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# The Next Generation Network:
## The consequences of technological and economic changes for media and communications policy in Brazil

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Walter Tadahiro Shima

**ABSTRACT**

This paper discusses the regulatory, economic and technical measures necessary to develop the *Next Generation Network* (NGN) in Brazil. After more than 15 years of privatization of telecommunications assets, initially expected to boost the Brazilian media and communications sector, very little has been changed. The regulatory framework has not managed to stimulate competition in landline services and access to broadband has not increased sufficiently. The copper line access to broadband is the infrastructure for the *Current Information Society* (CIS). The new challenge is building an institutional framework to enable the construction of the Next Generation Network (NGN) that will support the *New Information Society* (NIS). The NGN requires the construction of a fiber optic infrastructure and wireless ultra broadband network (Worldwide Interoperability for Microwave Access - WIMAX) to provide an ultra fast internet which reaches to the 'last mile'. While industrialized economies are discussing the institutional arrangements to achieve the NIS, Brazil is struggling to increase access to the internet in the mode of the CIS. However, since the NIS can be achieved through a proactive State that is capable of leading huge investment in this area, Brazil has the chance to leapfrog the CIS and catch up with the NIS rapidly through its current industrial policy. Obviously, success will depend on how the political arrangements are established.

## INTRODUCTION

This paper addresses economic and regulatory issues concerning the debate about the Next Generation Network (NGN) which can serve as a lesson for regulation in the Brazilian case. Despite being an important target, competition in the landline and broadband services markets was not achieved after the privatization of the Brazilian state-owned telecommunication company Telebras in 2000. The regulatory framework and the political power of the Agência Nacional de Telecomunicações - ANATEL (National Agency of Telecommunications) were not sufficient to persuade service providers – i.e. the incumbents – to unbundle their network elements. As a result, competition was only established in mobile services due to its specific technical characteristics and relatively easy regulation. Meanwhile, the UK achieved an effective level of competition in telecommunications services only in the mid-2000s, despite having privatised in the early 1980s. More than twenty years after privatisation, the UK finally attained a strong level of competition in some services, including landline and wireless broadband – an achievement that has proved difficult to match in other countries.

Changes in the technical and economic environment have created new challenges. In addition to the need to achieve a high level of diffusion of broadband permitting access to the Current Information Society (CIS), there is a new challenge which is building an institutional framework that enables the construction of the Next Generation Network (NGN) that will support the New Information Society (NIS). The NGN requires the construction of an fibre optic infrastructure and of wireless ultra broadband (Worldwide Interoperability for Microwave Access - WIMAX) that will enable ultra fast internet which reaches the 'last mile'.

In general terms, industrialised economies have taken the first step towards the CIS and are discussing the institutional arrangements to move towards the NIS through the establishment of the NGN. However, after more than 15 years of privatization in Brazil, the internet for the CIS has not yet become universally available. Regulatory arrangements have not succeeded in delivering internet access in all parts of the country. Incumbent companies manage the infrastructure and the institutional environment has not obliged nor encouraged these companies to invest more than they had previously invested in landlines. In its attempt to build the infrastructure for the CIS, Brazil has lagged behind other countries. Major regulatory adjustments must be made to change the current *status-quo*. Therefore, the questions raised in this paper are: what is Brazilian policy doing to advance towards the CIS and to ensure that it is well-positioned to develop the NIS? Is it important to build the CIS before the NIS?

In order to answer these questions, this paper discusses various aspects of the NGN. The second section describes the changes related to overlapping technical, economic and social issues. It shows that the technical shift to digital convergence has had important and unprecedented social and economic impacts. The third section establishes a chronological account of media and communication developments, denoting the current period as that of the Information Society. The following section discusses the competitive scenarios in the broadcasting and telecommunication markets that arose due to recent changes in the market environment.

It is suggested that digital convergence in the NGN will increase competition in the broadcasting market, although it will demand attention to important cultural and moral considerations. Also it is argued that in the telecommunications market, the state should be the main driver towards the NIS due to the high volume of investment in the NGN that is required. The policy to develop the NIS must not be based on market logic but on the logic of state-led investments that favour universal service and affordability. The main point is not to encourage competition across the whole telecommunications value chain, as an objective *per se*, but to develop the NIS based on a social and economic foundation fostered by the state.

After this section and based on the indices - IDI and IPB - developed by the International Telecommunication Union (ITU), the level of development of the CIS in Brazil as compared to the Top 5 countries plus Russia, India and China (RIC) is evaluated. The subsequent section discusses the very concentrated market structure in the Brazilian media and communication market. In this market, it is argued, there is no likelihood of change unless the regulatory framework is changed simultaneously through a direct intervention by the state. From 2003 onwards, Brazil adopted a pro-active approach and changed the regulatory framework encouraging investment in backhaul capacity. Brazil implemented an industrial policy focusing on national champions which led to the merger of two regional incumbent companies and created a nationwide company, branded Oi. The National Broadband Plan was released that reactivated Telebras, the former state-owned telecommunication company, to act as a capacity wholesaler and as the main investor in the fibre optic backbone.

## THE NEXT GENERATION NETWORK (NGN): TECHNICAL, ECONOMIC AND SOCIAL SCENARIOS FOR REGULATION

In the aftermath of the privatization of the state-owned telecommunication companies in the 1980s, the emergence of digital TV and the rapid diffusion of the internet, regulatory frameworks had to be realigned in technical, economic and social terms. Particularly, from the perspective of *technical* change, the existing dedicated telecommunications network used in all countries were transformed into a convergent network that supports a huge variety of communications services through a diversity of devices – the streaming/broadcast high quality digital content of voice, image, data, video and sound, etc. (Reding, 2006; Van Cuilenburg and McQuail, 2003). This is known as the Next Generation Network (NGN) and it means a high level of investment in fibre optic network and WIMAX. After an intense technological upgrade, this network – designated here as the internet – will be a channel with ultra fast broadband[1] geared towards the distribution of all kinds of content as well as the provision of various communication services. This technological change is related to digital convergence which can be understood as the transformation of all information into binary code that can be simultaneously carried through airwaves or cable and coded and decoded using a single device. Moreover, the miniaturized devices with ultra broadband capacity of streaming/broadcasting high bandwidth content are a key factor in the market dynamic of electronics consumption today. Thus, NGN, being an IP-based network, is expected to unify different networks through the trivialization[2] of differences between network standards.

From an *economic* perspective focusing on the demand side, digitization represents a window of opportunity for hardware manufacturers and software developers. These opportunities relate to two current trends: 1) there will be one subscription to a single ultra fast broadband service that supports growing demand for content (entertainment, data, image, voice, video,

[1] This paper is not considering ultra fast a broadband with a specific bandwidth. For example, Dini et al. (2012: 36) argue that (…) 'in several countries there are governments and service providers' trying to achieve a download speed of 50 Mb/s. However, for their purpose, they consider the Ofcom´s definition of broadband: 'Basic broadband is expected to provide downlink speeds of up to 2 Mb/s; Fast broadband is expected to provide downlink speeds between 2 Mb/s and 24 Mb/s and Superfast broadband is expected to provide downlink speeds of at least 24 Mb/s'. Moreover, the authors detail the technologies needed to provide superfast broadband. At BT these are: 'Fibre To The Cabinet (FTTC), Fibre To The Premises (FTTP) and FTTP using a Point-To-Point fibre (PTP)'. All of them imply an important coverage of fibre optic. It is obvious that the higher the penetration of fibre optic is, the greater the possibility of expanding the bandwidth, which depends on budgetary restrictions. For example, as pointed out by Benkler (2010), 'FTTC deployment costs roughly one-fifth of the cost of fiber-to-the-home (FTTH)'. Therefore, every downlink speed depends on the deepening of the fibre optic network. The important point is that bandwidth must be capable of providing for content at a satisfactory speed for users. This means that, as the quality and size of the content in general increases, the bandwidth requirement increases as well. Therefore, there is an increasing need for network elements to be comprised of fibre optic and a higher bandwidth wireless network.

[2] This is not a harmonious and natural process because there is an intense debate which involves technical and economic interests concerning the transition between IP versions and whether it will be feasible to distinguish between different types of content according to the regulatory arrangements affecting digital content.

etc.) and 2) the use of advanced mobile handsets (such as smartphones) interfaced with fixed equipment to support the same bandwidth hungry content in the users' premises (firms and individual households)[3].

Interactively with the demand side, on the supply side the evolutionary path is uncertain and clouded, mainly with respect to the regulatory framework. For example, concerning the first trend identified above; if the infrastructure becomes an ultra fast broadband channel, supporting access to the Internet and its content, then the regulatory framework will need to be adapted[4] in order to acknowledge the convergence of all forms of content in a single infrastructure. Different types of content cannot be distinguished unless detection mechanisms are introduced (Forgan and Tambini, 2001) and their use also depends on the regulations. Content on the internet, when streamed/broadcast, has an addressee and a sender and techniques of content inspection are feasible. This potential for content identification must be regulated, which means that each type of content should be considered differently (Noam, 2006). For example, IPTV and internet services are transmitted as *bits*, and are variable, interactive and selective, but they serve different purposes when decoded in the user's device. The large amount of content on the internet can be beneficial or harmful and, consequently, this demands powerful, but flexible regulation. The willingness to build a regulatory framework that considers these various complex issues depends on the political and economic interests in each country and on international agreements developed within the International Telecommunication Union (ITU), for example.

Traditionally, regulation in media and communication has been deemed necessary to protect the public interest and in terms of political welfare (related to freedom of expression of printed media), social welfare (related to cultural cohesion through broadcasting and cable) and economic welfare (related to the right to access and universal telecommunications services). Hence, historically there has been a separation between *media policy*, which is focusing on newspapers, broadcasting, cable and other similar means of general public

[3] An important example of this techno-economic relationship is the technological trajectory in the development of current smartphones which mix high capacity of processing and digital convergence. The pioneers of this handset were the manufacturers of the old electronic agenda, Sharp and Casio in the 80s, and of analogue mobile phones. The first ones transformed into the PDAs (Personal Device Assistant) or handhelds and, in the 90s, mobile telephony developed through many generations. The first mobile phone was analogue and supported voice. The second was digital and supported voice and data up to 9.6 kbps. And finally the third was digital and supported voice and data up to 2 mbps. Today, digitization means new devices with the fusion of the technological trajectories of PDAs and mobile communication that support high bandwidth content, are wireless, have high speeds and friendly handsets. Dini et al. (2012: 33) point out that: 'The capacity and ease of use of today's smart phone outstrips that of yesterday's personal computer. Users are buying and using ever more powerful communications and computing devices in ever larger numbers. The computational capacity of the devices is an enormous resource that can be put together in volunteer computing, when volunteers co-operatively support distributed computing applications useful to society'.

