Telecommunications networks and sustainable society:
A new perspective of broadband policy

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Abstract

Today, broadband network has gained much attention from the public because of its contribution to social and economic development. This recognition is evidenced in many studies, both theoretical and empirical research. As a result, many policies and initiatives have been developed and implemented in most countries around the world to make broadband available throughout a country. Some instruments can be seen in the form laws, rules, and regulations being issued to telecommunications market, and some instruments are based on several kinds of government supports. However, with globalization and sustainability impacts, the policy impetus for broadband should be shifted toward a means to facilitate future development. This changing emphasis due particularly to environmental aspect impacts the design of policy instruments. A question can be raised which instruments can serve a new concept of future broadband policy.

Against this background, this paper presents a theoretical concept of broadband policy by providing a model to integrate the related broadband policy instruments. A timeline of all instruments and initiatives being implemented is explored. This evolution is analyzed in order to see what kind of future model is applicable when broadband policy has to move beyond the traditional regulatory structure to a new changing environment i.e. sustainability. The analysis addresses how well the existing instruments can serve a new concept of broadband policy and what the needs are for new policy instruments.

Keywords: broadband policy, sector agenda, strategic agenda, sustainability, network society
1. Introduction

Dated back to the end of 19th century where the telephone system was first invented, no one could ever imagine how that new innovated technology would have a far-reaching changes to society and economic of the world. Even though technological revolution has a profound effect to the changes of society for hundred years since the industrial revolution in 18th century (Bell, 1999), no technology could compress time and space as telecommunications system has done. It compresses time by enabling the synchronization of many different human activities, and compresses space by allowing people to communicate over great distances (Tomlinson, 2010). In addition, it also facilitates many transactions and brings in many aspects beyond the physical boundaries of the countries. These new phenomenon could not be possible without technological development of telecommunications system, however, it encompasses many dynamic changes in this industry, not only market development but also its benefits to the consumers, and the evolution of policies, rules and regulations in this sector.

Though the contribution of broadband to social and economic development is very important, particularly during the current situations, it may not be the only benefit that broadband could bring about. As the focus of most broadband policy nowadays is not only to increase broadband growth within a country, but it also has contribution to sustainability and competitiveness of a nation which are a basis for future development. Therefore, the aim of this paper is to propose a conceptual framework of broadband policy by integrating both traditional and new aspect of telecommunications networks. The paper is structured as followed. The next section provides the overall picture of telecommunications developments. A review of literature will be explored in Section 2. Section 3 will provide theoretical considerations that are relevant to the proposed concepts. Section 4 will address the evolution of telecommunications sector. A comprehensive framework for broadband policy will be proposed in Section 5, and conclusions will be made in Section 6.

1.1. Technological development in telecommunications

Since the industrial revolution in 18th century, the society has faced three major technological revolutions which have given to the dramatic social and economic effects of industrialization. The first technological revolution was the inventions of steam engines, railroads, and a growing iron industry which was took place in Britain before spreading effectively to the continental states of Europe (McNeese, 2000). The second technological revolution, only a hundred years, can be identified with two innovations: electricity and chemistry. Electricity, in particular, enhanced new form of power that could be transmitted hundreds of miles, transformed voice electric signals so as to create telephone and radio. In this era, the revolution brought about tremendous progress in the field of communications, began with the invention of the telegraph in the mid of 19th century and followed by the invention of the telephone in 1876 which was patented in the US. (McNeese, 2000). The third technological revolution is built on four innovations, that are, the change of all mechanical and electrical systems to electronics, miniaturization, digitalization, and software (Bell, 1999).

From those three revolutions, the last two revolutions have much contribution to the changes of telecommunications networks. From the first invention of telephone, the telephone system was the plain old telephone service (POTS). It was the voice-grade telephone service that remains the basic form of residential and small business service connection to other telephone networks. During that time, voice communications was being able to transmit over the copper line to other people living far
away. Later on, POTS also allowed for data transmission through dial-up technology or so called narrowband but at the rate of transmission 56 kbps.

The development of data transmission technologies through copper line and fiber optic in the late 20th century such as integrated services digital network (ISDN), Digital Subscriber Line (xDSL), and FTTx have increased the data transmission capacity to go beyond 56 kbps, and that data services became important and where broadband have been known to the public. Today, there are many choices of technologies that allow for broadband connections, not only through copper line technology such as xDSL, cable modem, or power line communication (PLC), but also fiber optic and mobile technology.

1.2. Emergence of telecommunications framework

Along with technological development, industry structure and regulatory framework in this sector has changed over time. In the early era of telephone industry (during POTS period), the attitude that the ideal condition for telephone service was of complete monopoly was applied (Stehman, 1925; Brock, 1981; Noam 1992; Bauer, 2010a) because it was believed that increasing returns to scale could best be obtained by single firm supply (Fransman, 2003). The natural monopoly regime was applied to telephone industry in most countries, and that the monopolistic firm was regulated through several kinds of price regulations and universal service regime (Mueller, 1989).

At the same time where broadband technology was launched, competition was also introduced in telecommunications market, for example, in the US in 1970s (Brock, 1981) or in the EU in 1980s (EC, 1987; Noam, 1992). During the transition period from monopoly structure to competition, many regulatory regimes were implemented, for example, interconnection regime, access regime, and licensing regime. Even though there are many positive effects of competition, for example, price reduction, effective resource allocation, and quality of service improvement, the drawbacks of competition can also be seen, for example, uneven development due to low investment in unprofitable areas. Therefore, when broadband connectivity is widely accepted as having strategic importance to all countries because of its contribution to economic growth in all sectors, enhance social and cultural development, and facilitate innovation, policies and measures have been initiated in most countries around the world with an aim of encouraging broadband deployment.

From observations, three approaches have been deployed in many countries around the world in order to encourage broadband penetration: government approach, market approach, and regulatory approach. Firstly, the government approach, in this dimension, actions are mostly taken by government but in many different forms. The most aggressive strategies of this type are government investment and state-aid policy. In Sweden, for example, the government funding for broadband expansion have been stipulated by laws according to which the government undertakes a special responsibility to stimulate the broadband expansion in rural areas where the public interest is not fulfilled by the market-oriented forces. Under this approach, several kinds of public interventions can be seen, ranging from allocating a national budget for broadband infrastructure construction, operation, public-private partnership, to subsidization for broadband services. It is interesting to note that the results from countries which have implemented this approach, e.g. Sweden, Korea, and, recently, Australia can be seen from the high broadband penetration rate over time as well.

