies drafted by this division are designed to promote strategies "to stimulate the BcN's technology development, to promote telecom service markets and eventually to advance the quality of the services in the convergence era" which is critical to the BcN's development (KISDI, 2007b, p. 14). Moreover these "policy studies are also focused on reforms in the current regulatory framework in order to facilitate new emerging services of the BcN such as VoIP, mobile internet services and telematics" (KISDI, 2007b, p. 14). The Fair Competition Policy division of KISDI recognizes how the rapid changes occurring in the telecom services industry such as the introduction of new multimedia services, convergence of fixed and wireless technologies as well as of telecom and broadcasting, research efforts are concentrated on the study of a fair competition environment to facilitate growth of the national economy and enhance user convenience in a healthy telecom market. Consequently the research produced by this division "is focused on helping to establish the BcN as an appropriate fair competition system taking into account the unique characteristics of this infrastructure" (KISDI, 2007b, p. 17). Research efforts are also being made by this division "to develop valid evaluation criteria for each telecommunications service sector that participates in the BcN" (KISDI, 2007b, p. 17). They act as a basis for in-depth evaluation of the status of the market competition and obstacles to fair competition for those projects that comprise the BcN.

## **CHAPTER 5 – METHODOLOGY**

This dissertation integrates two primary approaches. The first is documentary research and analysis of primary policy texts relating to the evolution of South Korea's Broadband Convergence Network (BcN) from 2004 to 2007. The second approach involves field interviews of key informants who are familiar with the policy agenda of the BcN in South Korea.

# Using a Documentary Research Procedure

The major emphasis of qualitative document analysis is to capture the meaning and the themes of messages within the texts and to understand the organization and process of how they are presented (Glaser & Strauss, 1967). According to Altheide (1996) "this requires that we include the widest range of relevant messages in the texts that are collected for analysis" (p. 33). He suggests that it is difficult to know the range and variety of all the data that needs to be collected for analysis at the start of the research and that the rationale for collecting data for analysis must emerge as the researcher inspects and reflects on some initial material (Altheide, 1996, p. 33). He argues that for qualitative documentary research rather than "trapping" our analysis with too many preset categories and cases derived from a rigid sampling strategy, the selection of materials should be based on an emerging understanding of the topic under investigation (Altheide, 1996, p. 33). The idea is to select materials for conceptual or theoretically relevant reasons.

# Using the Documentary Research Procedure to Identify 12 Documents Relevant to the BcN

In terms of this dissertation on South Korea's Broadband Convergence Network (BcN) this procedure was used to identify 12 documents on broadband infrastructure policy that were drafted between 2004 and 2007 and that address the policy agenda for this particular Network. These documents provide insight into three core policy objectives of the BcN, namely media convergence, ubiquitous connectivity and network stakeholder coordination.

The documents fall into two broad categories. The first is comprised of seven formal policy documents that provide text on the policy objectives of the Broadband Convergence Network (BcN) as well as the policy agenda of the private sector firms and the non-profit actors. In this category there are six documents that are self – described as "White Papers" and one document described as a "Master Plan". This includes four documents published by the Ministry of Information and Communication (MIC), which in 2008 was reorganized into the Korean Communication Commission (KCC); one document drafted by the National Information Society Agency (NIA); one document drafted by the National Internet Development Agency (NIDA); and one text by the Office of the Prime Minister.

The second category is comprised of five documents that provide market information on the outcomes and the impact of the BcN in the field. These reports do not contain text on policy objectives of the BcN but unlike the documents in the first category provide quantitative or numerical data which will be used to draw assessments on the efficacy of the BcN's intended outcomes. Each of the five documents, (two from Phase 1 and two from Phase 2) plus one document published in 2008, in this category represent the annual publication of the National Computerization Agency's "Broadband IT Korea Informatization Report". The five documents represent five annual editions of the report starting with the document published in 2004 and ending with the one published in 2008. This data provides unique value as it can be used to assess the efficacy of the text provided in the seven documents.

All 12 documents were collected in a robust search of on-line databases linked to the official websites for the Ministry of Information and Communication, the Korea Broadcasting Commission and the Korea Communications Commission. In addition to the on-line databases for the regulatory agencies policy texts were gathered that are linked to the official websites of the government bodies that have been established to provide strategic support, research and consulting for the Broadband Convergence Network (BcN), specifically the National Information Society Agency (NIA) and the National Internet Development Agency (NIDA). Finally documents have been collected that are accessible on the websites for the non-profit government affiliated research institutes, specifically the Korea Information Society Development Institute (KISDI) and the Electronics Telecommunications Research Institute (ETRI). The document search was exclusively on the English language version of the site and all the interview subjects said that the documents on the English and Korean versions of the sites were identical. None of the documents were translated.

### Establishing an Inventory Map or Catalog for the Documentary Research Procedure

In order to establish an inventory map to catalog the 12 documents included in this dissertation's documentary research procedure it is important to identify the unit of analysis. Out of the 12 texts there are seven documents that provide textual evidence on broadband policy in South Korea and each of these seven contains a section on the policy objectives of the Broadband Convergence Network (BcN). In addition there are five documents that provide numerical or graphical evidence on broadband policy in South Korea and each of these four contains a section on the policy objectives of the Broadband Convergence Network (BcN). So this dissertation's unit of analysis consists of distinct and discrete affirmative statements on the policy objectives of the BcN from the seven documents. The policy objectives were initially identified in the section of each document that is specifically designed to identify the objectives for the BcN and then a thorough documentary research analysis of each document was conducted. The key informants verified the authenticity, validity and reliability of the objectives listed in these sections of the documents. Out of these seven texts, there are three documents that were published during the first phase of the BcN (2004 - 2005) and four documents that were published during the second phase of the BcN (2006 - 2007).

Distinct and discrete affirmative statements were cataloged within these seven specific texts that pertain to three objectives of the BcN. With respect to the first objective, specifically media convergence, the inventory map will include statements from each of the seven documents (three from the first phase of the BcN and four from the second phase of the BcN) that constitute distinct and discrete affirmative statements on an agenda for 1) integrating distinct media content; 2) integrating wired and wireless infrastructure; 3) integrating telecommunications, broadcasting and IT infrastructure. Each of these three factors is represented in the BcN Communication Utility Model.

In terms of the second objective, ubiquitous connectivity, the inventory map will include statements from seven documents (three from the first phase of the BcN and four from the second phase of the BcN) that constitute distinct and discrete affirmative statements on an agenda for 1) upgrading IP platforms; 2) promoting research and development projects to expand connectivity; 3) deploying wireless broadband access; 4) deploying Fiber To The Home (FTTH) / HFC (Hybrid Fiber and Cable) infrastructure. Each of these four factors is represented in the BcN Communication Utility Model.

In regards to the third objective, specifically network stakeholder coordination, the inventory map will include statements from the seven documents (three from the first phase of the BcN and four from the second phase of the BcN) that constitute distinct and discrete affirmative statements on an agenda for 1) the role of stakeholders in providing resources or funding for research and development projects; 2) the role of stakeholders in identifying which platforms, applications and services are the best fit with launching the BcN; 3) and the role of stakeholders in devising strategies for the infrastructure that utilize the BcN's pilot projects. Each of these three factors is represented in the BcN Communication Utility Model.

## Using Key Informant Interview Technique

The primary purpose of these key informant interviews is to complement and provide context for the documentary research method by obtaining professional judgments on the efficacy of policy objectives of the Broadband Convergence Network (BcN) that are stated in the policy documents. The data from these sources is utilized to gain insights into what factors impact the nations' policy documents on the objectives of the Broadband Convergence Network (BcN) that cannot be determined from the documents alone.

There are a number of procedures for selecting key informants based on qualitative methodology (Gubrium & Holstein, 2002). Informants are not selected randomly for studies using a qualitative methodological approach (Gilchrist & Williams, 1999). Random sampling, as one type of probability sampling, assumes that there is a population of key informants who are all equally valuable as participants for the purposes of the study. However the knowledge or perspective being sought by the researcher, as well as the inclination and ability to share that information with the researcher, is not equally distributed among the entire population universe of informants. Therefore Gilchrist & Williams (1999) argue that "the selection of key informants represents non-probability sampling referred to as purposeful, strategic, or information—rich sampling. The selection attempts to yield a small number of informants who provide information—rich pictures of aspects of information or knowledge distributed within study populations" (p. 76). There are at least two sets of criteria to be used sequentially in finding key informants: the type of information being sought; and compatibility for an ongoing relationship (Johnson, 1990).

Interview research can be divided into two different types: structured and unstructured. A structured interview is often referred to as a "survey or questionnaire research, where researchers ask questions in a fixed order with predetermined responses as choices. The interview is short in duration, typically lasting no more than an hour" (Beck & Manuel, 2008, p. 73). In unstructured interviews "The interviewer asks openended questions and allows participants to respond in their own words. These in – depth and intensive interviews may be a half hour to three hours in length" (Beck & Manuel, 2008, p. 73-74). This dissertation utilizes a blend of structured and unstructured techniques. In designing the questions precautions were taken to ensure that the questions are clear, economical, not double barreled, and that the questions do not lead the subject towards a particular answer. In order to accomplish this the interviews were pretested with colleagues in order to trouble shoot before the actual interviews were conducted.

The key informants were interviewed in accordance with human subjects research protocol (Denzin & Lincoln, 2005). Since the participants signed informed consent forms that guarantee their anonymity, their identities will be cloaked throughout this dissertation. The promise of anonymity was important for those key informants who are either officials in government or executives at large multinational corporations. For example these subjects wanted to be able to provide forthright professional opinions about the limitations of their organization's broadband strategy without being reprimanded by their superiors for being candid. There were no risks for the key informants in participating in this research. In addition the interview tapes, the paper copies of the interviews and the signed and completed informed consent forms are securely stored in a safety deposit box.

It is worth mentioning some advantages and disadvantages to the personal interview method. Advantages include the fact that it is the most flexible means of obtaining information because the face – to – face situation lends itself easily to questioning in greater depth and detail. According to Marshall & Rossman (2006) "an interview yields data in quantity quickly. When more than one person participates the process takes in a wider variety of information" (p. 101 - 102). Disadvantages include the introduction of researcher bias, and limitations with sample size and sample selection external validity. However this dissertation seeks to mollify some of these limitations by

integrating a documentary research procedure to add depth and perspective to the data from the interviews.

## Field Interviews for the Research on the BcN

With funding from a Dissertation Completion Fellowship, provided by the Graduate School at Michigan State University, 25 key informants were interviewed both at Michigan State University and in South Korea who have a strong understanding with broadband policy in South Korea. The majority of the interviews were conducted over the course of ten days in South Korea from August 4, 2008 through August 14, 2008. The field interview participants were selected by purposive snowball sampling that was initiated by a network of professional contacts. All of the interviews were conducted in English. The initial contacts were provided by colleagues at Michigan State University. Each interview was recorded on digital audio files and complete transcripts of each session were transcribed into written form.

# Establishing an Inventory Map of Key Informant Interviews

After collecting the transcripts, a systematic two step method was devised to process this data in the form of an inventory map or catalog. In the first step the 25 key informants were placed in four categories including: four academics in universities; four analysts in non-profit government affiliated research institutes, nine executives in firms that provide broadband in South Korea; and eight government officials who serve as regulators and policy staff. The unit of analysis for the key informant interviews is discrete affirmative statements that speak to policy issues on the BcN.

In the second step distinct and discrete affirmative statements are categorized into the three objectives: media convergence; ubiquitous connectivity; and network stakeholder coordination. Within the media convergence objective, the statements are categorized into three factors 1) integrating distinct media content; 2) integrating wired and wireless infrastructure; 3) integrating telecommunications, broadcasting and IT Within the ubiquitous connectivity objective, the statements are infrastructure. categorized into four factors 1) upgrading IP platforms; 2) promoting research and development projects to expand connectivity; 3) deploying wireless broadband access; 4) deploying Fiber To The Home (FTTH) / HFC (Hybrid Fiber and Cable) infrastructure. Within the network stakeholder coordination objective, the statements are categorized into three factors 1) the role of stakeholders in providing resources or funding for research and development projects; 2) the role of stakeholders in identifying which platforms, applications and services are the best fit with launching the BcN; 3) and the role of stakeholders in devising strategies for the infrastructure that utilize the BcN's pilot projects. Each of these three factors is represented in the BcN Communication Utility Model. The distinct and discrete affirmative statements provided by the key informants provide an informed perspective on the textual data from the documentary research procedure.

## **CHAPTER 6 – KEY FINDINGS OF CASE EVIDENCE**

This dissertation explores four research questions on the policy agenda for South Korea's Broadband Convergence Network (BcN) between 2004 and 2007. These questions are as follows:

• 1) Which sectoral level factors best explain media convergence, ubiquitous connectivity and network stakeholder coordination?

• 2) At the BcN, level how do different factors explain media convergence?

• 3) At the BcN, level how do different factors explain ubiquitous connectivity?

• 4) At the BcN, level how do different factors explain network stakeholder coordination?

## Providing a Background on the Seven Policy Documents on the BcN

This dissertation's documentary analysis focuses on three policy texts drafted during the first phase of the BcN (2004 - 2005) and four documents published during the BcN's second phase (2006 - 2007). The White Paper 2004: Dynamic Digital Korea IT Leading to U – Korea is one of the texts published during the BcN's first phase. This text was published in 2004 by the Ministry of Information and Communication. The primary impetus for this 120-page document is to present the government's plan for South Korea's broadband infrastructure. According to the document "the purpose of the plan is to create an environment for high-quality broadband multimedia services at speeds of 50-100Mbps by combining telecommunications, broadcasting, and the Internet" (Ministry of Information and Communication, 2004, p. 15).

The 2004 White Paper Internet Korea is a second document that was published during the second phase of the BcN. This text was published by the National Computerization Agency, which has been renamed the National Information Society Agency (NIA). The main purpose of this 80-page document is to establish the government's agenda for the country's broadband infrastructure. According to this text "the government has created an environment to establish a Broadband Convergence Network (BcN) to prepare for a future ubiquitous society" (National Computerization Agency, 2004b, p. i). Moreover "the 2004 Korea Internet White Paper will be useful in gaining a basic understanding of the present and future broadband Internet environment of South Korea. It provides a structured outlook on the future development of the broadband Internet environment, trends in the Internet sector, and the current status of Internet usage by companies and citizens" (National Computerization Agency, 2004b, p. i).

A third document from the first phase of the BcN is the policy text entitled Broadband IT Korea Vision 2007: The Third Master Plan for Informatization Promotion and was drafted on April 30, 2004 by the South Korean Office of the Prime Minister. The primary intent of this 111-page document is to articulate how "by constructing a broadband convergence network (BcN), [South Korea] will be able to efficiently cope with the changing IT environment including the convergence of wire and wireless communication and the fusion of telecommunication and broadcasting" (Office of the Prime Minister, 2004, p. i-ii).

This dissertation also analyzes four policy texts drafted during the second phase of the BcN (2006 - 2007). The first document from the second phase of the BcN is entitled 2006 Korea Internet White Paper and was published in May 2006 by the National Internet Development Agency. The main purpose of this 90-page white paper is to

expand the national broadband infrastructure so as to accommodate the trends of mobilization and convergence. Furthermore the document is structured in three parts where "Part 1 covers the foundation and status of the broadband infrastructure, Part 2 covers web – based services over the broadband infrastructure and Part 3 covers information on broadband infrastructure related public policies, laws and regulations" (National Internet Development Agency, 2006, p. ii).

The second document from the second phase of the BcN is entitled White Paper 2005: Dynamic Digital Korea IT Leading to U – Korea and was published in October 2006 by the Ministry of Information and Communication. The primary function of this 90-page document is to present the government's plan for South Korea's broadband infrastructure. This white paper "represents the government's vision and strategy for setting up a cutting edge broadband infrastructure such as the Broadband Convergence Network (BcN), and (prescribes) policies that foster new growth engines such as the development of digital multimedia broadcasting (DMB) terminals" (Ministry of Information and Communication, 2006, p. i).