[4] This means that each mode of transmission/broadcasting should have specific regulation. For example, TV content should be regulated differently from mobile and from radio, etc. Furthermore, education content could have privileges in terms of funding and should also be mandatory; commercial broadcasters should be obliged to provide funds for education content; education programs should be prioritized in the schedule of broadcasting.

distribution – with an emphasis on freedom, diversity, quality of content and public accountability - and *telecommunications policy* which is focused on infrastructure and architecture, market conditions, regulation of monopolies, etc. (Van Cuilenburg and McQuail, 2003). Regulation must consider that the media system has a strong impact on society not because it is a commodity but because it is an important factor in mediating culture, journalism and politically relevant information. It is a social institution similar to the education system (McChesney, 2003). It has a huge impact on culture and the moral values in society, and thus the nature of the regulatory framework is inevitably shaped by social, cultural and political interests. As the CIS (see below) becomes more pervasive, the regulatory framework is frequently referred to more broadly as a governance framework (Puppis, 2010).

For the preservation of social and cultural values, a socio-political decision should establish the regulatory fields where technical, social and economic changes are likely to shape competition in terms of content supply and companies' efforts to achieve vertical integration or oligopolization of the media and communication market. All media systems are organized as a result of political struggles and regulation, and this was even the case at the very beginning of the organization of a media system. For instance, frequencies for satellite and franchises for cable and terrestrial broadcasting are usually allocated to secure government-sanctioned monopoly rights (McChesney, 2003). Yet although the idea voiced by some that the 'handset as a single device to manage not just communications but much of our lives' and that these devices 'will truly become a remote control for life, with massively enhanced capabilities, advanced methods of user interaction and in-built tools' (Webb, 2007: 35) has become a technically possibility, it is at the same time a rather deterministic view (cf. Mansell, 2008) which does not consider the social, economic, political and historical dimensions of technological innovation. This technological possibility evolves and is moulded according to political and economic interests in an historical context. Hence, regulation is the resulting framework created in the face of the overlapping interests of the actors that are active in these different dimensions.

## HISTORICAL BACKGROUND OF THE REGULATION OF DIGITAL CONVERGENCE

According to Van Cuilenburg & McQuail (2003) three paradigmatic phases in communications and media policy can be distinguished. First, the paradigm of the emerging policy for the communications industry until the Second World War, with separate regulations for printed media (concerning freedom of expression); telegraphy and telecommunication (concerning ownership and infrastructure); and broadcasting (concerning a strong regulation of access and content, freedom of expression, ownership and universal services). Whilst in the US, decisions were made to maintain a model of private monopoly regulated by the government and regulation were focused more on an antitrust considerations than on public services, European policy regarded the telegraph and telephony, along with postal services, as a public monopoly or a public utility, effectively, a government branch. When Noam (2010) discusses a similar three-generation historical division - he classifies this period as Telecom 1.0 – and highlights other very important features. The telecommunication infrastructure was based on a copper analogue network controlled by a state bureaucracy. As a public (or private in the US) monopoly, the telecommunications companies had purchasing power through a cooperative relationship with their suppliers. The state had strong influence over the market power of the operators providing telecommunications services but also, upstream in the value chain when procuring equipment and leading the R&D process.

Second, the paradigm of public service media policy (1945–1980/90) mainly characterized by a political discussion concerned to the significance of mass media for political and social life for democracy in the post war reconstruction. Technical and economic issues seem not to be the main questions related to regulation policy, even because technical change was not so important that could cause important impact in regulation. For example, the technological foundations of TV and telephony did no change during this period, based on vacuum tube for TV and radio and analogical broadcasting. Hence, the regulation evolution was located on the political issues related to content. The main economic change came to the fore in the 80s which was the privatization of the state-owned telephone companies and opening the telecom market for competition, in Europe, firstly in the UK and the divestiture in the US telecommunications which separate Bell Telephone monopoly from AT&T. Now the focus of the telecommunications policy changed to liberalization of entry and competition based on technological innovation based on fibber-optic and high-capacity wireless access networks. In this generation the mass consumers now use data transmission that supports a capacity thousand times higher than at the beginning when data transmission were restricted to corporations. This is the generation Telecom 2.0 which for Noam (2010) runs until mid-2000s. This broad political movement of changes in the nature of the technology and the

stocks ownership lead to many deregulatory movements in the telecommunications market around the world, with the privatization of state owned companies and separating the equipment manufacturers as branch the telecom companies. Specially, in Brazil the change was more radical. There was the elimination of the domestic equipment manufacturers in favour of the traditional global manufacturers and substitution of national state owned telecommunications companies through divestiture in favour of Europeans and North Americans ones.

Third, the current paradigm (from 1980/90 onwards) is in search of a new policy in an environment that aims for the development of the NGN. Noam (2010) denotes this as Telecom 3.0, which is characterized by the technical possibility of streaming/broadcasting high bandwidth content at ultra high speed and by high fixed-cost investments in infrastructure in profitable and unprofitable (rural and low density population) areas. Therefore, the challenge is to develop a new regulatory framework and a new competitive dynamic. Following the logic of technological convergence, the idea prevalent in the current paradigm is that there should be a convergent regulatory framework for all kinds of content distributed through the new *all-IP* environment.

This is a paradigmatic change according to Freeman (1991) and Dosi (1982) who argue that technological change in some instances (in this case, from the telecommunication sector - among others) is revolutionary, pervasive and, therefore, gives rise to radical changes in economic life. Technological innovation in the digital environment has amongst others led to the unprecedented pervasiveness of the media and communication sectors in the economy and in everyday life[5]. Political and economic interests are also affected by these huge changes, so regulation with the same degree of novelty is required.

Should these current trends persist, all information content will be broadcast/transmitted /streamed through the same telecommunications transmission channel. This will result in telecommunication regulation and all regulation of mass media becoming more closely related to each other (Noam, 2006). In other words, political, social and economic welfare is best achieved through the integrated regulatory action of a single convergent framework for communication policy. A single convergent framework does not necessarily mean a single regulatory framework, but social, political and economic regulatory guidelines with coherent principles that address the issues raised by technological convergence. An example of a broad framework is the US Child Online Protection Act 1998 and there has been intense debate

[5] Media and communication sectors are considered Science-based sectors. According to Pavitt (1984), science-based industries comprise high tech firms with massive R&D investment inside and outside the industry, high levels of appropriability, patenting and tacit knowledge. Others industries are: Supplier-Dominated: traditional segments in the agricultural sector; Scale-Intensive: huge firms producing durable goods; and Specialized Suppliers: firms that produce technologies to be sold to other firms.

about internet regulation in terms of the commerce requirements, confidentiality and national security. In addition, the European Commission is trying to establish principles to regulate electronic media which are different from those which have governed conventional TV. These principles focus on competition, universal service, separate regulations for specific sectors and harmonized regulations among the state members (Van Cuilenburg and McQuail, 2003). However, it is unclear how the principles of competition and universal service sit together, especially when the need for incentives for investment in the NGN is considered.

This third paradigm coincides with the emergence of the information society. I propose that the information society is divided into two levels: the CIS, which refers to the current IS and the NIS, which relates to the new IS. The CIS comprises the current basic and fast broadband and content is still transmitted/broadcasted through dedicated networks due to the fact that:

- Most TV content is not streamed yet because there is no harmonisation of regulation for free IPTV content among countries. It is not known whether it will be possible to achieve regulation of this nature, considering the strong interests in price discrimination and issues with respect to the enforcement of intellectual property rights
- There is a struggle among IP versions to become the dominant standard although it is not certain if there will be a dominant IP version
- High bandwidth content cannot be streamed through fast broadband bandwidth at a satisfactory downlink speed
- Users are not used to watching TV content online yet
- TV sets or multi-purpose electronic devices are still developing or TV sets that support Internet are not available to households yet
- Industrialised countries have only just started a discussion about how to address these issues
- Some emergent economies are still struggling with a regulatory framework that does not incentivise growing investments even in the basic infrastructure for communications.
- Emergent economies are struggling to build an infrastructure that supports basic broadband.

Over time, many important changes have contributed towards the solution of these issues either through competition, technological innovation or institutional arrangements. This is what I am calling the NIS, which refers to a convergent network of ultra fast broadband. The convergence has become possible due to the widespread use of the information and communication technologies (ICTs) that break physical restrictions on the exchange of information. These technologies influence the generation and the use of knowledge to create value and, consequently, open up new markets and change the structure of current markets.

In this 'new' economy, we can observe a rapid decrease in costs and increases in the scale and scope of information related activities due to the broad use of knowledge in order to create value. Therefore, the main issue in the market is not only the supply of hardware, but also the availability of sophisticated and creative knowledge to drive the market. ICTs are known as

general purpose technologies as they are increasingly used in and spill over into every sector of the economy. Industrial sectors have been using ICTs intensively in machine-tools, in the transport of information for batch production, in project design, simulation, etc. Information is important since production becomes possible through the transmission of it. For example, the main point is not the supply of TV sets[6] but the social, political and economic issues involved in the production of content and its broadcast/stream. From a technical point of view, the result of ICT innovation is that content produced anywhere in the world could in principle be streamed everywhere and the main issues are: whether the media will broadcast these contents (Internet or Satellite, for example); the necessary regulatory and technical arrangements to connect the networks of countries; the cost; what kind of content will be allowed to be streamed according to the regulation of each country; what alliances the global content producers will make in order to sell their *product*; and what kinds of services will be sold, etc.

Therefore, the main issue in this paradigm is the technical, social, political and economic arrangements that make the supply of intangible content[7] possible in an infrastructure governed by regulatory institutions appropriate to the Telecom 2.0 era (see below for the challenges for Telecom 3.0). These institutions, which were originally created in an environment of relatively low technological complexity, are still operating today. They mainly focus on competition across the value chain of the media and communication industry, and attempt to regulate technical and economic change that cannot necessarily be subordinated to the rules of competition in a regulated market. It is argued here that new institutions and regulatory arrangements will be necessary in the later phase of the third paradigm. These will focus on:

- The regulation of state-oriented investments in complex ultra broadband infrastructure, even in low-density areas
- How content will be produced and broadcast
- Ensuring the establishment of Net Neutrality (see below) with less emphasis on establishing competition in order to ensure efficiency of the NGN

[6] Of course TV sets are manufactured in a global oligopoly market structure, but the main issue is not the technology involved to produce them, which is complex, but the invisible knowledge behind the arrangements to produce content, software, new services, etc.

[7] It is obvious that the supplies of tangible goods from other traditional industries (as machinery, equipment, energy, food, etc.) are still very important and have complex market structures with intense global competition, but the value created in the production of intangible contents grows much faster. At the same time, all the sectors of the economy are being affected by the ICT. Many changes in the process and product technology occurred from ICT. Complex machines and equipment are being introduced in all sectors and the main issue addressing the development now is the complex knowledge necessary to operate them through software and tacit knowledge.