Secondly, the telecommunications regulatory approach, it could be in the form of both ex-ante and ex-post regulation, for which encouraging competition in the broadband market and removing barriers to entry are primary objectives. These mechanisms are active at both international level and national level. At international level, the European Union, a supra-national organization, has introduced several
regulatory frameworks to encourage broadband competition and deployment in member states. The leading framework that targets broadband can be seen from the proposal to include broadband in the scope of universal service (Bohlin & Teppayayon, 2009; 2010), local loop unbundling, functional separation, and recently the NGA framework. At national level, this dimension has been implemented by most of the national regulatory bodies around the world such as Ofcom in the UK, ARCEP in France etc., and in some cases it is enforced by the competition authority of the respective countries.

Lastly, the market approach, this dimension can be seen in many countries nowadays as a leading policy where private investment is achieved as a result of liberalization and technological development. Japan, for example, relied much on competition in broadband market at the early era of broadband development (ICR, 2002). This dimension also links to the actions taken by the telecommunications regulatory body (in the 2nd dimension) in terms of balancing competition in the market.

1.3. New dimensions of telecommunications

The natural disasters happening around the world, for example, the Hurricane Katrina of the 2005 in the US, earthquake and tsunami in Japan 2011, tsunami in 2004 and severe flooding in 2011 in Bangkok, have called for attentions from every people and governments to think more seriously about the importance of telecommunications infrastructure. Having a good and efficient telecommunication infrastructure is not only to serve the demand for bandwidth from business sector and individual users, but also contribute to a long term development of a country. Available, accessible, and usable telecommunications infrastructures both before and during disaster situations are necessary.

The growing concern about environmental issues results to a growing awareness of the impact that human and their activities have on earth, and that call for the issue of sustainability through information technologies (IT). Over the last several years, the term Green IT has begun to be used to describe a field at the juncture of the growing concern about environmental issues and the use of IT itself. The rapid growth and acceptance of IT worldwide suggests that this area may be a fruitful in which to seek possibilities for environmental change since green IT can help reduce the impact of e-waste, enable sustainable interaction design, and decrease energy consumption by computational systems (Tomlinson, 2010).

2. Literature reviews

2.1. Literatures relating to the roles of telecommunications policy and regulations

From literatures, a huge research on broadband policies and initiatives has been conducted. An observation can be made that most of those research pay attention primarily on the implementation of regulatory regimes in telecommunication sector. Some studies focus on the overall picture of broadband policy, for example, research on convergence issues (Burgelman & Pauwels, 1991; Bohlin, 2003), research on information superhighways as technological enhancement of the most modern telecommunication systems (Melody, 1996), research on the importance of government role in the development of broadband networks (Hundt & Rosston, 1998; Cave, Prosperetti, & Doyle, 2006), research on effectiveness of different policy choices to promote broadband (Cava-Ferreruela & Alabau-Munoz, 2006; Falch & Henten, 2009).

Apart from overall picture of broadband policy, some literatures focus some specific tools or measures being implemented in broadband networks, for example, research on unbundling policy (Garcia-
Particularly, some studies consider the relationship between broadband networks and sustainability issue (Ducatel, 2001; Dodd, 2007; Saunders, 2007; Fuhr&Pociask, 2007; Middleton, 2009).

2.2. Implications to the paper

Literature review in previous section provides the basic idea for understanding how broadband has been viewed from academic research, and what is the primary focus of those research. Several implications in relation to this paper can be made.

Firstly, most literatures focus on one-sided issue of telecommunications, and that is about the development within telecommunications industry itself. Particularly, much attention has been paid to policies and regulatory measures that are developed over time. Observation can be made that those policies and regulatory measures have a main aim to increase penetration rate or to cope with market and technological developments in telecommunications sector.

Secondly, along with technological development, broadband connectivity is widely accepted as having strategic importance to all countries. The results of broadband penetration can be evidenced in growth and productivity in many studies which are not listed here. At the same time, the outcomes of being the information society in the EU are not only to improve quality of life of the EU’ citizen but also to strengthen capability of the EU to compete in the global market as a result of globalization. Even though some research point out some importance issue that the EU needs to be prepared in order to move towards information society, most of them did not touch upon the issue on how much impact of government policy to the market and society is in terms of influencing the changes in the whole system.

Thirdly, a growing concern on environmental issues is increasing all over the world as a result of natural disasters. Several research raise the issue that telecommunications technologies, in particular broadband can support the reducing of energy consumptions in other sectors. Some research also point out the negative impact from ICT equipments in terms of energy consumption, and that important as ICTs were in achieving sustainability could not be done by themselves, or by any technical solution without supporting changes in the system. However, very few research has been conducted by integrating the challenges of telecommunications under broadband policy.

3. Theoretical considerations

Most of traditional telecommunications policies are based on economic theory. This is because there are many research have pointed out the relationship between telecommunications and economic growth. Romer (1986, 1990) stressed the importance of technology as a driving factor increasing returns of the production function and accelerating the achievement of a higher rate of economic growth. Antonelli (1991) found that every dollar per capita increase in investment, especially in the telecommunications sector, creates a stronger diffusion effect in countries that were late starters, and a weaker effect in countries that started earlier. Atkinson (2011) discussed four economic doctrines underlying different position of network policy including broadband: Conservative neoclassical
economics, Liberal neoclassical economics, Keynesian economics, and Innovation economics. The paper stressed that each of the four doctrines has a different view of broadband competition and focuses on different parts of the overall policy challenge, however, understanding the relationship between economic doctrine and network policy views can help bring more clarity and insight to the policy making process.

In contrast, Bell (2001) suggested that there are some limits of economic considerations. Most modern economies rely more on market mechanism as the arbiter of scarce resource allocation and price system, and that leads to the perceptions of maximization, optimization and least cost. However, some drawbacks should be taken into account, and that economic doctrines are based on the proposition that individual satisfaction is the unit in which costs and benefits are to be reckoned but some goods are not private goods and that they cannot be divisible into individual items of possession. Instead, it is necessarily become matters of public policy, of public concern and sometimes of public funding.

Considering issues surrounding broadband nowadays, it is a mixture between broadband as a private goods that individual can purchase, broadband as a public goods that it is an important infrastructure that should be available and accessible for everybody, and broadband as an important factor to contribute to sustainability and competitiveness. Therefore, the theories to explain this phenomenon should be able to cover all areas. Also, the selected theories should be able to provide better understanding the interaction between public policy, firms in the market, and the outcomes to the society. In addition, the theories should be based on an understanding of technological revolution and its implications. Therefore, the theories proposed in this paper are the four levels of social analysis (Williamson, 1998, 2000), and the network society (Bell, 1999; Castell, 2009).