The third document from the second phase of the BcN is entitled White Paper 2007: Broadband IT Korea and was published in May 2007 by the Ministry of Information and Communication. The purpose of this 118-page white paper is to discuss how "government initiatives have contributed to the early development of the broadband infrastructure and have allowed the government in cooperation with the private sector to create an environment where people are inspired to become creative users of the world's best broadband infrastructure" (Ministry of Information and Communication, 2007, p. 17).
The fourth document from the second phase of the BcN is entitled White Paper 2006: Dynamic Digital Korea IT Leading to U – Korea and was published in June 2007 by the Ministry of Information and Communication. The purpose of this 94-page white paper was to "detail the major policies and achievements of the Ministry of Information and Communication during the second phase of the BcN and provide the government's vision for the broadband infrastructure's future directions" (Ministry of Information and Communication, 2007, p. ii).

### Providing a Background on the Key Informants Familiar With the BcN

In order to supplement the data from the documentary research 25 key informants who have a strong understanding of the country's broadband policy were interviewed both at Michigan State University and in South Korea. This includes key informants from four categories: four academics in universities; four analysts in non-profit government affiliated research institutes, nine executives in firms that provide broadband in South Korea; and eight government officials who serve as regulators and policy staff. The identities of the key informants have been cloaked to protect their anonymity.

### Addressing Research Question 1

The first research question asks: Which sectoral level factors best explain media convergence, ubiquitous connectivity and network stakeholder coordination? In order to address this research question it is important to consider the role of the organizational actors participating in the BcN, particularly during its first phase (2004 - 2005) and second phase (2006 - 2007). These organizational actors included governmental bodies such as the Ministry of Information and Communication (which was reorganized into the Korea Communication Commission in 2008), private sector firms such as Korea

Telecommunications (KT) and non-profit research institutes such as the Korea Information Society Development Institute.

The BcN infrastructure was launched as a multi-year three-phase project. The first phase comprised approximately a two-year period from 2004 through 2005 and is considered the foundation phase. The second phase lasted from 2006 through 2007. The third phase extended from 2008 through 2010. However this study looks only at the first and second phases. The primary agenda for the first phase was to launch the BcN. This entailed exploratory research and planning on intended goals, benefits and impacts for all the organizations involved in the BcN. In the first phase the government took the lead in terms of overseeing and funding the BcN, while industry and non-profit played more of a secondary role. The government's plans included strategies for getting the private sector to invest in the BcN and commissioning government affiliated non-profit research centers to do engineering and social science studies on the implementation and implications of the BcN. During this phase most of the investments came from the Ministry of Information and Communication.

# The First Phase (2004 – 2005)

During the first phase the government was particularly keen on forwarding the objectives of media convergence, ubiquitous connectivity and network stakeholder coordination (See Figure 1). With respect to media convergence the government took the lead role in encouraging the participation of private sector firms and non-profit research institutes particularly in terms of three high profile factors. These factors include integrating distinct media content, integrating wired and wireless infrastructure;

and integrating telecommunications, broadcasting and information technology infrastructure (See Figure 1).

In terms of integrating distinct media content, firms in the private sector and nonprofit groups were obligated to follow the government's lead on standardizing core broadband technologies for the BcN to facilitate convergence of content (Ministry of Information and Communication, 2004, p. 25). An official at the Telecommunications Policy Planning Division of the Korea Communications Commission confirmed that the private sector "looked to leadership from the MIC on the standardization process".1 With respect to the integration of wired and wireless factor (See Figure 1) the government established and managed a plan to transform fixed and wireless subscriber networks into broadband and digital networks of the BcN where private firms and research institutes were expected to comply with government recommendations (National Computerization Agency, 2004, p. 21). An executive at the Broadband Ubiquitous Infrastructure Service Department at Korea Telecom (KT) noted at the "MIC's plan on creating an environment where users can enjoy seamless service regardless if on a wired or wireless network was been followed closely by KT in 2004 and 2005".2 With regards to the integration of telecommunications, broadcasting and information technology infrastructures (See Figure 1) the financial support of the government, USD\$59.6 billion plus strategic leadership and consultation were used as policy tools to encourage firms to pursue convergence of broadcasting, telecommunications and the BcN's high speed Internet service (Office of the Prime Minister, 2004, p. 87).

With respect to ubiquitous connectivity objective the government took the lead role in encouraging the participation of private sector firms and non-profit research

institutes particularly in terms of four high profile factors. These factors include upgrading Internet Protocol (IP) platforms, promoting research and development projects to expand connectivity, deploying wireless broadband access; and deploying Fiber To The Home (FTTH) / HFC (Hybrid Fiber and Cable) infrastructure (See Figure 1).

In terms of the upgrading IP platforms (See Figure 1) the government was committed to expanding a trial network for IPv6 (Internet Protocol version 6) which extends e-mail addresses to all end users of the BcN. Private sector firms were expected to build services and the research institutes were expected to start research and development (R&D) pilot projects based on the government's trial network (Ministry of Information and Communication, 2004, p. 27). With respect to the promoting R&D projects to expand connectivity (See Figure 1) the government took the lead on the development of a digitalization model that involves R&D pilot projects on e-learning and virtual offices which private firms were encouraged to emulate when designing service for the BcN. Research institutes were expected to focus on this model when writing commissioned reports on the BcN social impacts (National Computerization Agency, 2004, p. 22). An official at the Telecommunications Policy Research Division of the Korea Information Society Development Institute remarked that studies on virtual offices and telecommuting conducted by the research institute where s/he works received considerable interest from the private sector and that the firms have organized their work force accordingly.3

In terms of deploying wireless broadband access (See Figure 1) the government promoted the standardization and technological development of the mobile Internet and the distribution of spectrum for high speed wireless local area network (LAN) services

for the BcN while the private sector and research institutes were expected to follow the government's lead (Office of the Prime Minister, 2004, p. 90). As for deploying Fiber To The Home (FTTH) / HFC (Hybrid Fiber and Cable) infrastructure (See Figure 1) the government took the lead role in encouraging the development of a model for distributing FTTH and HFC service of the BcN in residential environments. The private sector was expected to follow the government's lead in deciding how to make this FTTH and HFC service ubiquitous in the future. Research institutes were charged with the role of conducting studies on the social impacts of the FTTH and HFC networks. (National Computerization Agency, 2004, p. 21). An official at the Government Relations Team of SK / Hanaro Telecommunications said that in 2004 and 2005 the government provided tax benefits and funding to deploy FTTH and HFC that improve connectivity to the BcN.4

And regarding network stakeholder coordination the government took the lead role in encouraging the participation of private sector firms and non-profit research institutes particularly in terms of three high profile factors. These include the role of stakeholders in providing resources or funding for R&D projects; the role of stakeholders in identifying which platforms, applications and services are for launching the BcN, and the role of stakeholders in devising strategies for the infrastructure that utilize the BcN's R&D pilot projects (See Figure 1).

Regarding the role of stakeholders in providing resources or funding for R&D projects the government invested \$USD 1.5 billion in R&D projects designed in 2004 and 2005 to promote electronic government services. The private sector was expected to take over the investment in these projects during the BcN's second phase. The research

institutes were expected to conduct studies on the efficacy of the government's investment in these R&D projects (National Computerization, 2004, p. 22). With respect to role of stakeholders in identifying platforms, applications and services that are best fit with launching the BcN, an official at the Information Technology Policy Division of the National Information Society Agency noted that the government put in place a supply and demand system of services, platforms and applications of core equipment such as Wireless Broadband or Digital Multimedia Broadcasting that met the needs of the BcN at its launch.5

The private sector was required to participate in developing this core technology based on needs identified by the government. And the research institutes were required to do studies on how effectively this core equipment was being deployed (Ministry of Information and Communication, 2004, p. 27). Regarding the role of stakeholders in devising strategies for the infrastructure that utilize the BcN's R&D pilot projects an official at the Technology Strategy Research Division of the Electronics and Telecommunications Research Institute remarked that the government started projects that were designed to create new markets for the BcN's next generation infrastructure that allow for emerging interactive services of the BcN such as new features for sending text or instant messages over the BcN infrastructure.6 The private sector and the research institutes were expected to pursue similar projects during the subsequent phases of the BcN (Office of the Prime Minister, 2004, p. 93).

## The Second Phase (2006 – 2007)

The second phase occupied a roughly two-year period from 2006 through 2007 and has been referred to as the "Commercial Deployment Phase" (National

Computerization Agency, 2006). The primary agenda for the second phase was to improve the BcN and to encourage the private sector to become the primary investor in the project. During this phase the private sector firms, not the government, were primarily responsible for investing in R & D projects that would serve as test beds for the BcN. While large corporations like KT and SK / Hanaro Telecom would provide a large share of the financial investment the government would play a role in assisting smaller firms and non-profits, that were interested in being involved with the BcN but could not afford to be involved, with the financing. The government affiliated non-profit research centers would be commissioned to conduct more advanced studies based on the experience with the BcN's first phase.

In terms of the convergence the government was no longer responsible for taking the lead on standardizing core broadband technologies for the BcN which firms in the private sector and non-profit groups were obligated to follow. Instead large firms in the private sector such as KT and SK / Hanaro Telecom were primarily responsible for standardizing core broadband technologies for the BcN to facilitate convergence of content and the government merely commissioned the research institutes to issue reports on social implications of these technologies or conduct independent R&D projects using these technologies (Ministry of Information and Communication, 2006, p. 19). An executive at the Broadband Ubiquitous Infrastructure Service Department at Korea Telecom (KT) noted that by 2006 the government was no longer interested in maintaining a leadership role in the standardizing process and it was simpler for us at KT to handle this responsibility on our own without regulatory oversight.7

With respect to the integration of wired and wireless factor (See Figure 1) the government no longer oversaw and managed a plan to transform fixed and wireless subscriber networks into broadband and digital networks of the BcN. During the second phase these responsibilities were assumed by large firms in the private sector such as KT and SK / Hanaro Telecom and occasionally these companies commissioned the research institutes to conduct studies on the social impacts of these networks (National Internet Development Agency, 2006, p. 70). An official at the Government Relations Team of SK / Hanaro Telecommunications remarked that by late 2006 our firm and KT were doing the vast majority of the investment in R&D and network infrastructure development for integrating wired and wireless infrastructure while the government spending was being radically scaled back.8 With regards to the integration of telecommunications, broadcasting and information technology infrastructures (See Figure 1) the private sector invested \$USD1.8 trillion while the government invested a comparatively meager \$USD 100 billion to pursue convergence of broadcasting, telecommunications and the BcN's high speed Internet service (Ministry of Information and Communication, 2007a).

In terms of upgrading IP platforms the government was no longer involved in expanding a trial network for IPv6 (Internet Protocol version 6) which extends e-mail addresses to all end users of the BcN. A professor at the Korea Advanced Institute for Science and Technology said that large firms in the private sector such as KT and SK / Hanaro Telecom had already launched their own IPv6 networks for the BcN.9 The research institutes were responsible for R&D projects on IPv6 users for universities and other non-profit organizations (Ministry of Information and Communication, 2007b, p. 77). With respect to the promoting R&D projects to expand connectivity the government

no longer had a leadership role on the development of a digitalization model that involves R&D pilot projects on e-learning and virtual offices. An executive at the Corporate Strategy Department of Real Networks Asia Pacific pointed out that starting in 2006 the private sector firms started to invest in their own virtual office and tele-commuting projects, based on their unique corporate interests and the government's pilot projects were no longer relevant.10 The research institutes and smaller private sector firms such as Dacom and Daum were primarily designing these services for the BcN (Ministry of Information and Communication, 2007b, p. 29).

In terms of deploying wireless broadband access (See Figure 1) the government no longer had the primary role in promoting the standardization and technological development of the mobile Internet and the distribution of spectrum for high speed wireless local area network (LAN) services for the BcN. Instead during the second phase large firms in the private sector such as KT and SK / Hanaro Telecom had assumed the lead role in negotiating this standardization process (Ministry of Information and Communication, 2007b, p. 20). As for deploying Fiber To The Home (FTTH) / HFC (Hybrid Fiber and Cable) infrastructure (See Figure 1) the government did not have a lead role in distributing FTTH and HFC service of the BcN in residential environments. An official at the Telecommunications Policy Research Division of the Korea Information Society Development Institute remarked that large firms in the private sector such as KT and SK / Hanaro Telecom played a dominant role in the provision of FTTH and HFC service.11 The role of government was limited to open access rules which gave smaller firms such as Dacom and Daum the opportunity to compete. (National Internet Development Agency, 2006, p. 71).

Regarding the role of stakeholders in providing resources or funding for R&D projects the government had ceased its capital expenditure on R&D projects designed to promote electronic government services. Large and small firms in the private sector invested over \$USD 50 billion in these projects and the research institutes took over the government's role in leading R&D projects specializing on e-government (Ministry of Information and Communication, 2006, p. 19). With respect to role of stakeholders in identifying platforms, applications and services that are best fit with launching the BcN, the government no longer oversaw the supply and demand system of core equipment for the BcN. Instead an official at the Government Relations Team of SK / Hanaro Telecom played a dominant role in developing services, applications and platforms for the BcN such as Wibro and DMB.12

The private firms occasionally requisitioned the research institutes to conduct independent studies on the social implications of these technologies (National Internet Development Agency, 2006, p. 72). Regarding the role of stakeholders in devising strategies for the infrastructure that utilize the BcN's R&D pilot projects an official at the Information Technology Policy Division of the National Information Society Agency said that the government no longer had a dominant role in strategizing projects and private firms had assumed the vast majority of this decision making.13 Instead large firms in the private sector such as KT and SK / Hanaro Telecom made the vast majority of the strategic decisions on the value of the R&D projects, while government provided consultations on an ad hoc basis at the request of the private sector (Ministry of Information and Communication, 2007b, p. 101).

### Summarizing the Findings for Research Question 1

There are four main points that summarize the findings for Research Question 1, which asks which sectoral level factors best explain media convergence, ubiquitous connectivity and network stakeholder coordination?

•The first point is that the BcN was deployed in three phases and this dissertation focuses on the first two. The first lasted from 2004 – 2005 and was characterized by government leadership of the BcN while the private sector and research institutes played a secondary and supporting role. The second phase lasted from 2006 through 2007 and was characterized by the private sector assuming the leadership of the BcN while the government played a reduced role and the research institutes played a more specialized role in supporting the private sector. Every key informant concurred on the transition of the BcN from a government dominated project during its first phase to a private sector led project during its second phase.

• The second point is that there are three factors associated with the media convergence objective for the BcN specifically: 1) convergence of content, 2) convergence of wired and wireless networks and 3) the convergence of telecommunications, broadcasting and information technology infrastructure. Both the documents and the key informants stressed the high profile nature of these factors.

• The third point is that there are three factors associated with the ubiquitous connectivity objective for the BcN specifically: 1) upgrading IP platforms, 2) promoting research and development projects to expand connectivity, 3) deploying wireless broadband access; and 4) deploying Fiber To The Home (FTTH) / HFC (Hybrid Fiber and

Cable) infrastructure. Both the documents and the key informants stressed the high profile nature of these factors.

• The fourth point is that there are three factors associated with the network stakeholder coordination objective for the BcN specifically: 1) the role of stakeholders in providing resources or funding for R&D projects, 2) the role of stakeholders in identifying which platforms, applications and services are the best fit with launching the BcN, and 3) the role of stakeholders in devising strategies for the infrastructure that utilize the BcN's R&D pilot projects. Both the documents and the key informants stressed the high profile nature of these factors.

## Addressing Research Question 2

Research Question 2 asks: At the BcN level, how do different factors explain media convergence? Whereas Research Question 1 looks at the role of sectoral level actors in conceiving the BcN model, Research Question 2 and the subsequent research questions exclusively consider the roles that individual level factors play in the BcN Model (See Figure 1).