## SCENARIOS FOR COMPETITION IN THE NGN

### Broadcasting Services

Besides the traditional broadcasters and content producers in the CIS, many other independent competitors are emerging anywhere, anytime. In the NGN, any kind of content is likely to be streamed/broadcast by anyone, anywhere, more than it is streamed/broadcast today. One of the main regulatory issues that arises with this technological change is the kind of content that will be transmitted through the user's devices. In contrast to what has happened so far, with only a few open dedicated channels of TV/radio or even cable TV – which can be easily censored, controlled or not authorized by governments and local authorities – the NGN represents an age with an infinite array of content (from educational to harmful) that can come from anywhere in the world. This will open up a new world of possibilities for competition in broadcasting.

At this point, it is important to recall the principle of Net Neutrality. This principle guarantees that each piece of information is treated equally and that no provider (Internet Service Providers - ISP, broadcasters and telecommunications companies) can restrict access to information on the internet. The proponents of this principle state that Net Neutrality should be made a legal requirement so that no entity can restrict access to digital content through various forms of discrimination. For example, a hypothetical agreement between an ISP and a broadcaster could establish restrictions on the users' access to video content, unless this content is paid for and exclusively streamed from that broadcaster. Or, an agreement between an incumbent and a broadcaster could restrict access to the incumbent's network elements in order to avoid the entry of an ISP which might offer a video-on-demand service within the bundle of other services.

In essence, *ceteris paribus*, competition is expected to enable equal access to information if Net Neutrality is explicitly and legally guaranteed. With Net Neutrality in place, the prospect of future new entrants[8] becomes a genuine possibility. Consequently, even within an oligopolistic structure, this kind of competition has a very low barrier to entry, reducing the broadcasters' market power and enabling the entry of many other competitors from the media and communication industry. Any broadcaster that has the political power to control what, when and how information should be delivered is threatened by many potential players that enter the market and supply free access to information without price discrimination based on the type of content. Without the institutionalization of Net Neutrality, the natural

[8] Steindl (1952) coined the concept of the potential entrant which is a firm ready-to-enter in a market soon after incumbents are unable to meet current demand. To avoid the threat of potential entrants, incumbents tend to invest in idle capacity.

tendency is for incumbents to establish competitive strategies among themselves, including content discrimination and commercial agreements to avoid the terrifying potential threat of new entrants in the NGN age.

Broadcasting is a market strongly influenced by political decisions (Puppis, 2010). In terms of content broadcasting, the state can (or not) lead a regulatory dynamic that seeks to ensure that intense competition develops in accordance with the public interest, its autonomy and economic development. Over time, depending on the political interests, the state can establish an autonomous, supranational, harmonized and institutionalized regulatory framework relatively independently from direct political influences. Even in an oligopolistic market structure the target is to find a competitive *optimum*. In the NGN local/national TV broadcasters will face fierce competition from players around the world. In Baumol's terms, IPTV will turn TV into a relatively[9] contestable market and, consequently, the changes in the features of the content (either harmful or educational/cultural or even from low to high quality) produced will be the main strategy for competition.

The next issue arising from these technological and economic and changes is the funding in order to produce high quality content which depends on the market where it will be offered. Content producers will offer their *products* in promising markets with high income audiences capable of paying for them. There may be competition where the old TV concession, granted by the regulatory authority, is replaced by a license for IPTV broadcasters to enter the market. Such a license would have ethical, moral, economic, political and cultural aspects; i.e. with the shift from mass media to the NGN many kinds of content will be produced everywhere and an important concern is how appropriate they will be in different cultures. So there will be a need for a great deal of work on the regulatory control of day-to-day content. According to Noam (2006), when content is technically identifiable, it can be regulated. Moreover, if the state only regulates one ultra fast broadband channel (with an enormous volume of content) this will concentrate unprecedented power with the likely outcome that regulation in media and communication industry might become subject to political pressure, personal interests and corruption, especially in countries with a fragile institutional framework. In other words, a single channel can have an enormous impact on the economy and civil society if regulation is fragile; in contrast to the *past* when there were separate channels and despite the fact that historically, institutional frameworks have been subject to political pressure from both the left and the right.

[9] Compared to traditional broadcasters' sunk costs, the new broadcaster's and content producers' sunk costs are much lower since they do not have to maintain the same infrastructure.

In addition, content producer entry will depend on several factors such as: access to audiences (through cable, XDSL, aerial), access to network infrastructure, or profits from investment in content and the forecast size of the market (audience). These elements will establish the market structure and the competitive dynamic. If the forecast market is huge and regulatory demands are high on producers/broadcasters, the trend is likely to be oligopolistic competition: a few global players offering general access to information (content, data, etc.) according to their marketing strategies (high quality content, for example)[10].

Powerful media companies will enter telecommunications markets and vice-versa with offers of bundled services and ISPs are likely to move into the media and communication market (Foster & Kiedrowski, 2006). The most important issue for regulation is the neo-Schumpeterian innovation model which purports that the most favourable dynamic for investment is a market structure that is neither too concentrated nor too competitive. A small set of large firms constantly threatened by potential entrants represents the best environment to encourage new investments (Benkler, 2010). Small markets characterized by small audiences and with diseconomies of scale may not be able to afford high-cost investments in the NGN. The institutional arrangements needed to provide incentives for these investments will provoke changes in the market for broadcasting and content production. Local broadcasters, content producers and telecommunications companies will be forced to search for strategic alliances and mergers and acquisitions with international investors, encouraged by industrial policy and, as a result, there will be a profound change in the local market structure.

**Telecommunications**

In many industrialised countries an important challenge is to build a new regulatory framework for the NGN that will assure a high level of access to consumers. These countries successfully shifted from a market monopolized by state-owned telecommunication companies to a telecommunications market characterized by a considerable level of competition. In this transition from monopoly to competition incumbent companies were allowed to enter the market, though many restrictions and obligations were imposed by the regulatory framework which took into account the infrastructure and services of individual

[10] This kind of competition, within an oligopolistic structure and characterised by strong economic power, can also lead to a strong political power. According to McChesney (2003: 127) the Telecommunications Act of 1996, in the US, was deregulation in favour of private interest: 'Powerful corporate lobbies and trade associations fight it out with each other over who gets the largest slice of the US cake that is doled out by the FCC, Congress and other federal agencies. What they all agree upon is that it is their cake and nobody else should be permitted to participate in policy deliberations. The function of the FCC, as one former chair informed William Kennard as he assumed the chair in 1997, *is to referee fights between the wealthy and the super wealthy*'.

firms. This regulatory framework was developed in the 1980 and 90s and in the early 2000s. It was possible to restrain the incumbents' market power and achieve a reasonable level of competition as a result of the regulation of revenues (rate-of-return and price cap regulation), corporate pressure on markets and, the unbundling of network elements; i.e. the low supply of services, even after privatization, and pressure from the companies which led regulators to establish that incumbents were not allowed to raise prices (this only applied to regulated services, not all services) and were encouraged to increase productivity and open their network elements to competitors in the wholesale market.

For example, in the UK, Ofcom established an increasing target for productivity using the Price Cap Model[11]. Moreover, after privatization and after many attempts to introduce competition, replication of the infrastructure for voice and simple data by new entrants proved to be very difficult because of the substantial economies of scale associated with network investment. Incumbents were reluctant to open their networks to new entrants in the absence of an attractive economic and political agreement (Waverman, 2006). In 2006, British Telecom (BT) divested its infrastructure to form a subsidiary, Openreach[12]. This company is in charge of connecting wholesale customers to local exchanges under the concept of Equivalence of Inputs (EOI). This means that BT, through Openreach, unbundles its network elements for new entrants on the same terms as it supplies these elements to itself (using the same systems, same terms, and same timescales). Thus, new entrants were able to compete (as resellers) with BT in the retail market. This strategy is now being considered in Europe and has been adopted in New Zealand, Sweden and Italy. It has been implemented in the Netherlands and in Australia (Benkler, 2010). Brazil is following the same example. Regulation has served the basic objective of establishing firms' interactions in the retail and in the wholesale market in a bundled network.

As a result of this unbundling process, the UK achieved wide diffusion of broadband[13] and a competitive market structure. All segments in the telecommunications value chain have an oligopolistic market structure which is more or less concentrated depending on the strength of competition. However, an important observation is that the market structure changed from private monopoly to oligopolistic competition as a result of the unbundling of network elements. Although the market is concentrated, it seems to increase welfare in terms of

[11] This model permits a level of price in the retail market less X, which is the gain in productivity that is deducted from the retail price index: RPI – X.

[12] This agreement was established under The Enterprise Act 2002, which made important changes in UK competition law. In the UK, antitrust issues are the responsibility of the Office of Fair Trading (established in 1973 - OFT) under the Competition Act 1998 and the Enterprise Act 2002 (OFT, 2012).

[13] By browsing www.broadband-finder.co.uk (accessed at 06/02/2012), it was possible to find at least 6 companies offering not only broadband but also fixed line and mobile phone (triple-play bundle). Some of them were also offering a TV service (quadruple play). These companies were: BT, Orange, Plusnet, Virgin Media, Sky and O2.

economies of scale and scope for innovation, network investment, etc. Oligopolistic competition is characterized by an environment in which firms are at risk, due to uncertainty, from potential entrants and as a result there is a high level of contestability.

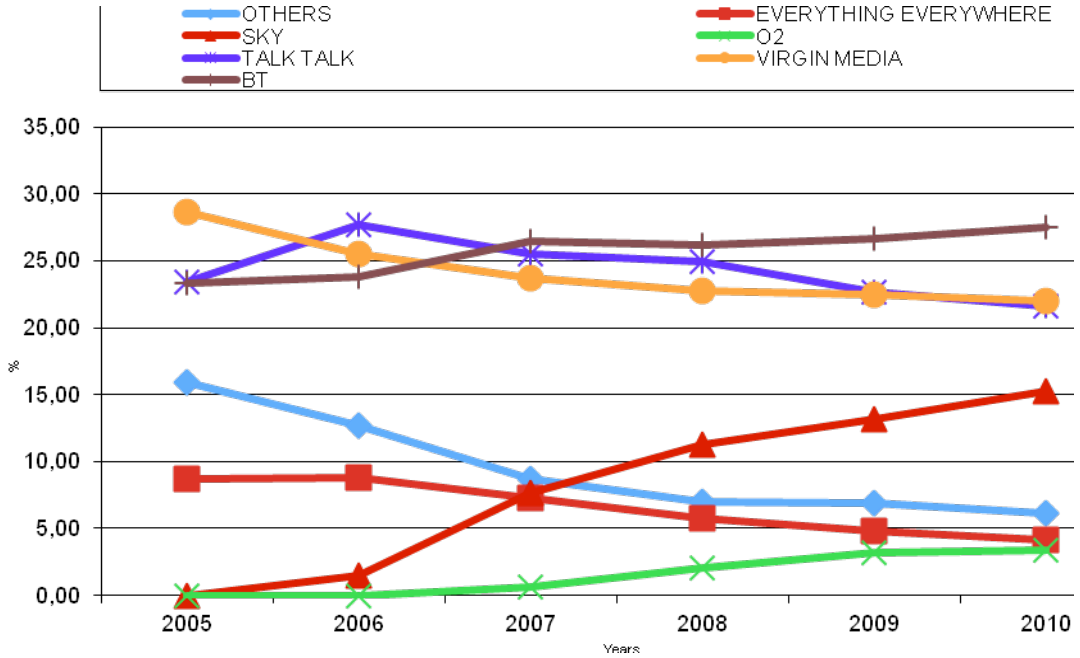
Data on the broadband market is an important indicator of the unbundling of the network elements. When there are many broadband providers, there is competition and diffusion of the internet which is the first step towards achieving NGN spillover effects; i.e. the faster the broadband diffusion, the more consumers use the internet for high bandwidth content which increases demand for fibre optic. The more developed the Current Information Society (CIS) is with its broadband, the more it stimulates demand for investment in the NGN and is able to develop the New Information Society (NIS) – a society capable of using ultra fast broadband for multiple information purposes. The question that arises is: what should the state do to create the institutional arrangements to stimulate these private and/or public investments? (See below).