3.1 Four levels of social analysis

Based on the framework developed by Williamson (1998), institutions have been distinguished into four levels (see Figure 1). These four levels have a hierarchical relationship. The solid arrows that connect a higher with a lower level signify that the higher level imposes constraints on the level immediately below. The reverse arrows that connect lower with higher levels are dashed and signal feedback. A brief characteristic of those four levels and the analogy to telecommunications sector are as following.

(Figure 1 here)

3.1.1 Level 1 or social embeddedness

The institutions at this level compose of norms, customs, traditions, etc. Institutions at this level change very slowly (on the order of centuries or millennia). The resulting institutions have a lasting grip on the way a society conduct itself. Therefore, insular societies often take measures to protect themselves against alien values. In addition, the informal constraints which are sanctions, taboos customs, traditions, and codes of conduct are located at this level.

An analogy of this level to telecommunications sector is the market structure where the changing from monopoly system to competition environment took about a century to change. The monopoly system of telecommunications existed in the market for almost a century, and this monopoly was mostly state-owned, except for the US where AT&T which was a privately owned company became a monopoly in the early 20th century. The natural monopoly existed because the fixed investments necessary to create a telecommunications network were so high. By the end of the 20th century this
model was globally seen as a failure. The state-run telecommunications carriers were seen as inefficient. In parallel, technological development which made the price of equipment decrease, and ongoing liberalization, led to the possibility of having other telecommunications providers in the market. Therefore, the transition from regulated monopoly to competition continued to face regulators everywhere (Teppayayon, 2010).

3.1.2 Level 2 or institutional environment

The second level is referred to as the institutional environment. The structures observed here are partly the products of evolutionary processes. Going beyond the informal constraints of the first level, formal rules are introduced at this level. This opens up the opportunity for first-order economizing: get the formal rules of the game right. Constrained by the shadow of the past, the design instruments at this level include the executive, legislative, judicial, and bureaucratic functions of government as well as the distribution of powers across different levels of government. Therefore, this level is the product of politics which provide the rules of the game within which economic activity is organized. Major changes in the rule of the game occur on the order of decades or centuries.

In telecommunications sector, when the liberalization concept was introduced, many policies and regulations in the telecommunications sector were pushed forward to facilitate competition in the market in the late 20th century. Subsequently, the open-access policy came along. However, the transitional period of Postal, Telegraph and Telephone Administrations (PTTs) in the monopoly era towards competition based on the liberalization concept focused not only on creating an openness policy by reducing barriers and permitting entry, but also required integration and conceptualization of a post-liberalization environment (Noam, 1992). Changing the whole structure from a monopoly system to a competition environment led to a new discussion of regulatory issues. Therefore, new sets of regulatory issues have been implemented and changed over time, in particular for the broadband market with the aims of encouraging competition and increasing broadband growth.

3.1.3 Level 3 or institutions of governance

Going beyond the rules of game, the play of game is needed, and that is where the institutions of governance is located. Although the rule of law remains important, a perfectly functioning legal system for defining contract laws and enforcing contracts is not achievable. The accepted problem for dealing with this constraint is that of vertical integration, which is the solution posed by Coase in 1937. As Williamson has argued in many publications, any issue that arises as or can be reformulated as a contracting problem can be examined in transaction cost economizing terms. Then the governance of contractual relations becomes the focus of analysis. Williamson suggests that the possible reorganization of transactions among governance structures is to be re-examined periodically, on the order of a year to a decade, often at contract renewal or equipment renewal intervals.

As a result of liberalization and technological development in telecommunications sector, today broadband market exists under competition structure. As the heart of the seminal contribution of Coase (1937) on transaction cost, vertical integration is also inherited in telecommunications firms as it decreases the costs of coordination between two entities and provide better incentives to invest (Cremer, Cremer & De Donder, 2007). And that is the main argument for opposing functional separation to be introduced in telecommunications regulatory system.

3.1.4 Level 4 or production function of a firm
Level 4 moves from discrete structural to marginal analysis. This is the level which neo-classical economics and, more recently, agency theory have been concerned. The neo-classical decision variables are price and output. Third-order economizing prevails, which entails getting the marginal conditions right. Optimality apparatus, often marginal analysis, is employed, and the firm, for these purposes, is typically described as a production function. Adjustments in price and output are made in a (more or less) continuous way in response to changing market conditions.

Under the current competition environment, efficient strategies are important for broadband providers in order to compete in broadband market. Adjusting price and outputs can be seen from promotions offered in the market to gain more users and profits.

3.2 Some considerations to the four levels of social analysis

The framework proposed by Williamson (1999, 2000) have been referred in many research areas such as telecommunications sector, electricity sector, or energy sector. In telecommunications, research by van Leiden and Monasso (2005) and Kodwani (2006) have addressed the Williamson’s framework to explain the relationship between players in telecommunications market. Van Leiden and Monasso (2005) conducted a research on under-serviced area licensing in South Africa. They stressed that in order to get telecommunications to rural areas, the government should not considered only layer three and four, but layer 2, the institutional environment, and layer 1 also have a major impact on the situations. Therefore, their research did not only describe the structure of the market and regulatory framework, but some other issues such as business process and educational system were also analysed. A research on governance mechanisms for telecommunications and electricity industries in India by Kodwani (2006) addressed the importance of institutions in each level matter for economic performance and firm behavior. He also stressed that the institutional analysis of economic behavior presented opportunity to consider the richness of the social, legal, political, and economic context in which economic decisions are made, and that whereby it is called hierarchical relationship.

From research, it can be seen that the Williamson’s framework tries to explain the governance structure of a system. In order to understand an economic behavior, it is important to know the institutional mechanisms surrounding the issues. In this sense, some observations can be made:

- In telecommunications sector, though the path development at the first level was replicated in most countries around the world where competition has been introduced to telecommunications market, the aspects of society in the 2nd level or institutional environment emerge slowly over long period of time. It may therefore not be possible to replicate the success of a country or a region (Bauer, 2010b). This is because each country has different environments such as market structure, geography, socio-economic, social structure etc.; therefore, the outcomes in each country may be different. Broadband penetration, for example, is different from country to country, though; competition mechanisms are introduced in most countries.

- If each level has a hierarchical relationship as pointed out by the framework, the first level should be the most important level because it is the first level that influences the decision in other levels. However, the framework did not explain what are the major factors for changing the situation in level one.

- Changing economic behaviors in level 3 and level 4 needs to change the underlying assumptions setting by level 1 and level 2. Since changing the practices in level 1 and level 2 require some times, it may not be able to respond to some situations that require the immediateresponse such
as sustainability issue in telecommunications. The difficulty to change comes from the different underlying principle. If the underlying principle of telecommunications industry is competition, the tendency of governance structure will focus more on economic perspective. While the underlying principle of the sustainability, green IT in particular, is social perspective, it is difficult to focus both issues without changing regulatory practices.