## **Convergence of Media Content Factor**

The convergence of media content is a critical factor of the media convergence objective of the BcN (See Figure 1). The project's stakeholders are interested in "creating an integrated service environment that converges content such as voice on wired and wireless telecommunications, broadcasting, and Internet data" (National Computerization Agency, 2004, p. vii). The primary tool to accomplish this integration of varied media services is: an open network that delivers a variety of convergence services of voice and data, wired and wireless, and telecommunications and broadcasting during its first two phases. This is intended to allow a service that can send and receive a wide array of broadband multimedia information. For example, it will allow a wide range of applications and services to be easily developed based on open networks that converge media. (National Computerization Agency, 2004, p. 20).

This open network is a component of the BcN that is designed to converge or

integrate discrete media such as audio, video and data.

According to a prominent policy text:

The biggest buzzword of the ICT industry today is the convergence of telecommunication and broadcasting media forms via the digitalization of audio, video and other modes of content. Given this, a number of activities will be carried out by 2008. First of all the BcN's service providers will be allowed to enter into multiple businesses within an open network that integrates media content services and applications instead of having to acquire many different licenses for each service type on different structures (Ministry of Information and Communication, 2007a, p. 64).

A high placed official the National Information Society's IT Policy Division said that the

open network was being evaluated along numerous criteria such as license review

procedures and criteria such as interconnection regimes and universal service

considerations by the end of 2007. The Ministry of Information and Communication will

identify strengths and weaknesses of the systems to promote competition within the open

networks connected to the BcN.14

The open network is designed with concrete and specific applications in mind.

For example:

The MIC is pursuing system reform in data broadcasting and is pursuing applications for data broadcasting for open networks connected to the BcN in 2006 and 2007. In data broadcasting, satellite broadcasting started data broadcasting for the first time in the world in May 2003. CATV and terrestrial TV started data broadcasting in 2005 and May 2006,

respectively. By the end of 2007 the government intends to integrate these versions within an open network environment. To promote data broadcasting, the Ministry of Information and Communication developed profit models like killer contents for the BcN and crafted user authentification systems and secured program interfaces across media throughout the BcN. As a result, the MIC could nurture data broadcasting as a next generation growth engine for handset manufacturers, content providers, middleware companies, broadcasting companies, network providers and distribution / logistics companies all of which would participate actively on the BcN's open network (Ministry of Information and Communication, 2006, p. 66).

There was widespread agreement with this assessment among the key informants that were interviewed. A high placed official at the Telecommunications Policy Planning Division at the Korea Communications Commission corroborated the efforts of the government to focus on data broadcasting as a practical application of the open network when he said:

In order to promote the development of an open network as a component of the BcN that integrates content such as information technology and broadcasting the government oversaw the launch of data broadcasting pilot service, which was jointly conducted by the broadcasters and others in the private sector, who offer services over the BcN. The government developed a service model through its analysis on the viewers' requests, while encouraging the development of application software and content that integrates broadcasting and other media15

However the open networks of the BcN would serve functions that were not limited just to integrating data and broadcasting media. For example the open network would integrate a variety of media forms:

The government intends to oversee the introduction of an open network to stimulate the integration of media services, to enhance the competitiveness of digital broadcasting and new media content and to improve the transmission quality of media applications that converge voice, video and data services (Ministry of Information and Communication, 2006, p. 66-67).

One real world practical example of an outcome of this innovation would be to enable users of the BcN's cable television service to e-mail and text message other users over the BcN's cable television service while watching television and without having to be signed up on a separate mobile phone service and without having to use of a computer that is not integrated into the BcN's cable television service.

### **Convergence of Wired and Wireless Infrastructure Factor**

The convergence of wired and wireless broadband infrastructure is a prominent factor of the media convergence objective of the BcN (See Figure 1). The "integration of wireless and wired infrastructure promises to create new profit models by establishing the world's first Broadband convergence Network (BcN)" (Ministry of Information and Communication, 2006, p. 19). The government made two important decisions which reflect its agenda for the convergence of wired and wireless broadband infrastructure for the BcN. The first involves the Ministry of Information and Communication's decision to promote convergence among two categories of wired and wireless broadband infrastructure and the second decision entails reclassifying broadband Internet access service on the BcN from a value added telecom service to a facilities based service.

With respect to the first decision:

The government is promoting the media convergence of the BcN particularly through the integration of two categories of wired and wireless services. These are contents service and phone-to-web service based on service types. Recent phone-to-web services, aside from contents search / download, allow the subscriber to upload personal contents such as photos or video clips produced with one's camera phones to a personal homepage or blog. (National Internet Development Agency, 2006, p. 63)

Many of the key informants that were interviewed argued that this policy approach of promoting convergence of two specific categories for converging wired and wireless infrastructure on the BcN was effective in setting a policy environment that provides industry with leadership on the convergence issue. For example a senior executive at KT's Broadband Ubiquitous Infrastructure Service Development department that were interviewed said:

Since the government made the integration of wireless and wired networks a priority and simplified the regulatory environment for this convergence the market has really responded. For example the distinction between the types of services and applications that were formally only available on either wireless or fixed broadband enabled networks is being erased and this convergence will also be at work on the BcN's infrastructure.16

With respect to the second decision:

The government has re-classified the category of the broadband Internet access service on the BcN from the current category of value added telecom service to the new category of facilities based service. The government intends to utilize this reclassification as a tool to increase market competition and to prevent the incumbent leaders in the fixed-line and wireless telecom market from blocking access of new market entrants that offer combined fixed and mobile services over the BcN. (Ministry of Information and Communication, 2007, p. 69).

Government officials confirmed that the government's decision to reclassify broadband service would have tangible implications for the BcN in terms of promoting more direct competition between wired and wireless broadband providers and thereby encouraging firms in the private sector to converge their wired and wireless networks over the BcN. For example an analyst in the Korea Communications Commission said that

So far our internal studies have shown that the decision to reclassify broadband will work well for the BcN in that it has precipitated a growth of new services and growth engines. Since 2006 the government has been encouraging competition specifically mergers and acquisitions in the broadband sector to promote the introduction of new telecom services for the BcN that integrate fixed and mobile infrastructure.17

# Convergence of Telecommunications, Broadcasting and Information Technology

# **Infrastructures Factor**

The integration of broadcasting, telecommunications and information technology infrastructures is a high profile factor in the government's media convergence objective for the BcN (See Figure 1). This factor has received considerable attention in government and industry circles. One of the documents published during the first phase of the BcN notes:

The recent ICT [Information and Communication Technologies] environment is rapidly moving towards digital convergence, which brings together the industries of telecommunications, broadcasting and the Internet. At the same time, the trends of intelligence, convergence and broadband are being reinforced in the services and devices of information and communication networks. In order to respond to such a drastic change in the ICT environment, particularly with respect to vibrant high growth ICTs that converge media multimedia content, the South Korean Government has set forth a plan to aid the creation of the Broadband convergence Network (BcN) (National Computerization Agency, 2004, p. 18).

The key informants in the non-profit research institutes that were interviewed agreed with

this point. For example a senior official at the non-profit research center, the Electronics

and Telecommunications Research Institute, concurred with the high profile nature of this

factor of the BcN's media convergence objective with the observation:

The government intends to oversee improvements to the existing broadband infrastructure during the second phase of the BcN which will contribute to its ability to create various business models and lead the existing broadcasting infrastructure such as terrestrial, cable and satellite, into going digital while developing into the convergence of telecommunications and broadcasting networks. By the end of the BcN's second phase there are plans to construct an access network for subscribers of the BcN which integrates existing public wireless LAN networks, xDSL networks, CATV networks, mobile communication networks and other access networks by incorporating key telecommunication cable and other media carriers.18

The issue of bundling and interconnection serve as two central dimensions that are critical to integrating broadcasting, telecommunications and information technology infrastructures over the BcN.

For example with respect to the bundling issue one of the documents notes:

The government has taken steps to establish a regulatory environment that encourages the private sector to bundle their broadband services so that telecom operators, KT, Hanaro Telecom, Dacom, SK Telecom, and a couple of cable SOs (Service Operators) offer Triple Play Service [TPS]products or have plans for the service. TPS through telcos generally consist of Internet Protocol Television [IPTV] + telephone, while TPS through cable operators consist of cable TV+Internet+telephone. The government would encourage telcos and cable operators to eliminate these distinction on the BcN (Office of the Prime Minister, 2004, p. 87).

Triple Play Service (TPS) involves the bundling of voice, video and Internet service.

Most of the key informants that were interviewed expressed doubt about this

agenda. For example an official at the Planning and Internet Policy Division of the

National Internet Development Agency was skeptical of this position:

Yes MSOs (Multiple Service Operators) in the cable sector have been offering bundled cable TV and broadband Internet services, but even in late 2005, telephone services were not included. However, cable MSOs are starting to add Internet phones to their service lineup. But equating bundling with convergence that actually integrates the existing broadcasting, telecommunications and Internet infrastructures is a big mistake. Convergence is a much more expensive and complicated process than bundling services just at the users' end.19

With respect to the interconnection issue one of the documents noted:

In response to the emerging convergence of telecommunication and broadcasting, in March 2006 the MIC improved related regulations to become more market friendly. For example, it overhauled the interconnection standards for telecommunication networks, broadcast network and the Internet. The intent of adopting these standards was to provide the Ministry of Information and Communication with increased power promote interconnection authority and to between telecommunications, broadcasting and other media infrastructures and networks that could be implemented into the BcN (Ministry of Information and Communication, 2007a, p. 52 – 53).

Many of the key informants were interviewed were skeptical about the potential for interconnecting the existing broadcasting, telecommunications and information technology infrastructures via the BcN. For example a senior professor at Hanyang University said that regulations to promote interconnection had been "delayed for several months and this delayed telcos from agreeing to interconnection standards for Internet Protocol Television (IPTV), with the cable service operators".20 He added that "convergence changes the market and technical environment and as a result carriers become engaged in mergers and acquisitions and consolidation activities. This can lead to declines in the level of competition status and can be detrimental to government policies to integrate telecommunications, broadcasting and IT infrastructures on the BcN".21

### Summarizing the Findings for Research Question 2

There are two main points that summarize the findings for Research Question 2, which asks at the BcN level, how do different factors explain media convergence?

• The first point is that there is a consensus that convergence of media content via open networks is critical. Furthermore the integration of wired and wireless broadband infrastructure is also critical. This was achieved by promoting convergence over wired

and wireless services and re-categorizing broadband from a value added telecommunications service to a facilities based service.

• The second point is that while the policy documents suggest that the integration of broadcasting, telecommunications and information technology infrastructures is a salient factor of media convergence, many of the key informants that were interviewed disagreed and are skeptical about the efficacy of this factor during the first two phases of the BcN.

## Addressing Research Question 3

Research Question 3: At the BcN, level how do different factors explain ubiquitous connectivity?

## Upgrading the BcN's Internet Protocol (IP) Platforms Factor

The upgrade of the BcN's Internet Protocol (IP) platforms is a pivotal factor in the objective to attain ubiquitous connectivity to the BcN (See Figure 1). Upgrading the BcN infrastructure and platforms into a:

stable All-IP network will enable the early realization of a ubiquitous BcN project, through which South Korea is set to become a world leading nation in terms of Internet infrastructure. The government envisions that the BcN's upgraded All – IP network will establish the country as a global model for next generation Internet development and a ubiquitous broadband enabled society, which will in turn improve the Internet usage environment for all its people (Ministry of Information and Communication, 2007, p. 83).

Most of the key informants interviewed agreed with this assessment. A senior official at the Telecommunications Policy Research Division of the non-profit research center the Korean Information Society Development Institute confirmed the salience of this factor within the BcN's ubiquity agenda by indicating that "the stakeholders of the BcN consider it a priority to upgrade all of the telecommunications and broadcasting networks into all-IP convergence network, assuring the BcN's end-to-end quality of service as well as enabling it to be a ubiquitous network that supports up to 100Mbps".22 An official at the Technology Strategy Research Division of the Electronics and Telecommunications Research Institute noted that the government and private sector decided to upgrade South Korea's IP platforms to make it a foundation for broad consumer access to next generation industries. To this end, the applications and equipment associated with the BcN should allow for ubiquitous connectivity throughout the nation.23 An official at the Planning & Internet Policy Division of the National Internet Development Agency remarked that the government and private sector are adhering to an agenda top put in place a supply and demand system of core equipments needed to build IP network platforms that will create a profitable business model to promote the introduction of video on demand and digital audio services.24

In order to upgrade the BcN's Internet Protocol platforms special emphasis has been placed on Internet Protocol Television or video on demand services and voice over Internet Protocol (VOIP) which allow the transmission of video files and phone calls over the BcN infrastructure.

With respect to IPTV applications one of the documents published during the first phase of the BcN noted:

In the first two phases of the BcN the network needs to be upgraded to meet the expected rapid increase in demand for broadband data communications as a result of the emergence of HDTV class IPTV service and other applications and functions that are critical features the BcN. At this point in time the BcN's infrastructure is far from ready in guaranteeing a high level of quality of service of the Internet such as providing high quality ubiquitous digital communications services but the government intends to rectify this by the end of 2007 (Office of the Prime Minister, 2004, p, 87).

A professor at the Korea Advanced Institute for Science and Technology was able to verify the importance of the role that video on demand and IPTV played in the government's agenda to upgrade to all IP infrastructure for the BcN:

By late 2007 the government planned to complete upgrades towards all IP platforms that include improving ground wave DTV and satellite broadcasting, improving technology to allow multi direction high definition broadcasting and establishing a digital video on demand network for telecommunications and broadcasting as a means to improve the functions of the BcN.25

An official the Soft Power Team of the Presidential Council for Future & Vision said that the by the end of the second phase of the BcN the government and private sector hope to complete the process of upgrading the BcN with all IP network platforms so that the BcN could support high quality digital video on demand in terms of terrestrial and satellite service that would usher in a new age of broadcasting services available on Internet platforms.26 An official at the Information Technology Policy Division of the National Information Society Agency remarked that by the end of 2007 the government and private sector intend to ensure that core technologies of BcN that promote all IP platform services such as digital multimedia broadcasting over the Internet are tested and verified to ensure seamless end user connectivity.27

With respect to VOIP applications a document published during the second phase of the BcN noted that:

By the end of the second phase of the BcN the government intends to upgrade VOIP as a high profile component of the BcN's all-IP network platforms. VoIP is a new telephony service that transmits voice by packet through the Internet network, rather than via the traditional circuit switching network. It has characteristics of both fixed line phones, which are only used indoor, and mobile phones, which are used both outdoor and indoor. Upgrading VOIP services for the BcN is an important component of upgrading South Korea's all-IP networks and will have benefits for the provision of local calls and long-distance calls and comprehensive services comprising voice, data and video can be more easily provided compared to existing telephony services (Ministry of Information and Communication, 2007, p. 46 - 47).

Two key informants that were interviewed agreed with this assessment. A high placed official on the government relations team at SK / Hanaro Telecommunications said "Since VoIP has already entered into market competition with the launch of its commercial service, it is necessary to draw a strategy for upgrading the rest of the IP network platforms of the BcN by the end of 2007".28 The second informant an executive at the Corporate Strategy Department of Real Networks Asia Pacific said that by the end of the second phase of the BcN the government plans to encourage upgrades in the BcN's VOIP technology development. These innovations entail the development of interchangeable middleware and a united home-gateway that entails the spread of Internet based phone service. During the second phase of the BcN the government will support small and medium private companies and other stakeholders engaged in increasing connectivity to the BcN via VOIP which will support in this technology's development in terms of strategic support and consulting services.29

## Promoting R&D Projects in Order to Expand Connectivity to the BcN Factor

There is some textual evidence that the promotion of R&D pilot projects that expand broadband connectivity has been an effective factor in attaining ubiquitous connectivity (See Figure 1). For example the government is committed "to develop concrete research and development (R&D) plans for the BcN, to create world-class IT clusters, to attract R&D centers in private IT companies and non-profit research institutes, in order to expand the accessibility of the BcN's broadband infrastructure by the end of the BcN's second phase" (Ministry of Information and Communication, 2004,

p. 11).