In the UK, from 2005 to 2010, there was fixed broadband market dominance by BT, Virgin and Talk Talk (around 71% to 77% of market share) (see Figure 1). However, an important factor was the entry and rapid growth in market share by Sky and O2. While BT, Virgin and Talk Talk's market share together had a negative CAGR[14] of 1.17% (2005-2010); Sky and O2's market share had a positive CAGR of 87.90% (2006-2010) – cf. Table 1. In addition, *Everything Everywhere* and other small companies (OTHERS) were relatively important suppliers of broadband in earlier years.

Thus, if access to broadband, referring to access to bandwidth hungry content and freedom of information is of great concern to society and policy makers, access to network elements remains of great concern to achieve the NGN; i.e. accessing the last mile to users' premises is still an important issue in the ultra fast broadband age given the costs involved and the absence of strong incentives to build this component of the infrastructure as compared to the backbone of the network. Noam (2006) reinforces this point by stating that the market for many network elements remains quite concentrated, especially at the level of the last mile. Although there are many technological alternatives such as cable TV infrastructure, satellite, fixed wireless or powerline communications, these are still offered mainly by a few incumbent companies in many countries. Thus, in the NGN environment the main concern remains the regulation of the unbundling of network elements, including access to the last mile infrastructure.

[14] Compound Annual Growth Rate (CAGR) = $\left[\frac{V(t_n)}{V(t_0)}\right]^{\left(\frac{1}{t_n - t_0}\right)} - 1$

**Figure 1:** Fixed Broadband Connections/Market Shares – UK (2005-2010)




**Source:** OFCOM, 2012

**Table 1:** Market Share and (CAGR) for Fixed Broadband Connections – UK (2005-2010)

| YEARS | SKY + O2 | TALK TALK + VIRGIN MEDIA + BT |
|---|---|---|
| **2005** | 0.00 | 75.40 |
| **2006** | 1.50 | 77.00 |
| **2007** | 8.30 | 75.70 |
| **2008** | 13.30 | 73.90 |
| **2009** | 16.40 | 71.90 |
| **2010** | 18.70 | 71.10 |
| **CAGR** | **87.90%** | **-1.17%** |

**Source:** OFCOM, 2012

Besides these issues in terms of Telecom 3.0, in the NGN four main challenges are of importance:

1. In the NGN the level of instability increases since prices tend to fall due to the high fixed costs of producing information and the low marginal costs to reproduce them. The ratio of fixed-to-variable costs increases due to a high volume of investment (new network of fibre optic and WIMAX). Thus, regulation should focus more on stabilization than on entry and competition. Competition in some markets will increase where a single platform such as IPTV is used; others will maintain more or less the same level of competition, as the current ISP market.

2. Despite reductions in hardware costs as a result of technological developments, continuing high cost in the NGN is likely to be related to civil engineering works which have different economies of scale and scope and experience a different pattern of cost reduction.
3. The number of high-speed infrastructure providers will tend to diminish due to the need to achieve economies of scale.
4. Funding the content and dealing with issues such as morality and ethics in broadcast can be a difficult challenge.

Thus, the Telecom 3.0 environment will change considerably and institutions suited to regulate Telecom 2.0 may not be suitable. As Noam (2010) argues the foundation of future regulation should not be determined by the media and communications industry, or by exclusively market-oriented regulation focused on encouraging competition in all segments of the media and communications market. Instead, regulation should focus more on societal priorities, such as price stabilization due to the complexity of investments in NGN, universal service obligations (not only in relation to fixed landlines) and high sunk costs. Thus, competition is a consequence, not a foundational policy. As is apparent, in the NGN, the huge investments required are not necessarily attractive in terms of profit, and thus demand more direct intervention by the state. This new environment is also expected to change the participants in the regulatory process. In the previous regulatory environment, the state was not a direct investor (anymore). In the framework of the NGN it might become mandatory for the state to lead investment and the new regulatory environment must adapt to this new investment environment.

Noam (2010) argues that there should be four foundations for this regulation: 1) the establishment of general principles agreed among the participants and acceptance of new entrants, led by incumbent companies[15]; 2) all agent actions should be in accordance with these principles; 3) the creation of a system for quick arbitration in cases of dispute; and 4) review of these principles after a pre-defined period. From a practical point of view, this new regulatory and competitive environment requires the state to lead investment in infrastructure, to subsidize investment in R&D and infrastructure rollout in areas with low population density. This has been happening to varying degrees in a number of countries. It also implies a market structure that is relatively concentrated with a few national champion companies.

Benkler (2010) reinforces this by pointing out that the stimulus package in the US after the financial crisis in 2009 included a substantial commitment to invest in the NGN. Luxembourg has one the biggest per-capita public investments in NGN in Europe; Australia and New Zealand have announced large government commitments to investment in

[15] This paper aims to emphasize the importance of the state regulating/owning the media and telecommunications industry.

broadband and the South Korean government has announced plans for investment at similar rates as the US over the period from 2009 to 2012. Other countries with public investment in the NGN are Finland, Japan, Portugal, and the United Kingdom, all of which have announced investment at a rate of about half of the per capita investment as the US.

## EVALUATING THE BRAZILIAN CIS

There are two important indices which measure the nature and state of current national information societies. These indices were created in 2008 by the International Telecommunication Union (ITU) and are used to compare developments in ICTs across 152 member countries. The indicators are: the ICT Development Index (IDI) and the ICT Price Basket (IPB) (see methodology in Appendix A and B). The assumption is that the more a country develops its infrastructure, spreads the use of the ICTs and increases the general skill level of its population, the more it will be able to develop the NGN (to become a NIS).

### Comparisons using IDI

From 2008 to 2010 the CAGR in BRICs[16] was significantly higher than it was in the top five countries[17] (4.94% for Top 5 and 8.08% for BRICs), possibly because the Top 5 are reaching *saturation* in the CIS, suggesting they are ready to implement the NGN (cf. Table 2). The CAGR of IDI Access was low in the Top 5, only 2.24%, when compared to the BRICs (8.39% in the RIC[18]s and 6.41% in Brazil). The basic infrastructure needed to build the NGN is extensively available in the Top 5. The growth of the sub-indices is impressive. The RICs have grown 2 to 4 times faster than the Top 5 and Brazil has grown 1.5 to 3 times faster than the Top 5. Although not very significant, Brazil's growth has been faster than the RICs and the Top 5 when it comes to IDI Skills. The RICs have a very high CAGR for all sub-indices due to developments in Russia, the fifth country with the highest variation on the IDI during 2008-2010 (ITU, 2011). In the three groups, the IDI Use has the highest growth (cf. Table 2). It can be assumed that the information society is still in the process of development when IDI Use is high in a country, even in the Top 5.

However, even with the high positive variations in the BRIC indices, there is much to be done and it should be done very quickly. The variations are positive but they are building from a very low technological basis. For example, Brazil's IDI position ranked 64$^{th}$ (4.22) in 2010 which means that - given its CAGR (6,51%) - it would take 7 to 8 years to catch up with the

[16] BRIC stands for Brazil, Russia, India and China.

[17] Top 5 countries are: Korea (Rep.), Sweden, Iceland, Denmark, Hong Kong and Israel (ITU, 2011).

[18] RIC stands for Russia, India and China.

last Top 20[19] country which is Israel with the lowest IDI in the group = 6.87). This is a very long time, considering the rhythm of development of ICTs. Russia is in a better situation because it is ranked 47th, but India and China's situation is worse: China is ranked 80th and India is ranked 116th on the IDI index (ITU, 2011).

**Table 2:** IDI, IDI Sub-Indexes and CAGR Of Top 5 Countries, RIC Countries And Brazil – 2008-2010

| Countries | 2008 | 2010 | CAGR |
|---|---|---|---|
| **IDI** | | | |
| Top 5 | 7.37 | 8.11 | 4.94% |
| RIC | 3.10 | 3.65 | 8.08% |
| Brazil (64)* | 3.72 | 4.22 | 6.51% |
| **IDI Access** | | | |
| Top 5 | 7.97 | 8.33 | 2.24% |
| RIC | 3.62 | 4.20 | 8.39% |
| Brazil (67) | 4.08 | 4.62 | 6.41% |
| **IDI Use** | | | |
| Top 5 | 5.75 | 7.19 | 12.13% |
| RIC | 0.85 | 1.56 | 36.12% |
| Brazil (64) | 1.49 | 2.11 | 19.00% |
| **IDI Skill** | | | |
| Top 5 | 9.38 | 9.49 | 0.57% |
| RIC | 6.56 | 6.69 | 1.08% |
| Brazil (54) | 7.48 | 7.65 | 1.13% |