3.3 Theory of network society

According to Bell (1999), technological revolution has a profound effect to the changes of society for hundred years. Since the industrial revolution in 18th century, the society has faced three major technological revolutions which have an impact to the development of society. The first technological revolution was the use of steam for pumps, controlled chambers for locomotion, and machines, paved the ways to industrial revolution. The second technological revolution, only a hundred years, can be identified with two innovations: electricity and chemistry. The third technological revolution which is the foundation of the post-industrial society or network society is built on four innovations, that are, the change of all mechanical and electrical systems to electronics, miniaturization, digitalization, and software.

The most crucial fact about the latest technological revolution is that it is a set of changes that pervade all aspects of society and reorganize all older relationships. The changes of old relationships can be witnessed from daily life of people up to the relationships between nation states. Communications through several kinds of technologies begins to replace transportation as the major mode of connection between people and as the mode of business transaction. With the ability to work from any places through Internet connection means that fixed sites for work are less meaningful. The conceptions of time and space transcend the boundaries of geography and take place in real time. With Internet connection, it brings in the ordinary citizen as a user and consumer, emphasizing interaction and participation. It provides enormous access to the cultural resources of humankind in a way never known before. It multiplies the number of affinity groups across national boundaries.

Therefore, the key feature of the network society is the networked connection between the local and the global (Castells, 2010). Digital networking technologies powered social and organizational networks in ways that allowed their endless expansion and reconfiguration, overcoming the traditional limitations of networking forms of organization to manage complexity beyond the certain size of network. The consequences of these new evolution is an increase in the importance of the awareness of new opportunities and possibilities for advancement through new information and, most important, by acquiring connections. However, the Internet, while spanning the world, is limited, actually, to those countries and areas that have a supporting infrastructure, essentially a modern telecommunications system (Bells, 1999). While everybody felt the effects of this new social structure, global networks included some people and territories while excluding others, so inducing a geography of social, economic, and technological inequality. In a parallel development, social movements and geopolitical strategies became largely global so as to act on the global sources of power, while the institutions of the nation-state inherited from the industrial society gradually lost their capacity to control and regulate global flows of wealth and information (Castells, 2010). The needs to have the efficient and high capacity of telecommunication networks are increasing overtime.
3.4 Some considerations to the theory of network society

When telecommunications infrastructures have a profound effect to the society as a result of transforming into post-industrial/network society, several consequences can be drawn from this new development as following:

3.4.1 Strategic importance of having the advance telecommunications infrastructures

The advance telecommunication infrastructures are necessary for the emergence of a new form of social structure as roads and transportations were in the past. It becomes a strategic important as they are the backbone of network society that should be made available to all people. From literatures, many research show that broadband can have both economic and social impact to a country. In terms of economic impact, an incremental of broadband penetration can result in the growth of GDP (Katz et al., 2009; Bohlin et al., 2009; MICUS, 2008; Climate group, 2008). Also broadband can contribute to the employment growth (Lehr et al., 2005; Crandall et al., 2007; ITIF, 2009; Gillett et al., 2006). Several studies show that lacking of broadband access can increase knowledge gap between social classes (Kim, 2008; Norris, 2001). The study of Forman, Goldfarb, and Greenstein (2009) also suggests the existence of a considerable divide in the benefits of advanced Internet use across urban and rural areas.

3.4.2 Necessity of capacity building

The divide among people is not the result of an option; it is, rather, the fruit of a society in which the necessary cognitive resources are distributed unequally amongst the generations, so that societies in which formal learning and literacy are historically better established present transition processes that accentuate the generational differences to a lesser degree (Cardoso, 2005). The network society is a society based on an informational development model, in which some cognitive skills are more valued than others, namely: the highest education level, formal literacy and technological literacies. Therefore, the correction of this massive exclusionary process requires concerted international public policy acting on the roots of the new model of development (technology, infrastructure, education, diffusion and management of knowledge) rather than just providing for the needs arising from social exclusion in the form of charity (Castells, 2005).

3.4.3 Challenging of sociologizing mode

According to Bell (2001), in modern industrial life, economizing mode of life is introduced. The conditions of economizing are a market mechanism as the arbiter of allocation, and a fluid price system which is responsive to the shifting of supply and demand. However, economizing mode is based on the proposition that individual satisfaction is the unit in which costs and benefits are to be judged. In contrast, a sociologizing mode or the effort to judge society’s needs in more conscious fashion and to do so on the basis of some explicit conception of the public interest. Therefore, the major sociological problem ahead, for example, environmental pollution or education, will test the public sector to foresee the effects of social and technological change and to construct alternative courses in accordance with different valuations of ends, at different costs.

4. Evolution of telecommunications structure

This section provides basic understandings and the challenges of telecommunications sector from different aspects. The first aspect relates to the structure of telecommunications in general. The main idea is to explain the development of telecommunications structure from the traditional structure to the
current situation. Different initiatives to facilitate or encourage the deployment of broadband infrastructures are also addressed. The second aspect relates to the new challenges of telecommunications. When telecommunications infrastructures are the basis for the improvement in other sectors, the issues to be considered may go beyond the telecommunications industry itself.

Among other technologies, information and telecommunications technology gains much attention from the public these days due to its enormous effects on economic and society development. With the age of more than one hundred year of evolutions, the structure of telecommunications industry today has changed from the first time this technology came to the market. Its changes can be divided into three main era (see Figure 2).

(Figure 2 here)

4.1. Traditional structure

Traditional telecommunications structure started from the time where the telephone system was first introduced into the market until 1970s. During that time, the natural monopoly regime was applied to telephone industry in most countries, either by private-owned company or by public-owned company. In the US and Canada, for example, the market was dominated by private-owned company, subject during the late nineteenth century to oversight by municipalities and beginning in the twentieth to regulation by specialized state and federal agencies (Bauer, 2010a). In contrast, telephone and telegraph development occurred with much greater government involvement in Europe than it did in the US. In most countries, private companies played an initial role but were eventually absorbed into a government monopoly (Broack, 1981, Noam, 1992). During monopolistic period, monopoly provider was regulated through universal service regime (Mueller, 1989).

Throughout most of the twentieth century, state ownership and government regulation were considered alternative, mutually exclusive, forms of public control of sectors deemed of critical importance to economy and society. This situation started to change beginning in the 1970s as weaknesses of the state-owned postal, telephone, and telegraph companies (PTTs) to provide efficient information and communication infrastructure became visible. At the same time, trust in the ability of government agencies to successfully regulate monopolies started to fade and made room for a stronger belief in deregulation and the superiority of market organization and competition (Bauer, 2010a).