The government engaged in two high profile R&D pilot projects, both of which were designed to promote the ubiquity of the BcN. The first BcN pilot project is entitled Super Computer 3 which was:

introduced at the central IT center at Seoul National University and stands out among numerous R&D projects of 2006 that are designed to improve the ubiquitous connectivity of the BcN. This super computer is connected to existing BcN infrastructure through a cluster of networks and is designed to anticipate network demands that will be placed on the BcN as the need for broadband becomes more widespread. This R&D facility is funded through a series of grants provided by the Ministry of Information and Communication (Ministry of Information and Communication, 2007a, p. 73).

During the first two phases of the BcN the government's capital expenditure on the Super

Computer 3 R&D pilot project was \$USD 18.4 billion (Ministry of Information and

Communication, 2007a, p. 74).

The second R&D project designed to promote the ubiquity of the BcN is entitled

the "Korea@Home Project". The initial funding for the project came from the non-profit

research center the Korea Institute of Science and Technology Information and in the last

two to three years KT and other firms from the private sector have joined the

Korea@Home Project R&D consortium:

to provide subscribers with infotainment such as TV-Video On Demand (VOD), Home Viewer, and lifestyle news. Most recently SK Telecom has

engaged in a number of R&D projects to support various service models such as a TV-based family location service using its mobile network and a home messaging product both of which are critical components of the BcN. The company has pilot launched services based on this R&D and selected households during the 1st half of 2007 (National Internet Development Agency, 2006, p. 75).

During the first two phases of the BcN the Korea Institute of Science and Technology Information's and the private sector's capital expenditure on the Korea@Home Project's R&D amounted to \$USD 68 billion (National Internet Development Agency, 2006, p. 78).

Many of the key informants that were interviewed expressed doubts as to whether these projects were effective in promoting the ubiquity of the BcN. They argued that the firms in the private sector firms, such as KT, have been very vague in developing a strategic vision for how those R&D pilot projects designed to improve ubiquitous connectivity will be implemented.

#### Deploying Wireless Broadband Access Technologies for the BcN Factor

The deployment of wireless broadband access technologies is a key factor in the objective to attain ubiquitous connectivity to the BcN (See Figure 1). In order to promote the deployment of wireless broadband access technologies the private sector telecommunication firms that participate in the BcN, KT and SK / Hanaro Telecom in particular, have been developing a technology called Wibro which is a next generation 3G technology that was first designed in South Korea as an alternative to Wimax, Long Term Evolution (LTE) and other wireless high speed Internet access technologies.

Wibro service was approved by the government for implementation in the BcN during the first phase of the BcN. In 2004, "the approval measure for WiBro was confirmed by the government for participation in the BcN after collecting opinions from experts and those in the related industries through public hearings and discussion forums" (Ministry of Information and Communication, 2006, p. 46). KT and SK / Hanaro

Telecom:

plan to roll out a high speed wireless local area network service with a goal of building the wireless network that ensures 50-100 mega bits per second (Mbps) of bandwidth both at a standstill and on the move. At the same time, Wibro a portable Internet service also will be introduced, offering 30-50Mbps transmission speed in low to medium speed moving environments. In addition, a service that ensures transfer speeds of up to 10 mega bits per second and New Mobile Access will be commercially available for the BcN with the speed of 100Mbps by the end of the project's second phase (National Computerization Agency, 2004, p. 21).

The expectations for Wibro's capacity to augment the ubiquity of the broadband

infrastructure via the BcN was accelerated during the second phase of the BcN. For

example:

Since January 2006 the Ministry of Information and Communication has been actively supporting the expansion of Wireless broadband services that can be integrated into the BcN's infrastructure. To this end, the Ministry of Information and Communication is promoting the expansion of the WiBro network (2006: Seoul and part of the metropolitan area 2007: five major metropolitan cities), and bringing the entire nation into the scope of wireless broadband service. The players in the BcN took action to expand nationally the Wibro terrestrial mobile broadband service by the first half of 2007, and allow the set up of terrestrial digital broadcasting stations in the non-metropolitan areas to encourage early service launch as part of the BcN. The Ministry of Information and Communication has taken notable action during the project's second phase to energize the Wibro 3G market is also notable. For instance, it encouraged investment to help carriers start the provision of wireless services and expanded service scope to 84 cities by the end of 2007. (Ministry of Information and Communication, 2007, p. 61).

Key informants with expertise on South Korea's BcN were divided over whether Wibro played a vital role in the agenda to deploy wireless broadband access technologies. An official the Soft Power Team at the National Information Society Agency said:

WiBro, wireless broadband service, has drawn attention from the domestic communication market as a new communication service. It provides a certain level of space and portability to the high speed Internet and wireless LAN. WiBro is expected to be a new driving force of growth in the communication service industry since it can generate a new market by improving speed and usage rate of the wireless Internet using the mobile phone. Technology and equipment for WiBro will improve significantly in terms of speed and function.30

However many of the key informants expressed some ambivalence about the efficacy of wireless broadband, specifically Wibro technology. They doubt it could serve as a factor that improves the ubiquity objective of the BcN. A professor at the Korea Advanced Institute for Science and Technology said:

Wibro is successful as a technology in terms of the process of its construction and network infrastructure development within the BcN, but there is not much market demand for it in South Korea. So in that sense Wibro is a success and a disappointment. Wibro was developed successfully is recognized with ITU standard certification and the R & D was successfully tested. But it lacks substantial market demand. Furthermore the developers of Wibro had difficulty in finding a killer application for it. As a result the potential to make the BcN a really pervasive and truly ubiquitous wireless access infrastructure via Wibro has been really set back.31

A senior executive at the telecommunications service provider SK / Hanaro Telecom was even more incredulous on the efficacy of Wibro to be a component of the factor to make the BcN more ubiquitous by saying: Hanaro was one of the few founders of the BcN that invested in Wibro from its start. So far the impact of Wibro is more talk and rhetoric than reality. Hanaro has been involved in leading the development of Wibro for several years and has made significant investments but there does not have much practical tangible results to show for it. From a strict business perspective the Wibro has no substantive financial value as a profit making enterprise and is limited to empty rhetoric on forging a ubiquitous broadband infrastructure which in real world terms is mostly an abstract notion.32

## Deploying Fiber To The Home (FTTH) or Hybrid Fiber and Cable (HFC)

There is some textual evidence from the policy documents and key informant interviews that Fiber To The Home (FTTH) or Hybrid Fiber and Cable (HFC) is a factor that played a role in increasing the ubiquity of the BcN (See Figure 1). For example a document published during the first phase of the BcN noted that:

By the end of 2007, the government expects that the FTTH networks of the BcN will expand gradually into residential areas with more than 50 households. The building of FTTH networks within the BcN's infrastructure for the 100,000 households located on islands and in mountainous areas is quite a challenge. To meet this challenge, the government will introduce either a universal service system or provide budgetary support to offer them FTTH and HFC service by 2007 (Ministry of Information and Communication, 2004, p. 20).

An executive at Real Networks Asia Pacific concurred that the government's expectations for FTTH networks are feasible and that this wired infrastructure can be a viable factor in strengthening the BcN's ubiquity agenda. He said:

In 2007 the government is committed to improving the BcN's capacity to integrate a FTTH or HFC network that detects, stores, processes, and integrates the information of objects to and from different places. In other words, FTTH / HFC can be defined as the high speed fiber optic enhanced infrastructure integrating and processing identified information for anyone to use freely regardless of time and place. FTTH and HFC networks will

allow high speed Internet data to be stored, integrated, and processed thereby improving broadband quality for end users of the BcN.33

There were also doubts that the FTTH or HFC networks will be effective in enhancing the BcN's ubiquity. A document published during the second phase of the BcN states that:

A full conversion to FTTH on the BcN infrastructure has been difficult due to the high initial costs involved with laying a lengthy fiber optic network directly to the home. As an interim solution for broadband infrastructure, services are carried on fiber from the central office to the distribution nodes and are then switched to VDSL or Ethernet from the nodes to the homes, but it is unclear if this solution can be maintained on a permanent basis (National Internet Development Agency, 2006, p. 45).

Some of the key informants that were interviewed also expressed doubts about how effective fiber wired networks were as a factor to BcN's ubiquity. A Senior Research Fellow at the Telecommunications Policy Research Division of the non-profit research center the Korean Information Society Development Institute pointed out that even by August of 2008:

the South Korean government and the private sector were yet to agree on ways to actively promote the ubiquity of FTTH or HFC. However the government was expected to announce the policy position that it will not require companies to provide open access to the FTTH networks on the BcN. This could limit the network's ubiquity.34

## Summarizing the Findings for Research Question 3

There are four main points that summarize the findings for Research Question 3,

which asks how different factors explain ubiquitous connectivity.

• Firstly there is a consensus that the upgrade of the BcN's Internet Protocol (IP)

platforms is a critical factor of ubiquitous connectivity.

• Secondly there is uncertainty about the efficacy of R&D pilot projects for expanding broadband during the first two phases of the BcN.

• Thirdly whereas government documents suggest that the deployment of wireless broadband was successful, many outside the government thought that either the success is debatable or the deployment was not viable.

• The fourth point is that there is uncertainty about the efficacy of Fiber To The Home (FTTH) or Hybrid Fiber and Cable (HFC) factor during the first two phases of the BcN.

## Addressing Research Question 4

Research Question 4 asks: At the BcN level, how do different factors explain network stakeholder coordination?

## The Roles of Stakeholders in Supporting the R&D Projects of the BcN Factor

The role of the stakeholders in supporting the BcN's R&D projects serves as a salient factor in attaining network stakeholder coordination for the BcN (See Figure 1). By stakeholders reference is to government bodies that participated during the first two phases of the BcN. They include the Ministry of Information and Communication, private sector firms such as KT and SK / Hanaro Telecommunications, and research institutes such as the Korea Information Society Agency. According to a policy document published during the first phase of the BcN:

The BcN includes an R&D Network, which consists of R&D facilities that develop and verify technologies and services by providing a test-bed for pilot projects. To build these facilities or test-beds, which are deployed in six major cities across the nation, South Korean research institutes such as ETRI and KISDI are conducting coordinated joint studies that received monetary and other support from private sector broadband providers with critical information and social and marketing impacts of the BcN. In the first phase these institutes played a more prominent role in providing resources for the test-beds, but in the second phase the government intends to have the private sector play the primary role (National Computerization Agency, 2004, p. 22).

Non-profit government affiliated research centers at universities and other

forums were given the distinct role in supporting the R&D projects of the BcN in

terms of:

creating a computing grid, a test grid, and an infrastructure that supports joint research on the BcN pilot R&D projects and the institutions – Seoul National University and Pohang University of Science and Technology will take the lead in funding the facilities, laboratory operations and day – to – day managing responsibilities for the test-beds in the Seoul metropolitan area (Ministry of Information and Communication, 2007, p. 42).

Government, specifically the Ministry of Information and Communication, was given a

distinct role in supporting the BcN's R&D projects. However after the first phase of the

BcN these roles were shifted to the private sector. For example:

In 2004 and 2005 the government is responsible for developing and testing the core technology of the BcN's broadband coordination networks through high tech R&D networks. The primary goals of the government's role in the R&D for the BcN is to ensure effective scientific research into product testing for the deployment of BcN, to make sure there is adequate funding for the BcN's advanced pilot R&D projects on an on-going basis, to coordinate R&D test bed activities with the non-profit and private sectors. In 2006 and 2007 the private sector assumed responsibility for these R&D activities (Ministry of Information and Communication, 2007, p. 18 - 19).

The private sector was given a distinct role in supporting the BcN's R&D

projects. For example:

Four consortia of private sector firms – one led by KT, one by SK / Hanaro Telecom, one by Dacom (Internet portal) and one by Daum (cable operator) care operating R&D for the BcN's pilot projects in terms of testing equipment, conducting quality of service tests and funding feasibility studies on how to commercialize cutting edge broadband applications and services for the BcN (National Internet Development Agency, 2006, p. 8).

While each network stakeholder in the BcN had their own distinct roles in the

BcN's R&D pilot projects the majority of the stakeholders' roles were intertwined. For

instance:

To facilitate the development of the BcN's core technologies, the government encourages the joint research activities among the industry, universities and research institutes. The close cooperation helps improve the timing relevance of the research activities and to maximize the outcome of the research activities. Active pursuit of developing core technologies is under way to develop new markets within the structure of the BcN. The government intends to allow companies to use R&D information resources effectively through the formation of a test – beds for the BcN. Moreover the government will secure the IT industry's market leadership by supporting private standardization and making alliances with non-profit research centers in order to maximize the value of R&D resources and investments in the BcN (Office of the Prime Minister, 2004, p. 95).

Most of the key informants that were interviewed agreed that there was cooperation

among private, public and non-profit stakeholders of the BcN. For example an official at

the National Information Society Agency's IT Policy Division said:

During the second phase of the BcN the government is working more closely with the private sector and non-profit research centers to develop a roadmap plan for the BcN's test-beds. Based on this roadmap, the three sides have set out a strategy to build a high-tech R&D network through which they will standardize technologies and services for application to commercial networks. This roadmap is intended to help the three sides to share information on how to develop practical tools for maintaining the BcN's and maximizing value of the BcN's pilot R&D projects.35

## The Roles of Stakeholders in Identifying which Platforms, Applications and Services

## are the Best Fit With the BcN Factor

The role of stakeholders in identifying which platforms, applications and services are the best fit with the launch of the BcN serves as a salient factor in the objective to attain network stakeholder coordination for the BcN (See Figure 1). Four private sector firms, KT, SK / Hanaro Telecommunications, Dacom and Daum and the government were the main stakeholders in identifying applications and services, while the non-profit sector did not play a role in this process except to assess the efficacy of these applications and services once they were in place.

During the first phase of the BcN the government was given a distinct role in identifying which platforms, applications and services will best suit the launch of the BcN. These functions were designated to the private sector after the first phase of the BcN. Specifically, during the first phase of the BcN "in 2004 the government took the lead role in developing technologies such as next generation mobile communications, and broadband enabled D-TV by securing original technologies as a means to lead new markets and to remain at the cutting edge of the broadband centered future of IT development" (Office of the Prime Minister, 2004, p. 78–79). Moreover:

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In 2004 and 2005 the government is developing applications and services for the BcN such as telecom network management service technologies and advanced service technologies that are differentiated from other applications and technologies not affiliated with the BcN. Primary technical developments in this area include the designing and implementation of multi-cast technology for both broadcasting and telecommunications services. Other developments include Internet address setting/allocation protocol functions for BcN users, and networks supporting basic functions for service delivery for the BcN. The government is negotiating with the private sector on how to transfer these responsibilities from the public to the private sector (Ministry of Information and Communication, 2004, p. 29). The private sector was given distinct roles in identifying which platforms, applications and services are most appropriate for the launch of the BcN. These roles include "developing and verifying new BcN Based Service model and supporting commercialization, developing BcN core technologies and commercial network application, activating the BcN communications broadcasting equipment industry" (National Internet Development Agency, 2006, p. 70).

While each network stakeholder in the BcN had their own distinct roles in identifying platforms, applications and services that will best suit the launch of the BcN, the majority of the stakeholders' roles were intertwined. For example:

The government has made efforts to negotiate with the private sector to develop killer applications for the BcN in terms of mobile telecommunication projects in a way that maximizes the potential of the BcN infrastructure. The private sector will gradually take the lead in these negotiations over the course of the BcN's second phase. The government has also been trying to introduce applications and technologies such as digital multimedia broadcasting and 3G mobile broadband into the BcN so that the project can provide users with high quality voice and picture and other media services at anytime and anywhere, and to give a boost to digital broadcasting equipment business and contents business. Moreover during the second phase of the BcN the government has been encouraging the participation of private companies in the BcN representing service, manufacturing and construction industries to develop technologies and applications such as a home network service model (Ministry of Information and Communication, 2007, p. 22 - 23).