*Rank consisting of 152 countries, members of ITU.
**Source:** ITU, 2011

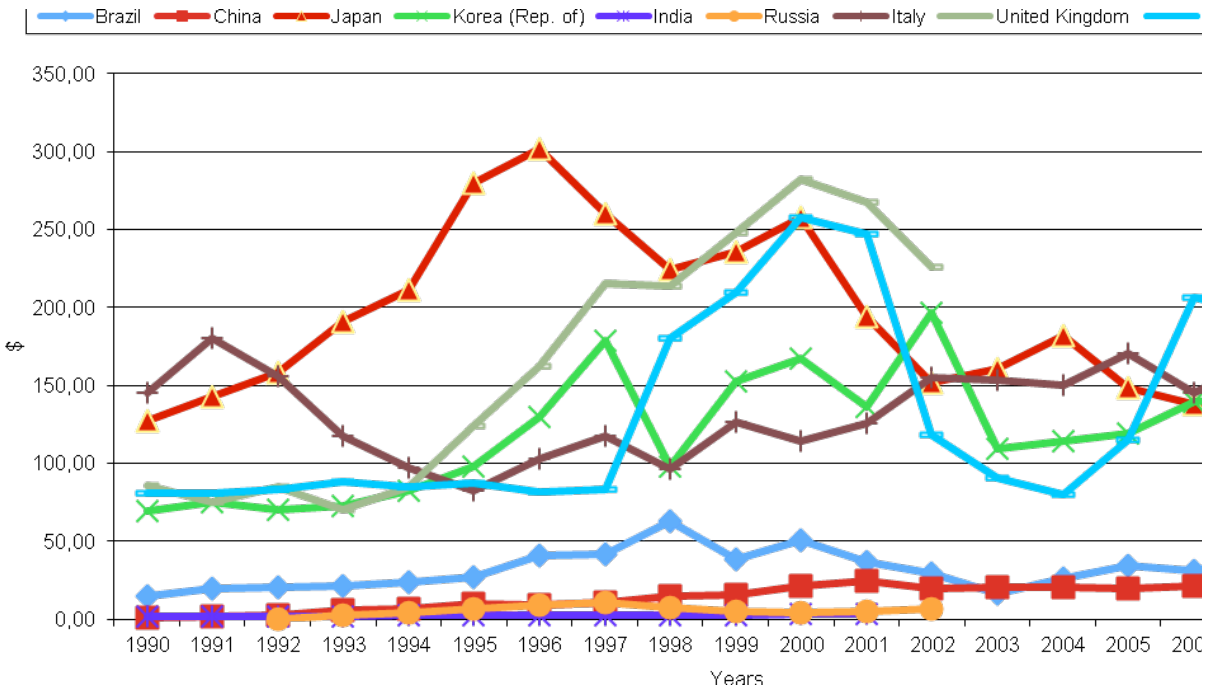
Therefore, a structural break is necessary to change performance on the IDI index in the BRICs. These countries must increase the volume of investment in infrastructure significantly, much more than they have done since the early 1990s. In Figure 2, the amount of investment per capita in these countries has been low when compared to industrialised countries (Japan, the US, the UK, Italy and South Korea). Comparing Brazil to the RICs, Brazil historically has invested more, but China is catching up quickly. Interestingly, in Brazil, the volume of investment has remained the same, even after telecommunications privatization in 1998 (cf. Figure 2). This finding demystifies the claim that telecommunications has gained in the country due to the increasing volume of investment by private incumbent companies. Thus, the State should be the locomotive to pull the necessary investment in the media and communications industry in Brazil. Brazilian industrialization has been marked by the structural presence of the State which has been working as the strongest leg in the triad represented by the public sector, multinational and national firms that were responsible for leading national development in the 20th century. However, in

[19] The Top 20 countries are: Korea (Rep.), Sweden, Iceland, Denmark, Hong Kong, China, Luxembourg, Switzerland, Netherlands, United Kingdom, Norway, New Zealand, Japan, Australia, Germany, Austria, United States, France, Singapore and Israel (ITU, 2011).

contrast to the South Korean State, the Brazilian State was not politically capable of influencing firm decisions and the strategic direction of investment to ensure that industrial policy would serve as the dominant promoter of economic development. The current regulatory framework is working with the earlier institutional structure - a form of regulation that is unsuited to encouraging a high level of investment by the private incumbent firms[20].

Following the Keynesian principle of effective demand, if investment is low, so too are revenues. This does not mean that the profits are low, but suggests that the volume of investment by incumbents is just an important factor in profitability. According to Figure 3 the level of revenue/per capita in BRICs, has historically being extremely lower than the developed countries. Therefore, low expenditure on investments, low revenue.

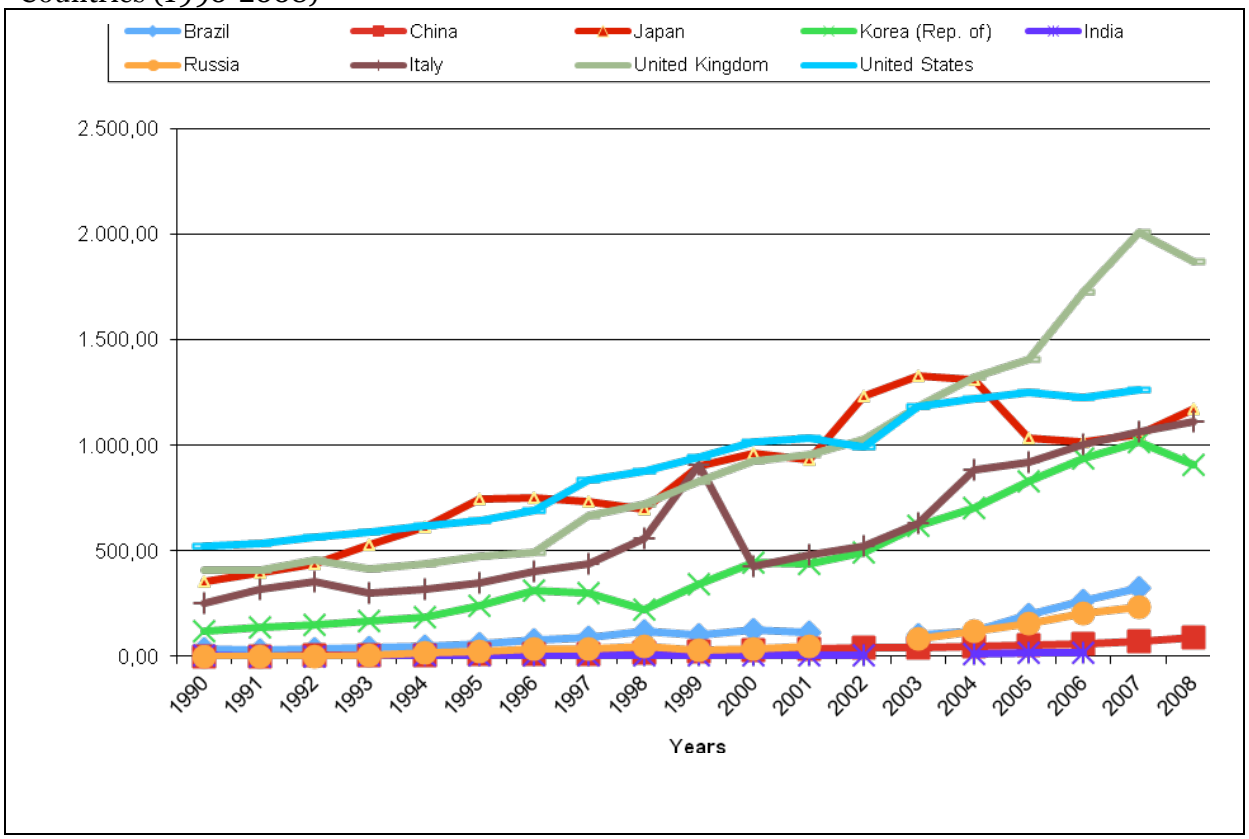
**Figure 2:** Total Annual Investment in Telecommunications (US$)/Per Capita in Selected Countries (1990-2008)




**Source:** ITU, 2010

[20] The situation is different in the UK. According to Dini et al. (2012: 39), the government will be promoting the promise of the offer of the 'best superfast broadband network in Europe by 2015 and envisages that much of the investment foreseen over the next few years in communications will be privately funded', which is estimated at around 90%. Hence, the UK government's target is '100% fast broadband coverage by 2015; 90% superfast broadband coverage by 2015 and the best superfast broadband network in Europe by 2015'.

**Figure 3:** Total Revenue from all Telecommunication Services (US$)/Per Capita in Selected Countries (1990-2008)




**Source:** ITU, 2010

**Comparisons using IPB**

The lower the IPB score, the better it is (see appendix A). In Table 3 the Top 5 lowest IPB score is much lower that the BRICs. The Top 5 countries with the highest IDI are not identical to the Top 5 countries with the lowest IPB, but all of them are in the Top 20 with the highest IDI - Monaco and Liechtenstein's IDI data are not available. Yet, the gap between the Top 5 and BRIC IPB is very significant. The IPB in Russia which is the best in BRICs, since it is the lowest, is 5 times higher than the IPB in Monaco, the first in the Top 5, while the IPB in China, India and Brazil is three times higher than it is in Russia.

Table 2 also shows that the BRICs have a large distortion in their ICT prices which suppresses the rhythm of the catching up dynamic.
Figure 4 shows the correlation between the IDI and IPB indices. Countries with a high IDI usually have a low IPB. Therefore, more people can access and use ICTs (increasing IDI) where they are affordable (low IPB).

According to the ITU (2011), as can be seen in Figure 4, in 69 countries where the IDI is above 4.0, the IPB is below 5.0. Also it seems that the BRICs are trying to address the problem of affordability since their IPB has decreased significantly. Despite the fact that

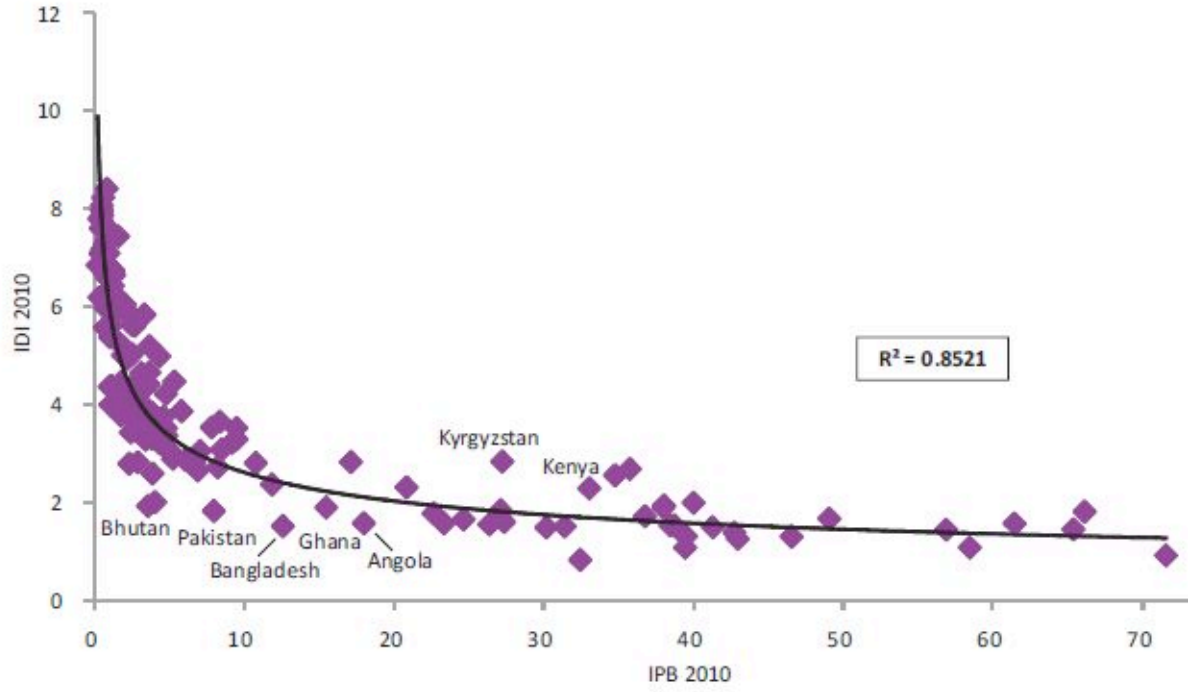
Brazil has had a substantial reduction in its IPB, it is still ranked 96th in the world, possibly due to the lack of competition - see below. Thus, many regulatory changes need to be implemented in this country.