4.2. Transition of traditional structure to the new structure

Along with technological development where broadband technology such as ISDN was introduced to telecommunications market in 1980s, the transition from the traditional telecommunications structure to the new structure has also taken place, and that the concept of market competition was introduced into telecommunications sector (see Figure 4).

During the late 1980s, led by the European Commission, within a relatively brief period of little more than a decademonopolies were abandoned and replaced by a more openly competitive marketstructure (Michalis, 2006; Steinfield et al, 1994). Like in the US, terminal equipment, value-added services, and mobile communications, were successively opened to new entrants (Bauer, 2010a).

External regulation by specialized agencies was considered a more efficientinstitutional arrangement than state monopoly (or at least a second-best necessity during the transition from monopoly to competition). Therefore, as PTTs were gradually privatized, countries that historically had opted for
state ownership such as Europe established independent regulatory agencies to oversee the reorganized incumbentservice providers. The owner-operator state was gradually transforming into theregulatory state (Jessop, 2002; Majone, 1996).

Under the new environment where competition was introduced into telecommunications market, the relationship between the government, the provider, and the users was clearly separated but it created more complexity than the old structure. Since competition is the underlying principle of telecommunications market, the role of the regulators is not only to remove barrier to entry for the new entrants but also has to maintain competition in the market whereby the different market power of the firms is presence. At the same time, when the demand for telecommunications is increased, having a greater capacity of the network as a result of increasing demand together with the responsibility to make telecommunications services accessible, available and affordable throughout the countries make the role for the regulators even more challenges.

Therefore, during this stage where broadband getting more important to the development of social economic of the countries, many initiatives have been implemented around the world in order to reach all the expectations from both firms and users, and that where those initiatives are called as the tools to serve the sector agenda.

Nowadays, there are three different approaches from practices of the countries around the world being implemented to reach the sector agenda; namely government approach, market approach, and regulatory approach (see Figure 3).

(Figure 3 here)

1. a) The government approach

The approach is taken by the governments in many different forms. The most aggressive strategies of this type are government investment where the governments invest in telecommunications infrastructures through government budget. The leading countries which implemented or have been implemented this strategies are Sweden, South Korea, and recently Australia.

In Sweden, for example, the government funding for IT infrastructure expansion to rural areas was underlined by laws where the funding was based on six-year support during 2001-2006 with amounts totaling 5.2 BSEK to aid municipalities in rural areas with the expansion of three distinct layers of broadband infrastructure technologies. This had also been the case in South Korea where the number at USD 24 billion for the Korean Information Infrastructure-Government phase in the late 1990s (Berkman, 2010). From 1995 to 2000, a nationwide backbone comprising a 155 Mbp–40 Gbpbbackbone network was established in 144 cities with the objective of upgrading this to Terabps (Lee and Chan-Olmsted, 2004). The latest country which follows this strategy is Australia. In 2009, The Australian government has announced a massive project to extend broadband internet systems across the country by in favour of a government investment of about A$43bn (USD30bn).

The lower degree of this approach can be observed when government acts as a supporter or facilitator. The government investment is made only to complement market functioning in geographic areas where there is a lack of broadband infrastructures since, under market conditions, the lack of incentives for private investment is mainly due to the high fixed cost of deploying infrastructures and
the low revenues associated with these areas (Cava-Ferreruela, 2007). Therefore, actions of this type taken by government can be carried out in many different ways, such as providing financial support or incentives to private telecommunications providers, or collaborating with those providers to roll out broadband infrastructure. There are several kinds of financial support or incentives to private firms, for example providing low-interest loans, tax incentives, government subsidies or investment incentives. In South Korea, an amount of 1.76 billion in low-cost loans was spent by the government to support broadband infrastructure (Berkman, 2010).

Another type of government approach that could relate to telecommunications regulatory framework is public-private partnership (PPP). PPP have been implemented in many countries such as Sweden, Spain, and France etc. For example, Sweden, the PPP project, namely SkåNet, has been launched since 2002 in Skåne with collaboration between municipalities and private companies. The project is based on collaboration between public and private players. Tele2 has undertaken to build, own and operate most of the fiber network, but the network is open to all players on equal terms.

The government approach is justified on the basis of market imperfection and when there is a divide among people in society. However, it has both advantages and disadvantages. The main advantage of this approach is certainly to address market failure and to achieve distributional policy. The effectiveness of government programs that have stimulated broadband supply by public funding, especially to increase coverage in areas where market forces do not deliver the required investment is also recognized by ITU (2003). The disadvantages of the approach can be observed if it is not implemented proportionate (Papadias et al., 2006), and that it can distort completion, crowded out the market and duplicate investment.

b) The market approach

The market approach relies on competition in the market. It is recognized that competition can yield the most benefits to the users in terms of price, quality of service, resource allocation etc. Fortunately, in the broadband era, the market for retail broadband communication services differs from the markets for local telephony in an important respect: it is emerging in an environment of competition rather than monopoly. Unlike the telephone network (which began as a patent monopoly and, after a brief period of competition, reached maturity as a regulated natural monopoly), every broadband provider has from the beginning faced actual or imminent competition. Broadband in its current, early state thus seems more analogous to wireless telephony, which was born as a duopoly, than to voice telephony (Shelanski, 2002).

This approach seems to be the underlying principle for regulating telecommunications market in many countries nowadays, among them, the countries that has strongly implemented this approach are Japan, the US, and Finland. For example, Japan, as a result of competition mechanism in broadband market at the early era of broadband development (ICR, 2002), results to a leading country of fiber-optic networks of the world these days. Another example is Finland. According to Eskelines et al. 2008), Finland has implemented this approach strongly. The Finnish broadband strategy relies on market forces and emphasizes technological neutrality. According to its operational aims, by the end of 2005 the household penetration rate of broadband should be 40%. All citizens should have access to high-speed, easy-to-use and affordable data transfer, and Finland should be among the leading European countries measured by communication network demand and accessibility. These aims were pursued by means of 50 action points, putting most emphasis on measures promoting competition in the broadband markets, the provision of services and content in the networks, and strengthening the demand for broadband. The proposal also included action points for low-demand areas. These
included recommendations for creating regional strategies for broadband deployment, increasing competition in local markets, and providing schools and libraries with public broadband connections. However, no government funding for broadband infrastructure investments was made available (Eskelines et al., 2008)