Most of the key informants that were interviewed agreed that there was cooperation among private and public stakeholders of the BcN and that after the first phase of the BcN the private sector assumed the lead role in identifying platforms, applications and services that were critical to launching the BcN. A professor at Hanyang University said: The government will be the staunch supporter to the private-sector efforts to develop standards for the BcN as the network transitions from phase 1 to phase 2. It further plans to introduce the 'autonomous certification system for wireless telecommunications manufacturers' to better cope with the changing environment of broadband development particularly on the BcN.36

#### The Roles of Stakeholders in Devising Strategies for Implementing R&D From the

#### **BcN Pilot Projects**

The role of the four private sector (KT, Hanaro SK / Telecom, Dacom and Daum) and government stakeholders in the BcN in devising strategies for implementing R&D from the BcN's pilot projects was a factor in network stakeholder coordination for the BcN (See Figure 1). A paper published by the Office of the Prime Minister in 2004 specified a distinct role for government agencies in devising strategies for implementing R&D from the BcN's pilot projects. This role was less active during the second phase of the BcN than during the first phase. For example:

In 2004 and 2005 the government was uniquely responsible for setting up a National Grid Project to provide an R&D environment for the BcN where researchers in private, government and non-profit institutions can utilize geometrically distributed R&D facilities as if they were a single system. The government is charged with the responsibility of oversight of this grid network and is require to coordinate interactions among the stakeholders on the grid so that the BcN information infrastructure for R&D can be jointly utilized by the respective institutions and the technologies would be developed using coordinated resources. The grid would function as an information and telecommunications service that under the oversight of the government interconnects the BcN's resources through high speed networks and enables the users to share resources. In 2006 and 2007 the private sector assumed ownership responsibility for managing R&D projects for this grid (Office of the Prime Minister, 2004, p. 85). The private sector was given a distinct role in devising strategies for

implementing R&D arising out of the BcN's pilot projects. For instance in 2004, in order to establish a strategy for the BcN's R&D activities, a system of consultants and marketing / management was introduced. The consultants were referred to as Project Managers (PMs), and served as private experts that provided consultative services. Their specific focus was on R&D projects that were seen as new growth engines. The managers and marketers are referred to as Planning Evaluation Commercialization & Marketing (PECoM) organizers. They were involved with standardizing and managing the entire R&D process for the BcN.

The strategic aim of these consultants, managers and marketers was:

to shift the BcN's IT R&D into a performance-based system. Project Managers (PM)s manage the entire process of the project from planning to commercialization. Such a system can promise more successful R&D results for the BcN and increase synergistic effects between the government and the private sector by reflecting technical demands by the private sector on government policy (Office of the Prime Minister, 2004, p. 85).

With that in mind, Project Managers (PM)s set out development strategy for IT growth engines and the master plan, identify new projects and pursue goal-oriented technological development. Consequently:

the Planning Evaluation Commercialization & Marketing (PECoM) organizers were first introduced as a stand-alone institution so that it can be used the R&D strategy as early as possible. In the second phase of the BcN, the government plans to make the (PECoM) organizers compatible with other network stakeholders to ensure functionality of the system and efficient use. The focus of the PECoM system will expand from progress management to the overall process of project planning, evaluation, and follow-up of the BcN's R&D pilot project initiatives. PMs' regular reviews on milestone accomplishments will be reflected in yearly project
evaluations to manage performance in R&D activities for the BcN. The government will continuously work to improve the R&D system to enhance expertise and transparency in selecting and assessing R&D projects (Ministry of Information and Communication, 2004, p. 50).

The non-profit sector was given a distinct role in devising strategies for implementing R&D conceived by the BcN's pilot projects. For example, to bolster the strategy of developing R&D pilot projects for the BcN:

R&D projects for IT start-up assistance centers were established. The R&D for these IT start-up centers are located in universities and non-profit research centers. All are run on a by-region or by university basis. These centers serve as 'incubators' for the launch of the BcN to nurture university-located venture companies that participate in the BcN, as these start-ups can utilize university manpower, advance facilities and equipment for broadband infrastructure and put creative ideas and new technology developed at non-profit research centers into R&D projects for the BcN (Office of the Prime Minister, 2004, p. 53).

Even though each network stakeholder in the BcN had its own distinct roles in

devising strategies for implementing R&D from the BcN's pilot projects the majority of

the stakeholders' roles were intertwined. For example:

by the end of the second phase of the BcN, in order to facilitate the implementation of the BcN, the government is supporting standardization of the R&D pilot projects among institutions from the private, public and non-profit sectors that are involved in the development of the BcN. The government plans to support trade and industry groups, coalitions and trade forums whose agendas involve strategic standardization in the strategic development of test – beds the promote the BcN's successful development. Moreover to facilitate the R&D for new products on the BcN the government is negotiating with the R&D pilot projects at private and non-profit research institutes so as to promote a system of a standard compatibility test and certification for network equipment and software that will be used to allow the BcN to function effectively (Office of the Prime Minister, 2004, p. 86).

Most of the key informants that were interviewed agreed that there was cooperation among private and public stakeholders of the BcN in terms of devising strategies for implementing R&D from the BcN's pilot projects. A senior official at the u-infra services division of the National Information Society Development Agency said that that the stakeholders in the BcN are actively involved in:

promoting strategic standardization of test-bed initiatives and technologies that further the BcN's network establishment and service development. This involves forming and operating an industry-academia-government cooperation system where the roles and specific responsibilities of each of the stakeholders are clearly defined in a way to reinforce linkages between the technology development and standardization activities of all parties participating on the BcN.37

An official the Soft Power Team of the Presidential Council for Future & Vision noted that by the end of the second phase of the BcN the government intends to establish a sufficient R&D foundation for the BcN that will enable the private sector to meet the huge demand for IT.38 These R&D assets will be built through cooperation and partnerships among government, private and research institute actors. An official at the Telecommunications Policy Research Division of the Korea Information Society Development Institute noted that by the end of 2007 the BcN the government will develop a methodology which will evaluate the multilateral economic and social effects of the BcN's R&D outcomes so that the responsibility for R&D activities can be effectively transitioned from the government to private and non-profit organizations.39 This would involve accurate analysis of R&D outcomes and industrial and social demands for the BcN that will ensure the systematic planning of the R&D.

#### Summarizing the Findings for Research Question 4

There are two main points that summarize the findings for Research Question 4, which asks how different factors explain network stakeholder coordination.

• Firstly there is a consensus that all three items in the BcN Communication Utility Model are critical to the network stakeholder coordination objective of the BcN. These items include: the role of the stakeholders in supporting the BcN's R&D projects; the role of the stakeholders in identifying which platforms, applications and services are best fit with the launch of the BcN factor; and the role of the stakeholders in devising strategies for implementing R&D from the BcN's pilot projects.

• Secondly there is uncertainty about the efficacy of the R&D for the BcN in devising strategies for implementing R&D on the BcN. The non-profit actors did not have a defined role in identifying which platforms, applications and services are best fit with the launch of the BcN.

#### Identifying Outcomes of the BcN's Objectives

Thus far the analysis has focused on textual evidence from policy documents and key informants on what factors explain the policy objectives of the BcN. The organizations in the private, public and non-profit sectors each played a distinct role in shaping the success of the BcN's core objectives. However the level of coordination among these actors and the lack thereof played a pivotal role in determining the infrastructure project's policy objectives. For example, the six factors where the evidence from the policy texts and interviews suggests success in forwarding the objectives were also characterized by a high degree of cooperation and coordination among the actors in the diverse sectors. These six factors include: 1) integrating distinct media content; 2) the integration of wireless and wired infrastructure; 3) upgrading to all

- Internet Platforms (IP); 4) the role of stakeholders in providing resources or funding for R&D projects; 5) the role of stakeholders in identifying which platforms, applications and services are the best fit for the BcN; 6) the role of stakeholders in devising strategies for the infrastructure that utilize the BcN's pilot projects. However the four factors where the evidence from the policy texts and interviews suggests a failure in forwarding the objectives were marked by a lack of cooperation and coordination among the actors in the diverse sectors. The four factors include: 1) the integration of telecommunications, broadcasting and information technology infrastructure; 2) promoting R&D projects to expand connectivity; 3) deploying wireless broadband access; 4) deploying Fiber-To-The-Home and Hybrid Fiber and Cable networks.

There is a distinct body of literature on the institutional approach that provides theoretically grounded insights into why coordination and collaboration between actors in the private, public and non-profit sectors can explain why six factors were effective in forwarding the BcN's objectives and four factors were not impactful (Melody, 1997). For example Williamson (2000) offers a transactional cost approach which explains how the concepts of hierarchies and markets can impact coordination and collective dynamics in organizational models such as the BcN. The concepts can be utilized to explain how coordination costs may have been relatively lower for those factors that successfully forwarded the BcN's objectives where there was greater collaboration between actors in the public, private, and non-profit sectors. Moreover the approach would suggest that the coordination costs would have been relatively higher for those factors that were unable to forward the BcN's objectives where there was relatively less collaboration between actors in the public, private, and non-profit sectors.

Levy and Spiller (1996) offer an institutional approach that draws insights into how governance and incentives in regulatory design can impact the choices of the BcN's stakeholders on how to coordinate, to pursue the BcN's objectives. According to the authors (1996) "regulatory governance and incentives are choice variables for policymakers. Choices about regulatory governance are constrained by the specific institutional endowment of the nation, which determines the form and the severity of the country's regulatory problems and the range of options of resolving them" (p. 4). Moreover "choices about regulatory incentives are also constrained by institutional endowment and by the governance features built into the regulatory system" (p. 4). Based on evidence from the documents and interviews, this approach would suggest that for those six factors which were effective in forwarding the BcN's objectives the stakeholders had a greater range of choices and incentive structures with which to coordinate, to successfully pursue the institutional endowment inherent in the achieved objective. On the other hand, for those four factors which were not effective in forwarding the BcN's objectives, the infrastructure project's institutional endowments constrained or stifled the range of choices and the incentive structures for coordination on achieving the objectives.

Fransman (2006) addresses the institutional basis for regulation and suggests that "institutions have been defined as 'rules of the game,' they are the factors that constrain and define the choices that are available and therefore shape the decisions that are made" (p.268). Moreover "institutions are not only living things such as the regulations that are passed by the regulatory authorities that obviously constitute some of the rules that affect the game, they are the processes that make the regulations what they are and not other than what they are" (p.268). These processes include political and ideological processes and the dominant interests that they express. Based on evidence from the documents and interviews, it can be deduced that for the six factors that successfully forwarded the BcN's objectives, there was a relatively greater confluence between the processes involved in the coordination of stakeholders and processes necessary for successfully achieving the objectives. Conversely, for the four factors that did not successfully forward the BcN's objectives there were less instances of confluence between the divergent processes.

The numerical data collected from the five annual reports of the "Broadband IT Korea Informatization Report" published by the National Computerization Agency between 2004 and 2008 provide empirical evidence on the real world outcomes of policy objectives for the BcN specified in the policy texts. While it is reasonable to expect that there is a relationship between the factors and the outcomes, this link does not constitute causation or even a correlation. While there is a connection between the factors and objectives it is not possible to use statistical tools such as correlation coefficients or regression analysis to establish this relationship in quantitative terms. This data is summarized in Tables 2 and 3.

## TABLE 2

# Capital Expenditure Outlays on the BcN (In billions of \$USD)

#### Government

MIC		% Change	
Phase 1 2004 -	Phase 2		
5	2006 - 7		
70.27*	155.56*	121	
186*	397.3*	114	
59.6*	40.4*	-32.21	
	M Phase 1 2004 - 5 70.27* 186* 59.6*	MIC Phase 1 Phase 2 2004 - 5 2006 - 7 2006 - 7 155.56* 186* 397.3* 59.6* 40.4*	

### **Private Sector**

	KT		% Change
	Phase 1 2004 -	Phase 2	•
	5	<b>2006 - 7</b>	
R&D	350**	470**	39.24
FTTH / HFC / Wireless BB	5.9**	6.6**	12

# TABLE 2 (CON'T)

Integration &	479**	521**	8.77
Standarization			
of Content,			
Infrastructures,			
Platforms &			
Services			

	S	% Change	
	Hanaro		
	Phase 1 2004 -	Phase 2	
	5	2006 - 7	
R&D	59**	78.83**	33.61
FTTH / HFC / Wireless Broadband	0.9**	1.2**	33.33
Integration & Standarization of Content, Infrastructures.	293.6**	206.4**	29.7
Platforms &			
Services			

	L	LG		
	Power	Powercomm		
	Phase 1 2004 -	Phase 2		
	5	2006 - 7		
R&D	n/a	n/a	n/a	

#### TABLE 2 (CON'T)

-28.57 FTTH / HFC / 0.7\*\* 0.5\*\* Wireless Broadband Integration & 186.1\*\* 113.9\*\* -38.80 Standarization of Content, Infrastructures, Platforms & Services

#### TABLE 3

#### **BcN Subscriber Capacity**

				%
	PHASE 1	PHASE 2	PHASE 2	CHANGE
	(GOAL &	(GOAL)	(ACTUAL)	FROM
	ACTUAL)			PHASE 1 -
	2004 -	2006 -	2006 -	
	2005	2007	2007	PHASE 2
				(ACTUAL)
Capacity for Fixed Subscribers	2,560,000	5,700,000	7,010,000	174%
Capacity for Wireless				
Subscribers	560,000	2,500,000	5,630,000	905%

SOURCE: Interview with senior official at the U-Infrastructure Division, National Information Society Agency, August 11, 2008, National Information Society Agency Headquarters in Seoul, South Korea, 1 hour interview, 2:20 p.m.

. This numerical data is supported by interviews with the key informants and it presented in two components. The first concerns subscriber levels for the BcN. Even though the BcN is not officially complete, these subscriber levels reflect the number of users that government and industry estimate that the BcN has the capacity to serve within the existing broadband infrastructure.

As Table 3 demonstrates the actual subscriber capacity for the BcN at the end of the second phase not only reached its projected goals of 5.7 million wired or fixed subscribers and 2.5 wireless subscribers but, according a source in the National Information Society Development Agency, actually exceeded the goals that had been projected achieved a capacity of 7.01 million wired or fixed subscribers and 5.63 wireless subscribers by January 1, 2008.40 In proportional terms this represents a 174% increase in the capacity for fixed subscribers and a 905% increase for wireless subscribers between the actual levels at the end of the first phase and the actual level at the end of the second phase of the BcN. The BcN is estimated to have the capacity to provide broadband services to 12 million wired subscribing households and 23 million wireless subscribers by January 1, 2011".41 This empirical data suggests that the policy objectives mentioned in the policy documents have been effective in improving the capacity of the BcN to reach end users over the course of the first two phases of the infrastructure project.

Aside from the subscriber numbers for the BcN, it is also important to consider capital expenditure made by the government and private sector during the first and second phases of this infrastructure project, which is represented in Table 2. This investment can be broken down into three distinct categories. The first category pertains to capital expenditure on research and development (R&D) in the BcN's pilot projects. As Table 2 indicates between 2004 and 2007, approximately \$USD 225.83 billion was invested into this R&D of the BcN by the Ministry of Information and Communication (MIC). Of this, \$USD 70.27 billion was invested during the BcN's first phase (2004 – 2005) and \$USD 155.56 was invested during the BcN's second phase (2006 – 2007).42

This investment in R&D was supplemented by additional funds generated by private investment amounting to a total of \$USD 957.83 billion. Out of the \$USD 957.83 billion in private sector investment Korea Telecom (KT) invested \$USD 820 billion, of which \$USD 350 billion was invested during the first phase and \$USD 470 was invested during the second phase.43 This represents a 39.24% increase between the first and second phases of the BcN. The remaining \$USD 137.83 was co –financed by SK / Hanaro Telecom and LG PowerComm. Out of this amount \$USD 59 billion was invested in the first phase while \$USD 78.83 billion was invested during the second phases of the BcN.