**Table 3:** IPB And CAGR in the Top 5 and BRIC Countries* (2008-2010)

| Rank | Countries | 2008 | 2010 | CAGR |
|---|---|---|---|---|
| 1 | Monaco | N/A | 0.2 | N/A |
| 2 | Macao, China | 0.3 | 0.3 | 0.00% |
| 3 | Liechtenstein | N/A | 0.4 | N/A |
| 4 | Hong Kong, China | 0.3 | 0.4 | 15.47% |
| 5 | United Arab Emirates | 0.4 | 0.4 | 0.00% |
| 32 | Russia | 1.3 | 1.1 | -8.01% |
| 73 | China | 3.7 | 3.1 | -8.47% |
| 87 | India | 4.6 | 4.1 | -5.59% |
| 96 | Brazil | 6.8 | 4.8 | -15.98% |

*It is not important to consider the values of the sub-baskets since each of them has approximately the same value.
**Source:** ITU, 2011

**Figure 4:** Relationship between the IDI And The IPB – 2010




**Source:** ITU, 2011

In summary, although the Brazilian CAGR on IDI and IPB (and also for the sub-indices and sub-baskets) in the period 2008-10 was significantly higher than the Top 5 countries, its rank is still very low. Its best position was 54th on IDI Skill which is considerably worse than some of its neighbours' position in Latin America and in industrialised economies with the same level of GDP. Without a doubt Brazil has to establish a set of policies to catch up in a short period of time with higher ranked countries and much remains to be done. The level of

investment in the BRICs historically has been very low compared to developed countries. It goes without saying that market forces along with a weak regulation will not manage to disrupt this structural inertia at the pace currently being set by telecommunications investment.

**Considerations Regarding the Investment in Broadband in Brazil**

Brazil has had a peculiar trajectory with respect to these technological developments. In the late 1990s, Brazil privatized all the various assets of its nationwide telecommunications state-owned company Telebras. During this privatization, Telebras was divided into four regional incumbent companies: Brasil Telecom, Telemar, Telefonica and Embratel (long distance services). The concession for each of these regional companies was bought by foreign investors (incumbent companies in industrialised countries) and funded by pension funds. A regulatory framework was created with a regulatory agency, ANATEL, and a new legal framework for telecommunication, *Lei Geral das Telecomunicações* – LGT [General Law of Telecommunications][21]. The LGT has regulated voice services with a few guidelines for advanced services. However, more than 15 years after privatization, Brazil has not attained a favourable competitive market for its telecommunications services. Also, the original shareholders have changed considerably with few positive results in terms of competition. These private incumbents did very little to increase investments. After a decade, Brazilian telecommunications regulation did not really evolve, arguably Brazil is stuck in Telecom 1.0. It is argued there that after struggling with many difficulties including the lack of unbundling of network elements and the lack of competition, Brazil has the unique opportunity to bypass Telecom 2.0 and leapfrog towards Telecom 3.0, providing the state initiates a pro-active industrial policy to catch up.

Two questions ought to be considered in this regard: why are broadband issues important for the Brazilian economy? And why should the Brazilian government commit valuable public resources to building new information and communication infrastructures while it still has basic problems to tackle such as poverty, sanitation, illiteracy, and so on? The answer is that these investments are as important as others in solving many basic problems. These investments are paradigmatic in the sense that they are associated with strong network externalities. Czernich (2011) in a study of twenty OECD countries, concluded that countries experiencing a rise in broadband penetration of 10% in the period from 1996 to 2007, increased their the annual per capita GDP growth by 0.9% to 1.5%. Moreover, these investments tend to stimulate innovation. According to Czernich (2011), a rise in broadband

[21] Some plans arose from the establishment of the LGT: the General Plan for Grant (Plano Geral de Outorga - PGO); the General Plan for Universalisation Goals (Plano Geral de Metas de Universalização - PGMU) and the General Plan for Quality Goals (Plano Geral de Metas de Qualidade - PGMQ)

penetration of 1% in nine OECD countries from 1998 to 2002, is associated with an increase in innovation of 3.5 to 5.3%. in a report for the World Bank, Benkler (2010: 23) furthermore highlights [22] 'that every 10 additional broadband subscribers out of every 100 inhabitants are correlated in high income countries with GDP growth increases of 1.21%, while the correlation was even more pronounced for low-and middle-income countries, at 1.38%'.

In Brazil, these investments might help to address basic problems because access to internet content requires literacy as well as improved social and political organization. In the recent past, similar tendencies could be observed in relation to the invention of the automobile, the introduction of electricity and the advent of radio and television which promoted cultural and a national integration through content (soap opera, news, TV show, and so on) and led to improved social and public policies. Additionally, it is claimed that the spread of the internet creates job opportunities with the emergence of ISPs, technical support for ICT, local content producers, developers, and so on.

Steinmueller (2001) corroborates this idea when he points out that ICTs are as unparalleled as steel, chemicals, and machinery were in the past. The characteristics of the applications and the type of production, the barriers to entry for using and producing some kinds of ICTs are relatively low because they do not require experience and high volume of investments in fixed capital. Furthermore, ICTs mean knowledge and consequently are components of all systems, are thus available in every market and are easily transportable and transferable to be used in all economies. The main point to be considered here is the acquisition of the needed knowledge to change and adapt the ICTs to the local needs. Therefore, these arguments suggest the idea that ICTs have the potential to support the development strategy of leapfrogging, which is the shortening of the path to catch-up with the industrialized economies in terms of the processes of accumulation and gains of productivity. Internet technologies increase the potential for leapfrogging, considering that they eliminate the barriers of time and distance for the distribution of information. Also, these technologies enable a 'variety of new and *open* formats for the distribution of information and the establishment of inter-organizational linkages' (Steinmueller, 2001: 194).

The Ingenious Consulting Network (2010) argues that the state should subsidize the deployment of basic or fast broadband to households not reached by the market, but there is no point in doing it simply to achieve an increase in broadband speed, i.e. most current internet services are provided for by basic or fast broadband. Higher speeds provide the same services at a significant extra cost. The study concludes that 'subsidising the deployment of

[22] Christing Zhen-Wei Qiang and Carlo Rossotto, with Kaoru Kimura, (2009) Economic Impacts of Broadband, in Information and Communications for Development 2009: Extending Reach and Increasing Impact, World Bank, July.

fast broadband to reach 100% of households in the UK would generate £2.25 of consumer surplus for every £1 of subsidy while subsidising the deployment of superfast broadband to reach 92% of households would generate only £0.72 of consumer surplus for every £1 of subsidy. Putting this differently, to justify deployment, for every £1 of subsidy, superfast broadband would need to generate at least £0.28 of externalities on top of those provided by fast broadband' (Dini, et al., 2012: 23).

Thus, if the internet of the CIS provides whatever is needed today, why should the Brazilian State leapfrog the CIS and lead investment in the NIS considering the extra costs only to achieve the same benefit? Why not provide just the basic internet? And finally, why should industrial policy build a favourable environment for Telecom 3.0 in Brazil?

## DIAGNOSIS OF THE COMMUNICATION MARKET IN BRAZIL

After Brazilian telecommunications privatization, this market changed from a public monopoly to a very concentrated oligopoly with a deficient regulatory framework. According to the US Department of Justice (USDOJ, 2012), a market structure with a Herfindahl-Hirschman Index (HHI) above 1800 is considered concentrated[23]. Despite the HHI for the Brazilian telecommunications (2,222.00) is similar to the HHI in industrialised countries[24] and the Concentration Ratio 4 (CR4) is 87.60% (Table 4) the Brazilian economy has low position on the IDI (64$^{th}$) and on IPB (96$^{th}$) which means that ICTs have not been developing due to unaffordable prices and lack of infrastructure.

The cable TV market is also very concentrated as can be seen in Table 5 with an HHI = 2.653.02. With this market structure the Brazilian market has approximately 12,744,025 subscribers which correspond to only 34%[25] of the Brazilian population with access to cable TV. In the UK, for instance, nearly 100% of the households have access to digital TV and are subscribers of subscription TV (cable, satellite or DSL line).

Furthermore, more than 60% of broadband connections are provided by digital modem by incumbent companies. Other broadband connections have been growing very slowly and, therefore, the incumbents retain their dominant position (cf. Figure 5).

[23] Markets in which the HHI is between 1000 and 1800 are considered to be moderately concentrated and those in which the HHI is over 1800 are considered to be concentrated (USDOJ, 2012).

[24] For example, the HHI for broadband in the UK = 2,124.98 and in the US = 2.453,57 in 2011 (See Appendix C).

[25] Considering that each subscription household is an average family of 5 members, the population that accesses cable TV is about 63,720,125. Considering that the Brazilian population is around 190,000,000; 63,720,125/190,000,000 = 33.54%. Also, these subscribers do not necessarily access digital TV, which is paid separately. Due to the lack of regulation, the cable TV operators discriminate prices and charge for digital TV.