There are both advantages and disadvantages of the market approach. From advantages side, this approach encourages private investment, in particular when the demand for telecommunications services is increasing. Also, it will facilitate market innovation where firms need to find strategies to induce new customers and to maintain their existing customers at the same time. Several strategies of firms have been introduced into the market these days such as bundled services, new application developments. However, disadvantages of this approach can also be observed since the real-world market exhibit some characteristics which prevent it from far being perfect. Therefore, the situations of cream skimming and anti-competitive behaviour may exist if the regulators do not regulate properly.

c) The regulatory approach

The telecommunications regulatory approach is active at both international level and national level. At international level, the European Union, a supra-national organization, has introduced several regulatory frameworks to encourage broadband competition and deployment in member states. The leading framework that targets broadband can be seen from the proposal to include broadband in the scope of universal service, local loop unbundling, functional separation, and recently the NGA framework. At national level, this dimension has been implemented by most of the national regulatory bodies around the world such as Ofcom in the UK, ARCEP in France etc. The going-on regulations for regulating broadband service these days are open access regimes, universal service, and functional separation.

Open access regimes require telecommunications providers, mostly incumbents, to make available to their competitors, usually at regulated rates, various parts of their network or service, so that the competitors can begin to compete using these components as part of their service, without having to replicate the full investment that the incumbent originally made. There are various types of access, namely, unbundled local loop, shared access, bitstream access, or wholesale. As shown by the literatures in Section 2, open access policy, in particular unbundling, played an important role in facilitating competitive entry in many of the countries, for example, most countries in the EU, Japan, New Zealand etc. In many cases, even where facilities-based alternatives were available, unbundling-based entrants played an important catalytic role in the competitive market. In some cases competition introduced through open access drove investment and improvement in speeds, technological progression, reduced prices, or service innovations. In addition, open access policies contributed to the success of many of the highest performers during the first broadband transition, and as a result they are now at the core of future planning processes in Europe and Japan (Berkman, 2009). Moreover, the study by Garcia-Murillo (2005) shows that unbundling an incumbent’s infrastructure results in a substantial improvement in broadband deployment for middle-income countries. This means that governments in less developed countries can promote the deployment of broadband networks by both fostering competition and requiring unbundling of local loops. Unbundling will allow other carriers to enter the market, and pressure from competition should force them to provide enhanced services.

Universal service is one of regulations that has a long rooted in telecommunications regulatory development. Though the main objective of open access policy, in particular unbundling the local
loop, is to foster competition in order to yield all benefits to the every people, low urbanization levels and consequently the high cost of network deployment per user appear to be the main constraints for building network. Telecommunication reform, together with technological development, brings competition into markets where penetration is increased, and the increases in coverage may not benefit consumers at all income levels (Clarke & Walsten, 2002). Therefore, universal service regime is implemented to guarantee that all citizen will be able to enjoy the benefits, at least, of the basic service in telecommunications under the regimes of accessibility, affordability and availability. Details of this regime being discussed in the EU are provided in Paper 1 and Paper 4.

Functional separation is increasingly adopted or considered to achieve open access into the next-generation transition in many countries, for example the UK, New Zealand, Sweden, Netherlands, Italy, and Australia. The justification for this regime arises when the market is alleged to be unable to deal with particular structural and/or behavioral problems. Since the structure of the telecommunications market emerged in the form of a monopoly, vertically integrated between upstream and downstream elements, integration may be problematic especially because a vertically integrated firm has the means and motive to practice non-price discrimination in the activity where it is dominant, in order to weaken or eliminate competitors in potentially competitive activities (Cave & Doyle, 2007). Details of this regime are discussed in Paper 3.

The telecommunications regulatory approach, in particular the local loop unbundling regulation, is recognized the successful initiatives in terms of increasing broadband penetration in the EU. Nevertheless, this approach also has advantages and disadvantages. The advantages of having regulations in place are that it reduces regulatory uncertainty and prevent non-discrimination practices. The disadvantages are that it may discourage investment if it is too strict and cannot respond to immediate changes in the market. The example of the discussions regarding advantages and disadvantages of implementing regulations can be seen when the NGA recommendation was launch in the EU. Details are written in Paper 5.

4.3. Moving beyond the telecommunications sector

The telecommunications market is dynamic, not only in terms of the industry, itself, but also in terms of demand and regulation. When the telephone was first introduced to the market more than a hundred year ago, no one ever imagined the tremendous impact of that innovation on society as a whole. Today, telecommunications infrastructure is not only a means to communicate but also a major factor for social and economic development of a country. Therefore, the perception of telecommunications structure is changing overtime.

A new factor is added to telecommunication structure as a new dimension, that is, global market because of the ability of broadband networks to connect people in every part of the world. Advance broadband infrastructure becomes a major factor for the society in moving towards the network society. National network becomes global network. National market becomes global market. Every country has to compete in this new market, particularly developed countries, in order to maintain their leader and powerful position at international level.

There are many issues from global perspective that can be improved by having an advance broadband infrastructure. Competitiveness of a nation is one of them. Several criteria are used in order to judge the level of nation competitiveness, among them, the penetration of an advance telecommunication infrastructure is a crucial one. Broadband is becoming vital for business and offers such competitive advantages that it is being compared to utilities such as water and electricity (UNCTAD, 2006).
Availability of telecommunications infrastructure benefits users and downstream industries. Users can easily access information and communicate with others. At the same time, having a good telecommunications infrastructure also enhances efficiency in other sectors, such as transport, education, healthcare, and emergency services - all sectors regarded as major factors in improving national welfare.

Sustainability is another one. Climate change is recognised as the most urgent environmental problem we are facing today. Communication initiatives can play a key role in addressing people's perception of climate change possibly driving them to change their lifestyles (Grasso, Baronti, Guarnieri, Magnano, Vaccari, & Zabini, 2011). On the one hand, broadband connection can help to reduce energy consumption, for instance by lowering transport needs, reducing logistic costs and improving cross-border trade and transportation in landlocked countries. In addition, broadband can also improve electricity generation and distribution and to improve environmental performance of urban systems and building. On the other hand, broadband technologies can also bring in negative effects, both direct and indirect (Teppayayon, Bohlin, & Forge, 2009). Direct effects include increased electricity use from ICT equipment and waste, while indirect effects relate to increased consumption of goods and services, fuelled by broadband. These indirect effects are typically devoted rebound effects (Hilty et al., 2006), especially in the situation where adverse effects if increased ICT use come about as a secondary effect of initially desirable ICT use (i.e. reduced travel due to on-line shopping but more transport due to customised delivery). The increased use of sophisticated IT equipment and broadband has accelerated the flow of information and resulted in increased consumption of electrical power. As a result of broadband connectivity, energy consumption from devices such as handsets, PCs and terminal equipments can have environmental impacts such as the direct energy used by devices and the power consumption involved in connecting remote networks.