The second category of capital expenditure entails investment in construction, equipment and facilities for the BcN's access network infrastructure specifically wired FTTH (Fiber To the Home) / HFC (Hybrid Fiber and Cable) networks and wireless broadband access networks. As Table 2 indicates between 2004 and 2007, approximately \$USD 583.3 million has been invested by the Ministry of Information and Communication (National Computerization Agency, 2007, p. 47). Of this, \$USD 186 million was invested during the BcN's first phase and \$USD 397.3 million was invested during the second phase.45 This represents a 114% increase between the first and second phases of the BcN.

The private sector invested an additional \$USD 15.8 billion on this capital expenditure (National Computerization Agency, 2008b, p. 49). Out of this total of

\$USD 15.8 billion in capital expenditure from the private sector, Korea Telecom (KT) invested \$USD 12.5 billion, with \$USD 5.9 billion being invested during the first phase of the BcN and \$USD 6.6 billion being invested during the second phase.46 This represents a 12% increase between the first and second phases of the BcN. SK / Hanaro Telecom invested \$USD 2.1 billion with \$USD 900 million being invested during the first phase and \$USD 1.2 billion invested during the second phase.47 This represents a 33.33% increase between the first and second phases of the BcN. Finally LG Powercomm invested the remaining \$USD 1.2 billion with \$USD 700 million during the first phase and \$USD 500 million during the second phase.48 This represents a 28.57% decrease between the first and second phases of the BcN.

The third category of capital expenditure entails investment into standardizing and expenditures on assuring interoperability among the diverse components of the BcN. This entailed investment into: open networks which integrate discrete media content; into the integration of wired and wireless infrastructure; into the integration of telecommunications, broadcasting and information technology infrastructure; into upgrading to all-IP network platforms; and into investing in technologies and applications which the government and private sector decide should be a priority for the BcN. As Table 2 indicates the total capital expenditure for these investments is \$USD 1.8 trillion. Out of this \$USD 1.9 trillion the Ministry of Information and Communication funded \$USD 100 billion (59.6 billion during the first phase and \$USD 40.4 billion during the second phase), while the vast majority of the investment came from the private sector.**49** This represents a 32.21% decrease between the first and second phases of the BcN.

Specifically Korea Telecom (KT) invested the majority approximately \$USD 1 trillion (479 billion during the first phase and \$USD 521 billion during the second phase), while SK / Hanaro Telecom invested \$USD 500 billion (293.6 billion during the first phase and \$USD 206.4 billion during the second phase) and LG Powercomm invested \$USD 300 billion (186.1 billion during the first phase and \$USD 113.9 billion during the second phase).50 This represents a 38.80% decrease between the first and second phases of the BcN. This data suggests that over the course of the first two phases of the BcN the private sector, for the most part, took on a primary role in investing in investing in factors critical to the BcN's three main objectives.

In addition to investment expenditures, the organizational stakeholders of the BcN have distinct expectations about the capital income and societal benefits that will be derived from capital expenditure on the BcN. For example by 2010 the BcN is expected to contribute \$USD 82.6 billion to the South Korean economy in terms of increased productivity (National Information Society Agency, 2007, p. 15). In addition by 2010 the BcN is anticipated to augment exports by USD 13.5 billion (National Information Society Agency, 2007a, p. 25). Finally the BcN is expected to create 370,000 jobs in the high technology sector (National Information Society Agency, 2007a, p. 16).

The estimates on the capital expenditure and investment in the BcN provided by the government body, the National Information Society Agency, that worked with the private sector on the strategy for the BcN seem inordinately high given the scale of South Korea's economy. Therefore it is necessary to triangulate the sources for this capital expenditure and investment data. Unfortunately the private sector executives representing stakeholders of the BcN, including KT and SK / Hanaro Telecom, refused to

provide estimates for this data as their firms have strict policies on not disclosing this information to the public. Also I was not able to obtain sources on this data from either other bodies in the government, aside from the National Information Society Agency, or from the non-profit research institutes such as the Electronic Telecommunications Research Institute or the Korea Information Society Development Institute since these actors did not participate directly in forming the BcN's strategy. However a source at the Korea Information Society Development Institute was able to approximate the percentages of the total expenditure that were shared by the private and public actors.

As a result in order to triangulate the sources for this data I am reliant on estimates provided by the press which covers high technology related news. Unfortunately these sources do not provide break downs for the data specifically for all the factors covered in this dissertation. The estimates provided by the press on total expenditures on the BcN vary widely. For example in late 2004 a press report indicated that the investment in the BcN would total USD \$58 billion for all three phases of this project (Malik, 2004). In 2005 a different media outlet in the press reported that the government planned to solicit USD \$7.7 billion of private sector investment in the BcN in 2006 while the government anticipated investing USD \$162,315,704 that year (Tonghyung, 2005). Initially the third phase of the BcN was anticipated to be completed by the end of 2010, but subsequently this deadline has been extended to 2013. In 2009 yet another source from the press reported that between 2009 and 2013 USD \$30.7 billion by the public and private sectors would be invested in the BcN (Hae-sun, 2009). All of the estimates from the press are substantially lower than the estimates provided by the National Information Society Agency and more in - line with the size of the South

Korean economy. The reason for the discrepancy between the National Information Society Agency and the press estimates is unclear.

#### **CHAPTER 7 – CONCLUSION**

South Korea has engaged in an ambitious policy agenda to advance its broadband infrastructure. The policy objectives for the Broadband Convergence Network (BcN) specifically media convergence, ubiquitous connectivity and network stakeholder coordination represent a cornerstone of this agenda. This chapter reviews a number of key points of the BcN, summarizes the key findings of the study and identifies some of the key issues that help clarify our understanding of how South Korea has attained a high level of new media infrastructure development through the BcN.

The Broadband Convergence Network (BcN) was started as a consortium that was established and initially funded by a number of organizations in the public and private sectors. The primary government body that oversaw the launch of the BcN was the Ministry of Information and Communication (MIC) which in 2008 was reorganized into the Korea Communication Commission. Two other government agencies have been actively involved in the BcN namely the National Information Society Development Agency (NIA) and the National Internet Development Agency (NIDA). A wide diversity of actors and players from the private sector were also founding members that funded the consortium such as Korea Telecom (KT), SK / Hanaro Telecom, and LG Powercom. The two main non-profit institutes that have a role in the development of the BcN are the Electronics and Telecommunications Research Institute (ETRI) and the Korea Information Society Development Institute (KISDI).

#### **Review of Key Findings and Implications of the Dissertation**

This study of the evolution of South Korea's Broadband Convergence Network between 2004 and 2007 shows that South Korea's new media infrastructure project for broadband development has been effective in pursuing its policy agenda. There are two over arching findings that were deduced from this dissertation.

• 1) The first is that during the first phase of the BcN (2004 – 2005) the government assumed the leadership role in shaping the BcN both in terms of providing a strategic vision and in term of investing in research and development (R&D) for the BcN's technologies and networks, while the private sector and the research institute largely followed the government's lead. For example during this phase the private sector would typically invest in networks and R&D projects in response to government recommendations on what infrastructure and technologies meet with the BcN's objectives and the research institutes would conduct studies on the social impacts of the BcN's objectives.

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During the second phase of the BcN (2006 – 2007) the private sector assumed the leadership role of the BcN in terms of designing its strategy and capital expenditure in the BcN's R&D and networks based on their own corporate interests, while the government and research institutes provided the private sector with support when it was requested by the firms. For example, on an ad hoc basis the private sector would request consultative services from the government and the research institutes on how to deploy networks and technologies that the private sector developed through the pilot projects of the BcN. (a) The second finding is that of the ten key factors identified by the policy planners of

the BcN model, six of them were successfully implemented between 2004 and 2007. The factors where the objectives were successfully implemented are: 1) the deployment of networks that integrates distinct media; 2) the integration of wireless and wired infrastructure; 3) upgrading IP platforms; 4) the role of stakeholders in providing

resources or funding for R&D projects; 5) the role of stakeholders in identifying which platforms, applications and services are the best fit with launching the BcN; 6) and the role of stakeholders in devising strategies for the infrastructure that utilize the BcN's pilot projects. The four factors where they failed to meet the objectives are: 1) the integration of telecommunications, broadcasting and information technology infrastructure; 2) promoting R&D projects to expand connectivity; 3) deploying wireless broadband access; 4) deploying Fiber-To-The Home (FTTH) / HFC (Hybrid Fiber and Cable) networks.

While each of the four factors failed for specific reasons the common thread for all four is a lack of cooperation among the stakeholders of the BcN. For example the factor on integrating telecommunications, broadcasting and information technology infrastructure was not effective in forwarding the media convergence objective (see Figure 1) largely because the two approaches that were used to empower this factor were ineffective. The first approach entailed bundling services. But simply bundling turned out to be too minor a move and was inadequate in dealing with the ambitious process of integrating television and radio networks, phone lines and dsl / cable infrastructures into a single integrated infrastructure. None of the stakeholders were committed to replacing the bundling approach with something more ambitious that would be necessary to fulfill the objective. The second approach entailed the setting up regimes that bound the BcN's stakeholders to interconnection obligations. But this issue had a very low priority status among the stakeholders of the BcN. Moreover, measures that had been agreed upon by the stakeholders to utilize interconnection requirements to integrate the various media infrastructures were repeatedly delayed during the first two phases of the BcN.

The second of the four factors that was not effective in forwarding the BcN's objectives entailed promoting R&D projects to expand connectivity. The reason why this factor failed to impact the BcN's objective of ubiquitous connectivity was that the stakeholders were not able to agree on a common strategy for how to empower those R&D projects that were specifically designed to improve connectivity in order to have an impact on the BcN's service provision. The third unsuccessful factor deploying wireless broadband access dealt with deploying wireless broadband access. The reason that this factor was not effective in forwarding the BcN's objective of ubiquitous connectivity was that the stakeholders were not able to launch the wireless technology, Wibro. Wibro was pioneered in South Korea, so that there would be a substantial domestic and international demand for it. But the BcN's stakeholders were not able to identify a killer application for it that would reach a critical mass similar to competing technologies such as Wimax.

The fourth factor that failed to forward the BcN's objective involved deploying Fiber-To-The Home and Hybrid Fiber and Cable networks. The South Korean market is saturated with broadband technologies and the BcN's stakeholders were unable to find a way to deploy FTTH and HFC networks at a low enough cost that would be competitive with the other established technologies. The stakeholders were also not able to agree on a strategy for how to launch FTTH and HFC networks for the BcN.

Regarding the specific research questions, research question 1, asks which sectoral level factors best explain media convergence, ubiquitous connectivity and network stakeholder coordination? There are three main points that summarize the findings for Research Question 1.

•The first point is that there are three factors associated with the media convergence objective for the BcN specifically: 1) convergence of content, 2) convergence of wired and wireless networks and 3) the convergence of telecommunications, broadcasting and information technology infrastructure.

• The second point is that there are three factors associated with the ubiquitous connectivity objective for the BcN specifically: 1) upgrading IP platforms, 2) promoting research and development projects to expand connectivity, 3) deploying wireless broadband access; and 4) deploying Fiber To The Home (FTTH) / HFC (Hybrid Fiber and Cable) infrastructure.

• The third point is that there are three factors associated with the network stakeholder coordination objective for the BcN specifically: 1) the role of stakeholders in providing resources or funding for R&D projects, 2) the role of stakeholders in identifying which platforms, applications and services are the best fit with launching the BcN, and 3) the role of stakeholders in devising strategies for the infrastructure that utilize the BcN's R&D pilot projects.

There are two main points that summarize the findings for Research Question 2, which asks at the BcN level, how do different factors explain media convergence?

• The first point is that there is a consensus that convergence of media content via open networks and the integration of wired and wireless broadband infrastructure is critical. This was achieved by promoting convergence over wired and wireless services and re-categorizing broadband from a value added telecommunications service to a facilities based service.

• The second point is that while the policy documents offers some empirical evidence to suggest that the integration of broadcasting, telecommunications and information technology infrastructures forwards the objective of media convergence, many of the key informants that were interviewed disagreed.

There are four main points that summarize the findings for Research Question 3, which asks how different factors explain ubiquitous connectivity.

• Firstly there is that the upgrade of the BcN's Internet Protocol (IP) platforms is a critical factor of ubiquitous connectivity.

• Secondly there is no strong textual evidence on the efficacy of R&D pilot projects for expanding broadband during the first two phases of the BcN.

• Thirdly while the documents offer evidence that the deployment of wireless broadband was successful forwarded the ubiquitous connectivity objective, many outside the government had doubts about this factor's efficacy.

• The fourth point is that there is no clear evidence to support the efficacy of Fiber To The Home (FTTH) or Hybrid Fiber and Cable (HFC) factor during the first two phases of the BcN.

There are two main points that summarize the findings for Research Question 4, which asks how different factors explain network stakeholder coordination.

• Firstly there is that all three items in the BcN Communication Utility Model forwarded the network stakeholder coordination objective of the BcN. These items include: the role of the stakeholders in supporting the BcN's R&D projects; the role of the stakeholders in identifying which platforms, applications and services are best fit with the launch of the BcN factor; and the role of the stakeholders in devising strategies for implementing R&D from the BcN's pilot projects.

• Secondly there is no clear evidence to support the efficacy of the R&D for the BcN in devising strategies for implementing R&D on the BcN. The non-profit actors did not have a defined role in identifying which platforms, applications and services are best fit with the launch of the BcN.

Finally a number of findings were raised on the outcomes of the policy objectives in terms of empirical numerical indicators of the BcN's development. While there are connections or links between the factors and the outcomes these links do not represent causation or even correlations. The policy documents and key informants confirmed that the BcN has met all its targets for the number of subscribers that the BcN has the capacity to accommodate with broadband service. In fact the BcN is on track to exceed expectations by attaining the capacity to provide broadband services to 12 million wired subscribing households and 23 million wireless subscribers by January 1, 2011. The documents and key informants also confirmed that the BcN increased capital expenditure and investment in the BcN between its first and second phase.

# <u>Identifying the Central Contributions That This Dissertation Poses to Advance the</u> Field

This dissertation offers a singular contribution to the existing literature on broadband policy in terms of how it applies the theoretical framework of institutionalism to the South Korean case. By and large the existing literature on the institutional perspective and new information and communication technologies examines the relationships between actors at the meso or sectoral level. In this literature institutions or

organizations are the key unit of analysis. However the BcN's communication utility model provides an additional intermediate model. This model helps explain how three groups of stakeholders, specifically governmental bodies, private sector firms and nonprofit institutes, via a variety of factors, impacts three key policy objective of the BcN at the meso or sectoral level. These three primary objectives of the BcN are media convergence, ubiquitous connectivity and network stakeholder coordination.

There are a number of lessons that others can be learned from the South Korean experience with the BcN. Using the BcN Communication Utility Model as a conceptual lens, six of the factors identified in the Model were found to be effective in forwarding the three core objectives of the BcN, while four of the factors were ineffective in impacting these objectives. The six factors that were effective in forwarding the BcN's objectives include: 1) integrating distinct media content; 2) the integration of wireless and wired infrastructure; 3) upgrading to all – Internet Platforms (IP); 4) the role of stakeholders in providing resources or funding for R&D projects; 5) the role of stakeholders in identifying which platforms, applications and services are the best fit for the BcN; 6) the role of stakeholders in devising strategies for the infrastructure that utilize the BcN's pilot projects. The four factors that were not effective in forwarding the BcN's objectives include: 1) the integration of telecommunications, broadcasting and information technology infrastructure; 2) promoting R&D projects to expand connectivity; 3) deploying wireless broadband access; 4) deploying Fiber-To-The Home and Hybrid Fiber and Cable networks.

The empirical evidence from the primary policy documents and interviews with the key informants suggest that each of the six factors that were found to be effective

differentiate themselves from the four factors that were not effective in one paramount way. All six effective factors reflected a higher degree of cooperation between stakeholders in the public, private, and non-profit sectors. In other words stakeholders from the distinct sectors that coordinated over these six factors shared a relatively greater commonality in economic and other interests in ensuring the success of the BcN's objectives. There were relatively greater externalities in making coordinating on behalf of the infrastructure project's policy goals. Moreover, the interaction among the stakeholders that centered on the four factors were not effective in forwarding the policy goals, and they lacked externalities or incentives to coordinate, ensuring that the BcN's policy goals of media convergence, ubiquitous connectivity and network stakeholder coordination were not met.