**Table 4:** Market Share and Herfindahl-Hirschman Index (HHI) in the Brazilian Broadband Market - 2011

| Companies | Market share (%) | HHI |
|---|---|---|
| Oi | 29.70 | 882.09 |
| Net | 25.80 | 665.64 |
| Telefônica | 22.00 | 484.00 |
| GVT | 10.10 | 102.01 |
| CTBC | 1.70 | 2.89 |
| Embratel | 1.60 | 2.56 |
| Other | 9.10 | 82.81 |
| **TOTAL** | **100.00** | **2,222.00** |

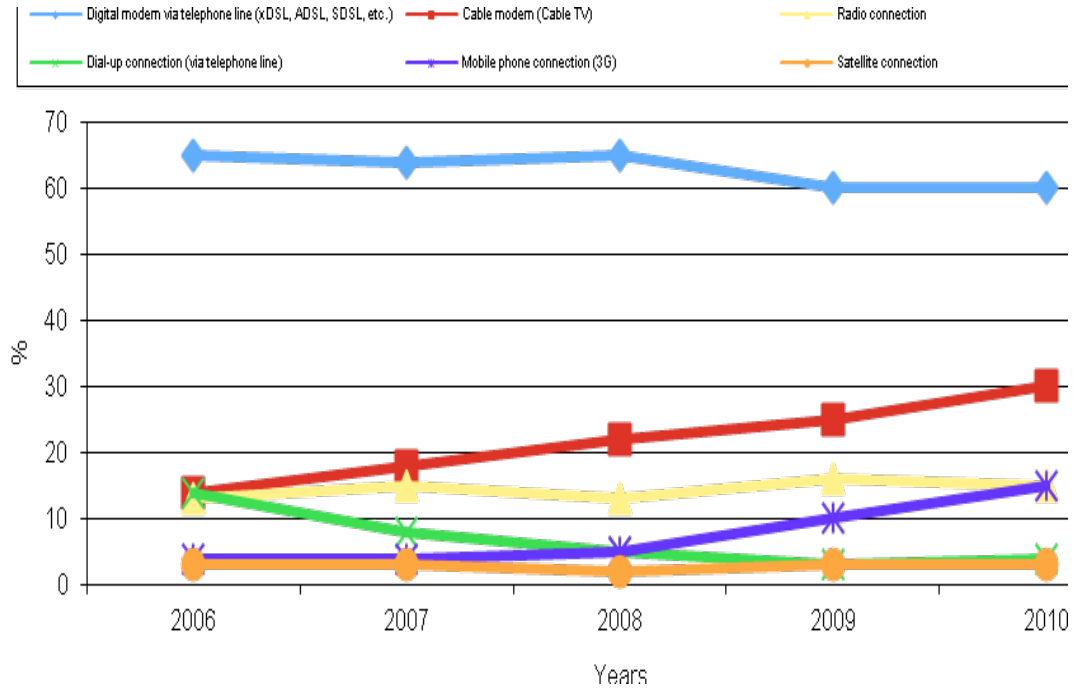
**Source:** Teleco, 2012a

**Table 5:** Market Share and Herfindahl-Hirschman Index (HHI) in The Brazilian Cable TV Market - 2011

| Companies | Market share (%) | HHI |
|---|---|---|
| Net | 37.00 | 1,369.00 |
| Sky | 29.79 | 887.44 |
| Embratel | 17.89 | 320.05 |
| Telefônica | 4.29 | 18.40 |
| Oi | 2.76 | 7.62 |
| Abril | 1.28 | 1.64 |
| Other | 6.99 | 48.86 |
| **TOTAL** | **100.00** | **2,653.02** |

**Source:** ANATEL, 2011

**Figure 5:** Distribution of Broadband Connections per Technology in Brazil – 2006- 2010




**Source:** CGI, 2010

In summary, 15 years after privatization, the Brazilian market structure and the regulatory framework are characterized by *immobility***.** The communications market is highly concentrated and few regulatory actions have been taken to stimulate a structural change in the communications market. This is an issue of great importance to Brazil which should lead investment in order to achieve the NIS and take firm action to create a new regulatory framework and a new industrial policy. The market will not achieve the Pareto Efficiency in this static situation without the direction provided by effective regulation and industrial policy. Specifically, regulation, antitrust and industrial policy should be fine-tuned to develop the media and communications industry. Specifically, this means state-led investment in infrastructure coupled with a regulatory framework organized by the state that encourages incumbent companies to invest according to priorities set by the state. This new approach to investment requires a political process, given that the public interest in universal provision, quality and affordability is not being met because of the private incumbent companies' logic of profit. This amounts to a classic example of market failure.

If the state establishes a new industrial policy and leads the development of the NIS with its purchasing power[26], the ICT industry and the incumbent companies would be strengthened, provided a high volume of investment is involved. However, the market structure could also become more concentrated as a result and therefore subject to discriminatory practices and collusion. Hence, an antitrust policy or a competition policy is another institutional necessity. In short, the NIS could be achieved through state-led investment which would enable the diffusion of the ultra fast broadband; an industrial policy would strengthen the incumbent companies and the ICT industry, assuming that a powerful antitrust law is in place to balance the incentives created by a concentrated market structure.

**Regulatory Changes and Industrial Policy in Brazil**

Recently the Brazilian government has acknowledged this situation to some extent and has been trying to introduce more pro-active policies by setting up some regulatory and industrial policy measures. During the privatization process, the government did not foresee[27] the need for the unbundling of network elements and the sections related to unbundling in the LGT were generic (articles 73, 154 and 155). Later on, in 1999, more specific regulatory action was taken with the editing of the Joint Regulation for the

[26] The State's purchasing power strengthens industry, since the volume of demand is constant and very significant. But more importantly, the State has the power to choose and implement a technological standard, which provokes a set of technological consequences *ex-post*. The State's purchasing power strengthens a technological trajectory, setting in train a process of lock-in and path-dependence with corresponding externalities along the whole value chain of an industry which can stimulate its development.

[27] The reasons the government did not foresee the need for the unbundling are controversial. They range from lack of knowledge and experience to a pro-producer regulatory environment due to *ex-ante* capture of the regulatory agency.

Unbundling of Infrastructure in the following sectors: Electric Energy, Telecommunications and Crude Oil (*Regulamento Conjunto para Compartilhamento de infra-estrutura entre os Setores de Energia Elétrica, Telecomunicações e Petróleo*) and the Joint Regulation for the Resolution of Conflicts by the Regulatory Agencies in Electric Energy, Telecommunications and Crude Oil (*Regulamento Conjunto de Resolução de Conflitos das Agências Reguladoras dos Setores de Energia Elétrica, Telecomunicações e Petróleo*). However, these actions were not to persuade or force the incumbents to unbundle their network elements. During these years, the regulatory authorities stated that incumbents should unbundle their network elements, but the regulatory instruments were too weak to actually enforce it. In practical terms, nothing was done and the broadband market structure has remained concentrated in the incumbents' hands while the expected new telecommunications carriers never arrived onto the market[28]. Thus, in most areas of the country, there is absolutely no competition for telecommunications services and users have been taken hostage by a monopolistic regional private company. It is important to emphasise here that the market share of the six telecommunications companies (Table 4) does not represent **intense** competition, but only the share held by these companies in regional markets as a proportion of the total market. In 2003, there was the first comprehensive movement towards the NIS. In Box 1 this regulatory framework is explained chronologically:

**Box 1:** regulatory measures for the CIS in Brazil

| |
|---|
| 1. General Plan of Universalisation Goals (Decree Nº 4769 – 27/06/2003): This is the second Plan established after privatization in 1998. The first plan had goals of expanding Brazilian landlines that should be achieved by the incumbents. In this second plan, besides the goal of expanding mainly public landlines, there were important **references to gradual goals of backhaul** installations in all Brazilian municipalities. According to this Decree, by 31/12/2010, all municipalities should have a backhaul installation on the premises with the minimum transmission capacity of 64 Mbps for municipalities of more than 60,000 inhabitants and if the population in these municipalities grows, the incumbent companies should increase the numbers of backhaul links. |
| 2. General Plan of Universalisation Goals (Decree Nº 6424 – 04/04/2008): This included minor changes, but maintained the goal of backhauls. |
| 3. General Plan to Update the Telecommunications Regulation in Brazil (Resolution Nº 516 – 30/10/2008): This Plan proposed general action to expand landlines, stimulate the national telecommunications equipment industry, reduce regional inequalities and promote freedom of choice in the short, medium and long term. It also **referred to broadband and cable TV** in Latin America, stating that broadband was concentrated in the hands of economic trusts and the government should establish action to spread **broadband to all areas** (rural and urban areas) at affordable prices. The government should stimulate the entry of **new national players in order to offer broadband**. For that purpose, the regulatory agency should implement the unbundling of network elements. |
| 4. General Plan of Universalisation Goals (Decree Nº 7512 – 30/06/2011): This 3rd Plan strongly emphasized the need for bidding for frequency spectrum by 30/4/12 so that **high quality voice and data services could penetrate remote and rural areas**. This |

[28] With the exception of a heroic carrier called Global Village Telecom (GVT) which survived by duplicating its network and achieving a market share of 10.10% (Table 4). All other carriers involved at the beginning of the opening of the market to competition gradually exited the market.

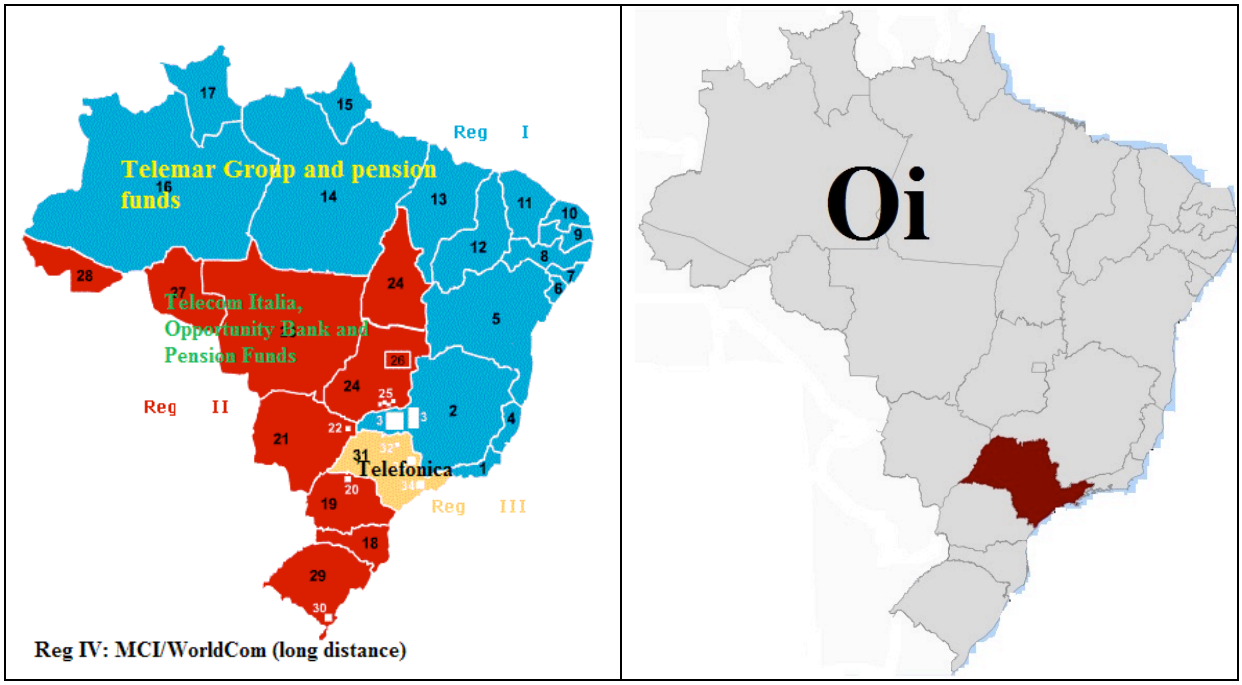
| | |
|---|---|
| | service should be free of charge for public schools in rural areas. Also, there should be bidding for 4G spectrum. |
| 5. | General Plan of Competition Goals (Under public consultation): This plan classified the companies according to their Significant Market Power which forced them to be more transparent and to **unbundle their network elements**. It also **created the retail and wholesale markets**. |

More recently, three measures were taken concerning industrial policy and antitrust regulation: the creation of the nationwide private telecom company (Oi), revision of the Brazilian antitrust law, and the reactivation of *Telebras* as a wholesaler.