Therefore, as illustrated in Figure 5, the new telecommunications structure is an integration of three main aspects: national strategy, regulatory framework and firm strategy. National strategy or strategic agenda is a country’s vision for the future. It is a long-term development that requires collaboration and participation from every sector in order to strengthen the capability of a nation to compete on the global market. Regulatory framework or sector agenda is a sector policy aimed at shaping the national telecommunications market. Its perspective is a short-term one, compared to national strategy, with an aim to improve or provide telecommunications infrastructure throughout a country. Firm strategy is the interaction between telecom providers and the users. Even though one could say that firm strategy focuses on the potential profit of a company, this strategy is undeniably influenced by government rules and regulations.

5. A comprehensive framework for broadband policy

The analysis of the two theories; the four levels of social analysis by Williamson and the network society by Bell, to the telecommunications structure is discussed in this section. The main objective is to explore whether or not the existing structure of telecommunications sector is applicable to deal with the new challenges of telecommunications.

5.1 Changing perspective of broadband policy

The performance of telecommunications market or the sector agenda these days can be well explained under the framework by Williamson. As illustrated in Figure 4, the high or low penetration, or high or low price of broadband are the results of firm behaviors. Firm behaviors are governed by rules and regulations.
regulations in telecommunications sectors. Rules and regulations in telecommunications sector are based on the concept of liberalization or market competition.

(Figure 4 here)

A question, therefore, arises whether or not the existing structure of telecommunications which is sector agenda will be applicable to the new challenges of telecommunications. There are two types of new telecommunications challenges. The first challenges is the expectation of broadband network as a factor to improve efficiency in other sectors such as transportation, healthcare, etc. which is, as a result, to improve country competitiveness. The second challenge is the expectation on sustainability of telecommunications which is to increase positive effects and reduce negative effects regarding the environmental issues.

Considering from the framework by Williamson, though it provides a good explanation for the sector agenda, it may not be able to explain the situations when telecommunications is expected to be a strategic importance for a long term development of a country or the global. Since the new challenges are the expansions of telecommunications to go beyond the existing structure which is rooted under the concept of liberalization or market competition (see Figure 5).

(Figure 5 here)

**Figure 1** Three changes of telecommunications perception

As suggested by the framework by Williamson, the four levels of social analysis have a hierarchical relationship. Therefore, what have been changed in a higher level imposes constraints on the level immediately below. This implies that in order to increase market performance towards the new challenges, for example, to perform more on the issue of sustainability, there are two aspects to consider.

The first aspect is about whether or not the concept of the first level of the Williamson’s framework should be changed. The perception of competition or liberalization can be maintained. A research in electricity sector by Moss and Kwoka (2010) suggested that competitive issues can be expected to persist through the transition to a low-carbon, energy-efficient future.

The second aspect is about whether or not rules, regulations, and policy of the second level of the Williamson’s framework should be changed. Williamson (1998) mentioned that such choices in the second level are vitally important to the economic productivity of an economy but cumulative change of a gradual kind is difficult to orchestrate. Nevertheless, there could be radically changed when “rare windows of opportunity to effect broad reform are opened”. There were some situations in the past that occasionally produced a sharp break from normal established procedures such as civil wars, occupations (following World War II), or perceive threats, or breakdowns (Eastern Europe and the former Soviet Union), or a military coup, or a financial crisis. The financial crisis is facing Europe these days, and there are many research suggested that availability of broadband can increase GDP growth, employment growth, and business growth. At the same time, many big crisis natural disasters have happened all over the world due to people and business do not realize the importance of environmental issues. Among them is global warming, many research point out that global temperature has enormously increased over 100 years due to CO2 concentration increased
(Rockstrom, 2009). All these issues suggested that the windows of opportunity are opened and need the new design of policy instruments.

Considering from network society viewpoint, there are several issues that need to be taken into account by the governments when the society is changing towards network society. The coming of network society is unavoidable and has a big impact to social structure. It changes the ways of people living, the ways of doing business transactions, and removing the physical boundaries of the countries.

The result of this social changing requires an advance telecommunications structure, in particular, broadband in order to serve the increasing demand from every sector in society. Having an advance and high speed broadband networks is not only for the purpose of allowing people to enjoy the benefits that the broadband networks can bring, but also allow the countries to acquire a greater opportunities to position themselves in the global market. However, having an advance telecommunications infrastructure is a big challenge for the countries where the telecommunications network is based on an old technology. Either to upgrade or to change to new technology requires a huge investment, and that may not be able to attain under the existing regulatory structures.

Apart from having an advance telecommunications infrastructure, a conception of the public interest is also important for network society. Since some issues may not be able to sustain under the perception of economic goods but it is regarded as social goods which requires public policy. Telecommunications sustainability is one of them. To encourage telecommunications sector to realize and take more responsibility on environmental issues may not be the first priority for business firms due to increasing cost. All these issues suggest that the existing telecommunications policy, in particular broadband, may need to be reconsidered.

5.2 Two concepts of broadband policy

The new broadband policy design for the existing telecommunications sector and the new challenges of telecommunications should compose of two dimensions; sector agenda and strategic agenda (see Figure 6).

(Figure 6 here)

The sector agenda consists of strategies or measures implemented by a country with the primary objective of increasing broadband penetration in a country. This objective of sector agenda is based on the existing structure of telecommunications which can be pursued under the current regulatory regimes. Another objective of the sector agenda is that to increase adoption usage. Though there is a wide range of policy to increase adoption and usage but many research suggested that the availability of telecommunications infrastructure is one major factor. There are other purposes that could be regarded as sector agendas, for example, interoperability or quality of service, but this paper does not elaborate them in detail because they require another set of discussions.

Meanwhile, the strategic agenda comprises of a set of objectives which is regarded as the new challenges of telecommunications sector but go beyond the telecommunications boundary. These objectives nowadays consist of, for example, country competitiveness and sustainable development. Other issues can also be set for the strategic agenda of a country, for example security, but this paper does not mention them.
One observation can be made regarding the proposed framework and that is the issues under each agenda can be changed over time depending on national and global development. Once the new issue has come into attention of a country, the detail analysis has to be changed, both empirical and theoretical discussion.

5.3 Broadband policy: A major initiative for the sector agenda

Having an advance broadband infrastructures, both wireline and wireless, are a fundamental factor of moving towards network society. That is a justification why most broadband policies implemented around the world these days have the primary objectives to serve the sector agenda, where several strategies have been implemented with an intention to increase broadband penetration and growth in a country (see Figure 7).