#### <u>ENDNOTES</u>

1. Interview with an official at the Telecommunications Policy Planning Division of the Korea Communications Commission, August 12, 2008, Korea Communications Commission Headquarters in Seoul, South Korea, one hour 15 minute interview, 3:00 p.m.

2. Interview with an executive at the Broadband Ubiquitous Infrastructure Service Department at Korea Telecom (KT), August 12, 2008, KT Headquarters in Seoul, South Korea, one hour 15 minute interview, 10:00 a.m.

3. Interview with an official at the Telecommunications Policy Research Division of the Korea Information Society Development Institute, August 14, 2008, Korea Information Society Development Institute Headquarters in Seoul, South Korea, one hour ten minute interview, 3:00 p.m.

4. Interview with an official at the Government Relations Team of SK / Hanaro Telecommunications, August 13, 2008, SK / Hanaro Telecommunications Headquarters in Seoul, South Korea, one hour interview, 3:00 p.m.

 Interview with an official at the Information Technology Policy Division of the National Information Society Agency, August 5, 2008, National Information Society Agency Headquarters in Seoul, South Korea, one hour interview, 10:40 a.m.
 Interview with an official at the Technology Strategy Research Division of the Electronics and Telecommunications Research Institute, August 5, 2008, Electronics and Telecommunications Research Institute Headquarters in Daejeon, South Korea, one hour 10 minute interview, 11:00 a.m. 7. Interview with an executive at the Broadband Ubiquitous Infrastructure Service Department at Korea Telecom (KT), August 12, 2008, KT Headquarters in Seoul, South Korea, one hour 15 minute interview, 10:00 a.m.

8. Interview with an official at the Government Relations Team of SK / Hanaro Telecommunications, August 13, 2008, SK / Hanaro Telecommunications Headquarters in Seoul, South Korea, one hour interview, 3:00 p.m.

 9. Interview with a professor at the Korea Advanced Institute for Science and Technology, August 5, 2008, Korea Advanced Institute for Science and Technology campus in Daejeon, South Korea, one hour eight minute interview, 3:10 p.m.
 10. Interview with an executive at the Corporate Strategy Department of Real Networks Asia Pacific, August 12, 2008, Real Networks Asia Pacific Headquarters in Seoul, South Korea, one hour interview, 10:00 a.m.

11. Interview with an official at the Telecommunications Policy Research Division of the Korea Information Society Development Institute, August 14, 2008, Korea Information Society Development Institute Headquarters in Seoul, South Korea, one hour ten minute interview, 3:00 p.m.

12. Interview with an official at the Government Relations Team of SK / Hanaro Telecommunications, August 13, 2008, SK / Hanaro Telecommunications Headquarters in Seoul, South Korea, one hour interview, 3:00 p.m.

13. Interview with an official at the Information Technology Policy Division of the National Information Society Agency, August 5, 2008, National Information Society Agency Headquarters in Seoul, South Korea, one hour interview, 10:40 a.m.

14. Interview with an official at the Information Technology Policy Division of the
National Information Society Agency, August 5, 2008, National Information Society
Agency Headquarters in Seoul, South Korea, one hour interview, 10:40 a.m.
15. Interview with an official at the Telecommunications Policy Planning Division of the
Korea Communications Commission, August 12, 2008, Korea Communications
Commission Headquarters in Seoul, South Korea, one hour 15 minute interview, 3:00
p.m.

16. Interview with an executive at the Broadband Ubiquitous Infrastructure Service Department at Korea Telecom (KT), August 12, 2008, KT Headquarters in Seoul, South Korea, one hour 15 minute interview, 10:00 a.m.

17. Interview with an official at the Internet Policy Division of the KoreaCommunications Commission, August 8, 2008, Korea Communications CommissionHeadquarters in Seoul, South Korea, one hour interview, 3:00 p.m.

18. Interview with an official at the Technology Strategy Research Division of the Electronics and Telecommunications Research Institute, August 5, 2008, Electronics and Telecommunications Research Institute Headquarters in Daejeon, South Korea, one hour 10 minute interview, 11:00 a.m.

19. Interview with an official at the Planning & Internet Policy Division of the National Internet Development Agency, August 12, 2008, National Internet Development Agency Headquarters in Seoul, South Korea, one hour interview, 10:00 a.m.

20. Interview with a professor at Hangyang University, August 6, 2008, Hangyang University campus in Ansan, South Korea, one hour 15 minute interview, 2:00 p.m.

21. Interview with a professor at Hangyang University, August 6, 2008, Hangyang
University campus in Ansan, South Korea, one hour 15 minute interview, 2:00 p.m.
22. Interview with an official at the Telecommunications Policy Research Division of the
Korea Information Society Development Institute, August 14, 2008, Korea Information
Society Development Institute Headquarters in Seoul, South Korea, one hour ten minute
interview, 3:00 p.m.

23. Interview with an official at the Technology Strategy Research Division of the Electronics and Telecommunications Research Institute, August 5, 2008, Electronics and Telecommunications Research Institute Headquarters in Daejeon, South Korea, one hour 10 minute interview, 11:00 a.m.

24. Interview with an official at the Planning & Internet Policy Division of the National Internet Development Agency, August 12, 2008, National Internet Development Agency Headquarters in Seoul, South Korea, one hour interview, 10:00 a.m.

25. Interview with a professor at the Korea Advanced Institute for Science and Technology, July 7, 2008, Michigan State University Main Library in East Lansing, MI, one hour 20 minutes, 2:00 p.m.

26. Interview with an official the Soft Power Team of the Presidential Council for Future & Vision, August 11, 2008, National Information Society Agency Headquarters in Seoul, South Korea, one hour interview, 2:00 p.m.

27. Interview with an official at the Information Technology Policy Division of the National Information Society Agency, August 5, 2008, National Information Society Agency Headquarters in Seoul, South Korea, one hour interview, 10:40 a.m.

28. Interview with an official at the Government Relations Team of SK / Hanaro Telecommunications, August 13, 2008, SK / Hanaro Telecommunications Headquarters in Seoul, South Korea, one hour interview, 3:00 p.m.

29. Interview with an executive at the Corporate Strategy Department of Real Networks Asia Pacific, August 12, 2008, Real Networks Asia Pacific Headquarters in Seoul, South Korea, one hour interview, 10:00 a.m.

30. Interview with an official the Soft Power Team of the Presidential Council for Future & Vision, August 11, 2008, National Information Society Agency Headquarters in Seoul, South Korea, one hour interview, 2:00 p.m.

31. Interview with a professor at the Korea Advanced Institute for Science and Technology, August 5, 2008, Korea Advanced Institute for Science and Technology campus in Daejeon, South Korea, one hour eight minute interview, 3:10 p.m.

32. Interview with an executive at the Regulatory Affairs Department at SK / Hanaro Telecommunications, August 13, 2008, SK / Hanaro Telecommunications Headquarters in Seoul, South Korea, one hour interview, 2:00 p.m.

33. Interview with an executive at the Corporate Strategy Department of Real Networks Asia Pacific, August 12, 2008, Real Networks Asia Pacific Headquarters in Seoul, South Korea, one hour interview, 10:00 a.m.

34. Interview with an official at the Telecommunications Policy Research Division of the Korea Information Society Development Institute, August 14, 2008, Korea Information Society Development Institute Headquarters in Seoul, South Korea, one hour ten minute interview, 3:00 p.m.

35. Interview with an official at the Information Technology Policy Division of the
National Information Society Agency, August 5, 2008, National Information Society
Agency Headquarters in Seoul, South Korea, one hour interview, 10:40 a.m.
36. Interview with a professor at Hangyang University, August 6, 2008, Hangyang
University campus in Ansan, South Korea, one hour 15 minute interview, 2:00 p.m.
37. Interview with an official at the U-Infrastructure and Service Division of the National
Information Society Agency, August 11, 2008, National Information Society Agency
Headquarters in Seoul, South Korea, one hour interview, 2:00 p.m.

38. Interview with an official the Soft Power Team of the Presidential Council for Future & Vision, August 11, 2008, National Information Society Agency Headquarters in Seoul, South Korea, one hour interview, 2:00 p.m.

39. Interview with an official at the Telecommunications Policy Research Division of the Korea Information Society Development Institute, August 14, 2008, Korea Information Society Development Institute Headquarters in Seoul, South Korea, one hour ten minute interview, 3:00 p.m.

40. Interview with an official at the U-Infrastructure and Service Division of the National Information Society Agency, August 11, 2008, National Information Society Agency Headquarters in Seoul, South Korea, one hour interview, 2:00 p.m.

41. Interview with an official at the U-Infrastructure and Service Division of the National Information Society Agency, August 11, 2008, National Information Society Agency Headquarters in Seoul, South Korea, one hour interview, 2:00 p.m.

42. Interview with an official at the Telecommunications Policy Research Division of the Korea Information Society Development Institute, August 14, 2008, Korea Information

Society Development Institute Headquarters in Seoul, South Korea, one hour ten minute interview, 3:00 p.m.

43. Interview with an official at the Telecommunications Policy Research Division of the Korea Information Society Development Institute, August 14, 2008, Korea Information Society Development Institute Headquarters in Seoul, South Korea, one hour ten minute interview, 3:00 p.m.

44. Interview with an official at the Telecommunications Policy Research Division of the Korea Information Society Development Institute, August 14, 2008, Korea Information Society Development Institute Headquarters in Seoul, South Korea, one hour ten minute interview, 3:00 p.m.

45. Interview with an official at the Telecommunications Policy Research Division of the Korea Information Society Development Institute, August 14, 2008, Korea Information Society Development Institute Headquarters in Seoul, South Korea, one hour ten minute interview, 3:00 p.m.

46. Interview with an official at the Telecommunications Policy Research Division of the Korea Information Society Development Institute, August 14, 2008, Korea Information Society Development Institute Headquarters in Seoul, South Korea, one hour ten minute interview, 3:00 p.m.

47. Interview with an official at the Telecommunications Policy Research Division of the Korea Information Society Development Institute, August 14, 2008, Korea Information Society Development Institute Headquarters in Seoul, South Korea, one hour ten minute interview, 3:00 p.m.

48. Interview with an official at the Telecommunications Policy Research Division of the Korea Information Society Development Institute, August 14, 2008, Korea Information Society Development Institute Headquarters in Seoul, South Korea, one hour ten minute interview, 3:00 p.m.

49. Interview with an official at the Telecommunications Policy Research Division of the Korea Information Society Development Institute, August 14, 2008, Korea Information Society Development Institute Headquarters in Seoul, South Korea, one hour ten minute interview, 3:00 p.m.

50. Interview with an official at the Telecommunications Policy Research Division of the Korea Information Society Development Institute, August 14, 2008, Korea Information Society Development Institute Headquarters in Seoul, South Korea, one hour ten minute interview, 3:00 p.m.

#### <u>REFERENCES</u>

Altheide, D.L. (1996). Qualitative media analysis. Thousand Oaks, CA: Sage.

Arthur, B. (1989). Competing technologies, increasing returns, and lock-in by historical events. *Economic Journal*, 99, 116–131.

Avgerou, C. (2002). Information systems and global diversity. Oxford: Oxford University Press.

Contraction of the local division of the loc

Baskerville, R. (1997). Distinguishing action research from participative case studies. Journal of Systems and Information Technology, 1(1), 25–45.

Beck, S.E., & Manuel, K. (2008). Practical research methods for librarians and information professionals. New York: Neal Schuman Publishers, Inc.

Benkler, Y. (1998). Communications infrastructure regulation and the distribution of control over content. *Telecommunications Policy*, 22(3), 183–196.

Beniger, J. (1986). The control revolution: Technological and economic origins of the information society. Cambridge, MA: Harvard University Press.

Berg, P. (2004). Qualitative research methods for the social sciences, fifth edition. Boston: Pearson.

Berger, A.A. (1998). Media research techniques, second edition. Thousand Oaks, CA: Sage.

Bertrand, I, & Hughes, P. (2005). Media research methods: Audiences, institutions, texts. New York: Palgrave Macmillan.

Biegel, S. (2001). Beyond our control? Confronting the limits of our legal system in the age of cyberspace. Cambridge, MA: MIT Press.

Cambini, C., & Jiang, Y. (2009). Broadband investment and regulation: A literature review. *Telecommunications Policy*, 33, 559 – 574.

Carr, W., & Kemmis, S. (1986). Becoming critical: Education, knowledge and action research. Geelong: Deakin University Press.

Chen, R., Kraemer, K.L., Sharma, P. (2009). Google: The world's first information utility? Business & Information Systems Engineering, 1, 1-9.

Chung, I. (2006). Broadband, the information society, and national systems. In M. Fransman (Ed.), *Global broadband battles: Why the U.S. Europe lag Asia leads*, (pp. 87 – 108). Stanford, CA: Stanford University Press.

Choudrie, J., Papazafeiropoulou, A., Lee, H. (2003). A web stakeholders and strategies: A case of broadband diffusion in Korea. *Journal of Information Technology*, 18, 281-290.

Choudrie, J., & Lee H. (2004). Broadband development in Korea: institutional and cultural factors. *European Journal of Information Systems*, 13(2), 103–114.

Crandall, R. (2006). Broadband communications. In M. Cave, S. K. Majumdar, & I. Vogelsang (Eds.), *Handbook of telecommunications economics, vol.2* (pp. 156–190). Amsterdam: Elsevier.

David, P.A. (1986). Narrow windows, blind giants, and angry orphans: The dynamics of systems rivalries and dilemmas of technology policy. CEPR Working Paper 10. Stanford, CA: CEPR.

Dedrick, J., & Kraemer, K.L. (1995). A tale of two IT industries. *Electronics Business* Asia, February, p. 72.

Denzin, N.K., & Lincoln, Y.S. (Eds.) (2005). The Sage handbook of qualitative research, third edition. Thousand Oaks: Sage Publications.

Drake, W. (2001). Communications. In P. J. Simmons & C. de Jonge Oudrat, (Eds.), *Managing global issues: Lessons learned*, (pp. 25–74). Washington, DC: Carnegie Endowment for International Peace.

Electronics and Telecommunications Research Institute (ETRI). (2007). Intellectual capital report 2007. Seoul: Electronics and Telecommunications Research Institute.

Electronics and Telecommunications Research Institute (ETRI). (2008). IT R&D global leader ETRI. Seoul: Electronics and Telecommunications Research Institute.

Elmer, G. (2002). The case of web browser cookies: Enabling/Disabling convenience and the relevance on the web. In G. Elmer (Ed.), *Critical perspectives on the Internet*, (pp. 49–62). Lanham, MD: Rowman and Littlefield.

Forge, S., & Bohlin, E. (2008). Managed innovation in Korea in telecommunications: Moving towards 4G mobile at a national level. *Telematics & Informatics*, 25, 292-308.

Fornefeld, M., Delaunay, G., & Elixmann, D. (2008). The impact of broadband on growth and productivity. Report by Micus, Management Consulting GmbH, Berlin, Germany. Available athttp://ec.europa.eu/information\_society/eeurope/i2010/docs/benchmarking/broadband\_im pact\_2008.pdfs.

Fransman, M. (2006). Conclusion: The importance of institutions. In M. Fransman (Ed.), *Global broadband battles: Why the U.S. and Europe lag while Asia leads*, (pp.267–269). Stanford, CA: Stanford Business Books.

Frieden, R. (2005). Lessons from broadband development in Canada, Japan, Korea and the United States. *Telecommunications Policy*, 29, 595 - 613.

Frumpkin, P., and Kaplan, G. (2005). Institutional theory and the micro-macro link. Harvard University, Cambridge, MA. Unpublished manuscript.

Galperin, H. (2004). Beyond interests, ideas, and technology: An institutional approach to communication and information policy. *The Information Society*, 20(3), 159-168.

Gilchrist, V.J. & Williams. R.L. (1999). Key informant interviews. In B.F. Crabtree & W.L. Miller (Eds.), *Doing qualitative research, second edition*, (pp. 71 – 88). Thousand Oaks: Sage Publications.