(Figure 7 here)

The strategies to secure the sector agenda of a country can fall into, in all or in part, the three-dimensional framework composed of the government approach, market approach, and telecommunications regulatory approach as discussed in Section 3. However, according to Bauer (2010b), at the level of policy models and particularly instruments, the experience elsewhere may likewise sharpen the understanding of what is possible and what works and does not work. Given the diversity of institutional arrangements and the dependence of policy choices and outcome of complementary arrangements, effective learning will typically have to go beyond simple forms of imitation. Therefore, there is no pattern in terms of sector agenda for a country to implement which results in significantly increasing broadband deployment, because increasing broadband growth depends on the social and economic circumstances of each country. The same strategy may not give the same result even among developed countries.

Considering from technology viewpoint, many technologies today, both mobile and fixed line, have been developed for broadband connection. Though users tend to have broadband connection more and more through mobile technology such as LTE, fixed line infrastructure is still important for business in every sector. As for fixed line infrastructure, fiber optic technology is regarded as having high capacity than any technology. Therefore, many governments encourage more investment on fiber network. According to Atkinson and Noam (2010), given the high investment needs, and considering practices of other governments around the world, fiber broadband network deployment can be encouraged by many approaches. Interestingly, most of them have been taken mainly from government approach, except for the US which has a more market-based approach. These include:
- government ownership of new infrastructure: this approach is a strong approach for countries like South Korea, and, recently, Australia;
- tax incentives;
- government as lead user;
- subsidies, especially to rural areas or to low income users;
- ease of access to public rights of way;
- social compacts of upgrade commitments in return for approval of higher prices;
- permission of infrastructure sharing among competitors;
- provision of more spectrum, especially from under-utilized government frequencies (whose use need to be audited)
- public private partnership;
- support of the demand side by removing barriers to the entry of entertainment providers, educational services, and tele-medicine;
- support of the supply of content and network utilization by encouraging content access.

The case for public upgrade support programs is mixed. It is strongest for high-cost rural areas to prevent them from falling behind. It can also be extended to encouraging the demand side by supporting content and applications. But such supportive policies can also be a double-edged sword, because they might be tied to regulatory conditions. Whatever one may think of these policies, the mere fact of their entry into the public debate shows the transition from the competition-based model of just a few years ago. Now, with major investment requirements looming, and the long-term need for countries to remain competitive, a frequent acceptance of the government’s active role in ‘industrial policy’ has returned. Thus, ICT policy might move in different directions in Europe than it does for other countries (Atkinson & Noam, 2010).

5.4 Broadband policy: The strategic agenda for country

As mentioned earlier, the strategic agenda is set for some specific national agenda, particularly when broadband is considered as an infrastructure for future development, which means that broadband can contribute to the increasing potential of social and economic status in the future of a country. A strategic broadband policy can increase country competitiveness in the long run where broadband infrastructure is a fundamental factor for country and business growth in every sector. In addition, when climate change attracts attention from people all over the world, broadband can contribute its capabilities to energy saving in other sector. However, to reach that goal in terms of energy saving, a concrete policy needs to be in place because broadband itself can have an impact in terms of energy consumption at the same time.

(Figure 8 here)

As Freeman and Soete (1997) and Perez (2002) pointed out, a new context of broadband policy requires new institutional frameworks to effectively pursue political and policy agenda. Changes in institutional frameworks can involve new priorities for the issues because of resources limitation, and new boundaries between different government agencies (Poel et al., 2010). Therefore the typical broadband policy which focuses more on broadband growth may need to be reconsidered in order to lay down a foundation for the future.

Though national agenda of many countries have pointed out the importance to increase competitiveness through IT infrastructure or many research have addressed the importance of energy consumption by communications infrastructure (e.g. Hilty et al., 2006; Ogasawa, 2006), there is no aggressive government broadband policy from practices around the world.

Nevertheless, the strategic agenda needs long-term planning and vision of a government, and the most important is that it may need strong government support. The collaboration between public and private organizations is possible in terms of implementing these kinds of policy but, at the initial stage, government involvement is important (see Figure 8).
6. Conclusions

From explorative information, broadband connectivity is widely accepted as having strategic importance to all countries because of its ability to accelerate the contribution to economic growth in all sectors, enhance social and cultural development, and facilitate innovation. Though the contribution of broadband to social and economic development is very important, it may not be able to yield all those expected benefits that broadband could bring about to the society under the existing perspective of broadband policy. The development of telecommunications sector for more than 100 years has suggested that broadband policy these days focuses primarily on increasing broadband penetration inside telecommunications sector which has been pursued through three-dimensional approach: government approach, market approach and telecommunications regulatory approach. Meanwhile, the changing of telecommunications structure over time in part due to technological revolution and the emerging of the new challenges towards telecommunications infrastructure as a crucial factor for the efficiency improvement in other sectors suggest that the existing broadband policy design may not be appropriate for this new emergence.

Therefore, a new framework to assess broadband policy can be formulated, and that the sector agenda and the strategic agenda should be integrated into the new broadband policy. The necessity of the division between the sector agenda and the strategic agenda result from the facts that they are based on different concepts and objectives which are not able to be achieved through the same path. While the sector agenda evolves from the development of the traditional telecommunications structure which focuses on the growth of telecommunications availability for the users, the strategic agenda is emerged from the new challenges and expectations outside telecommunications sector. The integration of these two perspectives need a new policy design and need also new policy instruments.

Future research

This paper proposes the new perspective to view broadband policy in order to respond to both the existing objective within the telecommunications sector and the new challenges of telecommunications infrastructure. It is important for a long term development of a country to integrate those two agendas under broadband policy since telecommunications infrastructures are and will be a crucial factor for future society. To have a new perspective broadband policy in place leads to the systematic thinking of the structures and better solutions.

Though this paper suggests that broadband policy should be viewed from two separate agendas, the paper has not yet explored or proposed the policy implementations of those two integrated agendas. Basically, the new broadband policy requires a new conceptual thinking in order to re-design the whole structure of telecommunications. The new working structures are also important and need to be explored. Therefore, in order to provide practical solutions, further research is needed.
References


Figures

Figure 1 Four level of social analysis (Source: Williamson, 1998; 2000)

Figure 2 The changing structure of telecommunications
Figure 3: Three approaches of broadband initiatives

Table: The four levels of social analysis

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Figure 4: The adaptation of the Williamson’s framework to telecommunications sector
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Figure 6 The two perspectives of broadband policy
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Figure 8: The relationship between strategic agenda and some specific national agenda