Godfrey, D.G. (2006). *Methods of historical analysis in electronic media*. Mahwah, NJ: Lawrence Erlbaum Associates.

Greenstein, S., & McDevitt, P. (2009). The broadband bonus: Accounting for broadband Internet's impact on USGDP. NBERWorkingPaperNo.14758. Cambridge, MA:NBER.

Gubrium, J.F., & Holstein, J.A. (Eds). (2002). Handbook of interview research: Context & method. Thousand Oaks: Sage Publications.

Hae-sun, J. (February 2, 2009). Korea plans gigabit Internet. *Korea IT Times*. Last accessed on-line on May 1, 2010 at: http://www.koreaittimes.com/story/korea-plans-gigabit-internet.

Hall, P. A. (1992). The movement from Keynesianism to monetarism: Institutional analysis and British economic policy in the 1970's. In S. Steinmo, K. Thelen, and F. Longstreth (Eds.), *Structuring politics: Historical institutionalism in comparative analysis*, (pp. 90–113). New York: Cambridge University Press.

Hansen, A., Cottle, S., Negrine, R., Newbold, C. (1998). *Mass communication research methods*. New York: New York University Press.

Harter, L.M., Dutta, M.J., Cole, C.E. (2009). Communicating for social impact: Engaging theory, research and pedagogy. Cresskill, N.J.: Hampton Press.

Hawkins, R. (1999). The rise of consortia in the information and communication technology industries: Emerging implications for policy. *Telecommunications Policy*, 23, 159 – 173.

Helling, B. (1998). Web-site sensitivity to privacy concerns: Collecting personally identifiable information and passing persistent cookies. *First Monday 3*(2), URL (consulted 12 November 2009): http://firstmonday.org/htbin/cgiwrap/bin/ojs/index.php/fm/article/view/574/495.
Hodder, I. (1998). The interpretation of documents and material culture. In N.K. Denzin & Y.S. Lincoln (Eds.), *Collecting and interpreting qualitative materials* (pp. 110 – 129). Thousand Oaks, CA: Sage.

Holloway, W., & Jefferson, T. (2007). Doing qualitatively different research: Free association, narrative and the interview method. London: Sage Publications.

Horwitz, R. B. (1989). *The irony of regulatory reform*. New York: Oxford University Press.

International Telecommunications Union. (2004). World telecommunication indicators database, eigth edition 2004. Geneva: International Telecommunications Union.

International Telecommunications Union. (2005). Ubiquitous network societies: The case of the republic of Korea. Geneva: Strategy and Policy Unit (SPU) of the International Telecommunication Union.

Jeong, K. & King, J. (1997). Korea's national information infrastructure: Vision and issues. In B. Kahin & E. J. Wilson III (Eds.), *National information infrastructure initiatives: Vision and policy designs*, (pp. 112–149). Cambridge, MA: MIT Press.

Jepperson, R. (1991). Institutions, institutional effects and institutionalism. In W. Powell, & P. DiMaggio (Eds.), *The new institutionalism in organizational analysis*, (pp. 143–164). Chicago, IL: University of Chicago Press.

Jin, D.Y. (2005). Socioeconomic implications of broadband services: Information economy in Korea. *Information, Communication & Society*, 8(4), 503-523.

Johnson, J.D. (1990). Selecting ethnographic informants. Newbury Park, CA: Sage. Kelly, T., Gray, V., & Minges, M. (2003). Broadband Korea: Internet case study. Geneva: ITU. Last accessed at - http://www.itu.int/ITU-D/ict/cs/Korea/material/CS\_KOR.pdf (October 1, 2009).

Kim, D. (2008). Widening universal service in Korea to include broadband and mobile communications. Info, 10(5), 70-82.

Kim, Y., Jeon, H., & Bae, S. (2008). Innovation patterns and policy implications of adsl penetration in Korea: A case study. *Telecommunications Policy*, 32, 307-325.

King, J., Gurbaxani, V., Kraemer, K., McFarlan, F., Raman, K., Yap, C. (1994). Institutional factors in information technology innovation. *Information Systems Research*, 5(2), 139-169.

Korea Information Society Development Institute. (2006). *IT industry outlook of Korea 2006*. Seoul: Korea Information Society Development Institute.

Korea Information Society Development Institute. (2007a). *IT industry outlook of Korea* 2007. Seoul: Korea Information Society Development Institute.

Korea Information Society Development Institute. (2007b). Dynamic u-Korea kisdi. Seoul: Korea Information Society Development Institute.

Korea Information Society Development Institute. (2008a). 2008 Korea IT industry outlook. Seoul: Korea Information Society Development Institute.

Korea Information Society Development Institute. (2008b). Toward a digital world, kisdi. Seoul: Korea Information Society Development Institute.

Krasner, S.D. (1989). Sovereignty: An institutional perspective. In J. A. Caporaso (Ed.), *The elusive state: International and comparative perspectives*, (pp. 69–96). New York: Sage.

Kristol, D. (2001). HTTP cookies: Standards, privacy and politics. ACM Transactions on Internet Technology, 1(2), 151–98.

Kuo, E., Choi, A., Mahizhnan, A. A., Peng, L. W., & Soh, C. (2002). The internet in Singapore: A study of usage and impact. Singapore: Time Academic Press.

Kuo, E., & Low, L. (2000). Information economy and changing occupation structure in Singapore. *The Information Society* 17(4), 281-293.

Lau, T.Y., Kim, S.W., & Atkin, D. (2005). An examination of factors contributing to Korea's global leadership in broadband adoption. *Telematics & Informatics*, 22, 349 – 359.

Lee, C., & Chan-Olmsted, S.M. (2004). Competitive advantage of broadband Internet: A comparative study between Korea and the United States. *Telecommunications Policy*, 28, 649 – 677.

Lee, H. J., O'Keefe, R.M. & Yun, K. (2003). The growth of broadband and electronic commerce in Korea: contributing factors. *The Information Society*, 19(1), 81–93.

Lee, K.O., Kim, S.K., Chung, T.S., Kim, Y.S. (2007). Reference model of the broadband convergence network in Korea. Paper presented at the Proceedings of the Asia – Pacific Conference on Communications, 2007.

Lehr, W., Gillett, S., Osorio, C., & Sirbu, M. (2006). Measuring broadband's economic impact. *Broadband Properties*, 1, 12–24.

Lessig, L. (1999). Code and other laws of cyberspace. New York: Basic Books.

Levy, B., & Spiller, P.T. (Eds.) (1996). Regulations, institutions, and commitment: Comparative studies of telecommunications. New York: Cambridge University Press.

Lin, D., & Loui, M. (1998). Taking the byte out of cookies: Privacy, consent and the Web. Computers and Society, 28(2), 39-51.

Malik, O. (December 27, 2004). Koreans to spend \$58 billion on BcN. *Gigacom*. Last accessed on-line (May 1, 2010) at: http://gigaom.com/2004/12/27/koreans-to-spend-58-billion-on-bcn/.

March, J.G., & Olsen, J.P. (1984). The new institutionalism: Organizational factors in political life. *American Political Science Review*, 78, 734-749.

Marsden, C.T. (2000). Introduction: Information and communications technologies, globalization, and regulation. In C. T. Marsden (Ed.), *Regulating the global information society*, (pp. 1–40). New York: Routledge.

Marshall, C., & Rossman, G.B. (2006). Designing qualitative research, fourth edition. Thousand Oaks: Sage Publications.

Mayer-Schönberger, V. (1998). Internet privacy: The Internet and privacy legislation: Cookies for a treat? Computer Law and Securities Report, 14(3), 166-74.

Melody, W.H. (Ed.) (1997). Telecom reform: Principles, policies and regulatory practices. Lynby, Denmark: Den Private Ingeniorfund.

Mekonnen, S.M., & Sahay, S. (2008). An institutional analysis on the dynamics of the interaction between standardizing and scaling processes: A case study from Ethiopia. *European Journal of Information Systems*, 17, 279 – 289.

Millett, L., Friedman, B. & Felten, E. (2001). Cookies and web browser design: Toward realizing informed consent online. In *Proceedings of the Association for Computing Machinery* (URL [consulted November 2009]: http://portal.acm.org/citation. cfm?id=365034).

Ministry of Information and Communication. (1996). Framework Act on informatization promotion. Seoul: Ministry of Information and Communication.

Ministry of Information and Communication. (2004). White paper 2004: Dynamic digital Korea. Seoul: Ministry of Information and Communication.

Ministry of Information and Communication (2006a). Report of the Ministry of Information and Communication: U-Korea Master Plan. Seoul, Korea: Ministry of Information and Communication.

Ministry of Information and Communication (2006b). White paper 2005: Dynamic digital Korea. Seoul: Ministry of Information and Communication.

Ministry of Information and Communication (2007a). White paper 2006: Dynamic digital Korea. Seoul: Ministry of Information and Communication.

Ministry of Information and Communication. (2007b). White paper 2007: Broadband IT Korea – Connecting you to the digital world. Seoul: Ministry of Information and Communication.

Ministry of Government Administration and Home Affairs (2007). Master plan for the next generation e-government in Korea: Digital government inside the people. Seoul, Korea: Ministry of Government Administration and Home Affairs.

National Computerization Agency. (2003). *Informatization white paper 2003*. Seoul: National Computerization Agency.

National Computerization Agency. (2004a). 2004 broadband IT Korea informatization white paper. Seoul: National Computerization Agency.

National Computerization Agency. (2004b). *White paper 2004 Internet Korea*. Seoul: National Computerization Agency.

National Computerization Agency. (2005). Broadband IT Korea 2005: Informatization white paper. Seoul: National Computerization Agency.

National Computerization Agency. (2005a). 2005 white paper Internet Korea. Seoul: National Computerization Agency.

National Computerization Agency. (2006). *Informatization white paper 2006*. Seoul: National Computerization Agency.

National Computerization Agency. (2007). *Informatization white paper 2007*. Seoul: National Computerization Agency.

National Computerization Agency. (2008a). *Informatization white paper 2008*. Seoul: National Computerization Agency.

National Computerization Agency. (2008b). 2008 white paper Internet Korea. Seoul: National Computerization Agency.

National Internet Development Agency of Korea. (2006). 2006 Korea Internet white paper. Seoul: National Internet Development Agency of Korea.

National Information Society Agency. (2007). 2007 Yearbook of information society statistics. Seoul: National Information Society Agency.

National Information Society Agency. (2007a). 2007 Informatization white paper. Seoul: National Information Society Agency.

National Information Society Agency. (2009). 2009 Yearbook of information society statistics. Seoul: National Information Society Agency.

Nelson, R.R. (1959). The simple economics of basic scientific research. Journal of *Political Economy*, 67(3), 297–306.

Noll, R.G. (1986). The political and institutional context of communication policy. In M. S. Snow (Ed.), *Marketplace for telecommunications: Regulation and deregulation in industrialized democracies*, (pp. 42–65). New York: Longman.

Noll, R. G., & Rosenbluth, F.M. (1995). Telecommunications policy: Structure, process, outcomes. In P. F. Cowhey & M. M. McCubbins (Eds.), *Structure and policy in Japan and the United States*, (pp. 119–165). New York: Cambridge University Press.

Nord, D.P. (1989). The nature of historical research. In G.H. Stempel III & B.H. Westley (Eds.), *Research methods in mass communication* (pp. 290-315). Englewood Cliffs, NJ: Prentice-Hall.

North, D.C. (1990). Institutions, institutional change and economic performance. New York: Cambridge University Press.

North, D.C. (1993). Toward a theory of institutional change. In W. Barnett, M. Hinich, & N. Schofield, (Eds.), *Political economy: Institutions, competition, and representation*, (pp. 61–69). New York: Cambridge University Press.

Office of the Prime Minister. (2004). Broadband IT Korea 2007: The third master plan for informatization promotion. Seoul: Office of the Prime Minister.

Organization of Economic Cooperation and Development. (2004). The development of broadband access in rural and remote Areas, DSTI/ICCP/TISP(2003)7/FINAL, Paris: OECD.

Painter, C. (2002). Early leader effects on the process of institutionalization through cultural embedding: The cases of William J. Donovan, Allen W. Dulles, and J. Edgar Hoover. Unpublished dissertation, Virginia Polytechnic Institute and State University.

Park, M.C. (2008). Broadband Internet in Korea: Current status and success attributes. Communication Policy Research South Conference, Beijing, 5-7 December. Last accessed at - http://www.cprsouth.org/wpcontent/uploads/drupal/Myeong%20Cheol%20Park.ppt (March 15, 2010).

Parkhill, D. (1966). *The challenge of the computer utility*. New York: Addison-Wesley Educational Publishers Inc.

Poland, B.D. (2002). Transcription quality. In J.F. Gubrium & J.A. Holstein (Eds)., Handbook of interview research: Context & method, (pp. 629-650). Thousand Oaks: Sage Publications.

Potter, J.W. (1996). An analysis of thinking and research about qualitative methods. Mahwah, NJ: Lawrence Erlbaum Associates.

Powell, W.W., & DiMaggio, P.J. (Eds.). (1991). The New institutionalism in organizational analysis. Chicago, IL: University of Chicago Press.

Press, L.I. (1974) Arguments for a moratorium on the construction of a community information utility. *Communications of the ACM*, 17(12), 674–678.

Roberts, C.W. (1997). Text analysis for the social sciences: Methods for drawing statistical inferences from texts and transcripts. Mahwah, N.J.: Lawrence Erlbaum Associates.

Sackman, H., & Boehm, B.W. (1972). Planning community information utilities. Montvale: AFIPS Press.

Sackmann, H., & Nie, N. (1970). The information utility and social choice. Montvale: AFIPS Press.

St. Laurent, S. (1998). Cookies. New York: McGraw-Hill.

Samarajiva, R., & Shields, P. (1997). Telecommunication networks as social space: Implications for research and policy and an exemplar. *Media, Culture & Society, 19, 535* - 555.

Sawyer, S., & Tapia, A. (2007). From findings to theories: Institutionalizing social informatics. *The Information Society*, 23, 263 – 275.

Schostak, J. (2006). *Interviewing and representation in qualitative research*. New York: Open University Press.

Schwartz, J. (2001). Giving the web a memory costs its users privacy. New York Times, 4 September, p. A1.

Scott, W. (2001). Institutions and organizations. Thousand Oaks, CA: Sage.

Seidman, I. (2006). Interviewing as qualitative research: A guide for researchers in education and the social sciences, third edition. New York: Teachers College Press.

Shah, R.C, & Kesan, J.P. (2009). Recipes for cookies: How institutions shape communication technologies. New Media & Society, 11(3), 315 – 336.

Shin, D.H. (2007). A critique of Korean national information strategy: Case of national information infrastructures. *Government Information Quarterly*, 24, 624 – 645.

Shin, D.-H., & Venkatesh, M. (2008). The political economy of convergence: The janus faces of Korean convergence. *Javnost – The Public*, 15(1), 23-38.

Stone, P.J. (1997). Thematic text analysis: New agendas for analyzing text content. In C. W. Roberts (Ed.), *Text analysis for the social sciences* (pp. 35 - 54). Mahwah, N.J.: Lawrence Erlbaum Publishers.

Tong-hyung, K. (January 1, 2005). Seoul to generate W8tr for BcN investment BcN. *Tescom*. Last accessed on-line on May 1, 2010 at: http://www.tescom-lab.com/english/viewtopic.php?t=441&view=next&sid=2ef1cd5ba21f0699701e2e59180 9435e.

Williamson, O.E. (2000). The new institutional economics: Taking stock, looking ahead. *Journal of Economic Literature*, 38(3), 595-613.

World Economic Forum and International Management and Development Institute (1994, 1995). *World competitiveness report*. Washington, D.C.: International Management and Development Institute.

Zhao, F., Shin, J. & Reich, J. (2002). Information – driven dynamic sensor collaboration. *IEEE Signal Processing Magazine*, 19(2), 61 - 72.