### The Nationwide Telecom Company - Oi

During the privatization process in 1998, the assets of the nationwide State-owned company, Telebras, were divided among four regional companies, as shown in Figure 6:

**Figure 6:** Concession in Four Regions During the Privatization of Telecommunications in Brazil in 1998 and the New Concession Area after the Merger Oi-Brasil Telecom in 2009




**Source:** Teleco, 2012b.

Brazil's original model of privatization bore no resemblance to any other countries. In industrialised economies, privatization policy focused on strengthening national operating companies, some of which bought concessions in Brazil. In the US, Bell was broken up in 1984 to create the Baby Bells which then became concentrated as incumbent Regional Bell Operating Companies (RBOCs). In Brazil, the only domestic shareholder firm was Telemar, a regional incumbent that was not allowed to operate outside its region. The Brazilian privatization imposed a model whereby the telecommunication system was to be dominated

by global telecommunications players in a free market without any clear national direction or purpose.

From 2003, intense hostility between Telecom Italia and Opportunity Bank's shareholders inside Brasil Telecom (incumbent in Region II) arose as a result of a series of espionage and corruption scandals involving politicians and some Federal institutions[29]. In 2008, Telecom Italia sold its share and Brasil Telecom became a domestic incumbent shareholder as Telemar had been. In 2009, the National Bank of Social and Economic Development *(Banco Nacional de Desenvolvimento Econômico e Social* – BNDES) led a merger of these two companies into a nationwide private incumbent company, branded Oi[30]. This was a measure of industrial policy justified by a policy of fostering national champions. Telefonica, in São Paulo, continued as the only foreign incumbent shareholder (cf. Figure 6). This merger was seen as a solution favouring national development, and was proposed by a coalition of those[31] who were opposed to the privatization in 1998. Their proposal was based on a strategy of national sovereignty with a nationwide private company capable of being a global player and developing the domestic equipment industry through the state's purchasing power. The idea was to transform Telebras into Brazil Telecom as a professional and qualified domestic

[29] Some details of this corruption scandal are at http://www.istoedinheiro.com.br/noticias/7029_POR+TRAZ+DOS+ESPIOES.

[30] Even before the merger, Telemar used the brand, Oi. Its shareholders are: AG (19,35%), La Fonte Tel. (19,35%), BNDESPar (13,08%), Portugal Telecom (12,07%), Fundação Atlântico (11,50%), Previ (9,69%), Funcel (7,48%) and Petros (7,48%) (Teleco, 2012c).

[31] This coalition happened in 2002 as a result of the election of Luis Ignacio Lula da Silva - from the Worker Party - after being defeated three times in 1989, 1993 and 1997. The process of privatization organized in 1998 was leaded by President Fernando Henrique Cardoso, who was in charge of the biggest neo-liberal reform in the country, following the Washington Consensus, despite coming from a social-democrat wing. Not only was the telecommunications sector privatized, but also many other utilities. As it was stated before, the problem was not the privatization in telecommunications per se, but the way it was carried out: the telecom assets were divided in four batches to be sold to global players instead of being preferentially sold as a whole to a national private economic group. Shima (1999) reports details on the political process in the Congress during privatization. For example, the government took absolutely no interest in encouraging or creating a national consortium to buy the telecom assets. On the contrary, the government encouraged lobbyists to pressure members of the Congress in order to approve the government proposal of privatization in favour of international groups. There were members of the Congress who overnight decided to switch their political views to support the government. Some members of the Congress, from the left wing, denounced scandals of corruption concerning vote buying, but nothing was made and there were no consequences. On the other hand, some members of the Congress, from a left wing position, called National-Developmentism, proposed a national-based privatization supporting a nationwide company and not fragmented one as it had been established. Furthermore, these members believed that a privatization based on a nationwide company would be more "profitable" for the government because the assets would be more valued. In 2002, this group from the left wing along with President Lula got into power, and later, there was the establishment of the nationwide company, Oi, in order to make up for all the failures made at the beginning of the privatisation. Then, there were important changes in the regulatory framework in order to enable the concentration of previous regional markets. However, Oi still does not have an important role in terms of investments as the European telecom companies did in their countries, since the regulatory framework is not well suited for a nationwide telecom company. Moreover, structural changes in the regulatory framework are practically impossible to be made whilst the contracts of concession are still in force. This could be regarded as an institutional break. Finally, it is important to point out that those changes made through the establishment of OI had a reformist nature based on the idea of a national-developmentalism. It was not a socialist reform. In political terms, probably the current government (Lula/Dilma) is considered a popular democracy, but in economic terms it is still conservative, since it did not touched crucial economic points such as the income distribution, education and so on. It did not make any political and fiscal reforms. Thus, far from socialism, the status-quo and, consequently, the elites' political power still remain quite the same.

incumbent company guided by the national interest[32]. In many ways, the idea was to make Brazil Telecom similar to France Telecom, British Telecom, Deutsche Telekom, etc.

After several detours, the emergence of Oi represented the resumption of a national development project. Despite being a private incumbent, Oi can potentially serve as an instrument for social inclusion and the diffusion of landlines and the internet in the retail market and as an instrument of economic and technology development through partnerships and/or strategic alliances to stimulate the national ICT industry. Oi is the main nationwide incumbent and the regulatory measures in place (cf. Box 1) oblige it to achieve a high level of investment which is expected to be around US$ 6.9 billion – with a supplementary budget of US$ 1.9 billion from BNDES - to meet the goals established by the Plan and to achieve competitive efficiency[33] and a strong position on the international market.

The company was expected to work to converge the networks of both operators (Telemar and Brasil Telecom); to provide mobile services in all municipalities with more than 200,000 inhabitants (by 2011); to implement the network infrastructure for broadband in more than 3,000 municipalities (by 2016) and to install broadband connection in all 28,000 urban public schools (BNDES, 2009). This was an unprecedented decision to stimulate catching up investment. This high investment volume suggests that the Brazilian government understood the need to speed up the investment in telecommunications infrastructure as discussed in the introduction. The projected volume of investment in Brazil is much bigger than the planned volume of investment in some industrialised economies (See A/B in Table 6).

Despite that, considering the low development of the Brazilian CIS it would be necessary a ratio investment/per capita (A/B) similar to Australia, South Korea, Luxembourg or New Zealand to catch-up.

[32] Coutinho (2012), current president of BNDES and one of the most influential economists in Brazil, was the greatest proponent of this idea see, *Teles, Opção a um Grande Equívoco*, (Teles, Option to a Big Mistake), in *Folha de São de Paulo* (daily newspaper) on 07/06/1998.

[33] A strategy supporting national champions does not necessarily mean efficiency, but implies the achievement of economies of scale and scope. Large firms in concentrated markets tend to reach a certain level of efficiency in the long term, provided they operate in an oligopolistic competitive market. Furthermore, the focus of this type of policy is not exclusively on efficiency, but also on the concentration of national groups.

**Table 6:** Public Investment in Broadband around the World

| Countries | Planned investment (A) | Population (B) | A/B |
|---|---|---|---|
| Australia | 41.227.229.146,69 | 22.846.668 | 1.804,52 |
| South Korea | 27.000.000.000,00 | 50.004.441 | 539,95 |
| Luxembourg | 257.790.000,00 | 511.800 | 503,69 |
| New Zealand | 1.400.800.000,00 | 4.449.110 | 314,85 |
| **BRAZIL** | **6.974.600.000,00** | **193.946.886** | **35,96** |
| Italy | 1.652.500.000,00 | 60.870.745 | 27,15 |
| United States | 7.200.000.000,00 | 314.976.000 | 22,86 |
| Austria | 165.250.000,00 | 8.452.835 | 19,55 |
| Japan | 2.220.000.000,00 | 127.547.000 | 17,41 |
| Finland | 87.252.000,00 | 5.426.980 | 16,08 |
| France | 991.500.000,00 | 65.350.000 | 15,17 |
| Portugal | 146.742.000,00 | 10.561.614 | 13,89 |
| United Kingdom | 567.700.000,00 | 63.181.775 | 8,99 |
| Canada | 170.196.671,71 | 35.014.000 | 4,86 |
| Germany | 198.300.000,00 | 81.903.000 | 2,42 |

**Source:** Adapted from Benkler, 2010.

### The Reformulation of the Brazilian System of Competition Defence

The degree of monopoly in an economy is likely to increase when industrial policy focuses on the strengthening of national champions. To avoid this happening in Brazil the framework for industrial policy has been reformulated with its System of Competition Defence (SoCD)[34], a new institutional compensatory measure with a goal of balancing monopolistic and discriminatory behaviour among companies. This reformulation was signed by then President Luiz Inácio Lula da Silva in November/2011 (Law Nº 12.529 – Planalto, 2011) leading to two main changes:

1. In the past, the SoCD was the responsibility of: 1) Secretariat of Economic Law (in the Ministry of Justice), 2) Secretariat of Economic Monitoring (in the Ministry of Finance) and 3) Administrative Council for Economic Defence (*Conselho Administrativo de Defesa Econômica* - CADE), an independent federal agency. As separate institutions, they were unable to coordinate or take unified actions efficiently. The SoCD is now unified under the responsibility of CADE and the Secretariat of Economic Monitoring. The unification measure was not taken only to achieve improved coordination, but also because of the increasing of the legal power of CADE. Since the Government is focusing on national champions capable of becoming global players, these firms are likely to acquire monopoly power in the domestic market with the need for the SoCD to keep the market continuously under strict oversight. For example, the Government has led mergers of

[34] Despite being established later, this reformulation is similar to the Enterprise Act 2002 in the UK. CADE now bears some similarities with the current UK Office of Fair Trading (OFT).

national groups in the electronic retail market and in the pharmaceutical, food, pulp and paper and meat industries, etc. While CADE had an executive and legal role, imposing penalties and giving permissions, the Secretariat of Economic Monitoring had an advisory role in terms of economic foundation and analyses so that CADE could make decisions.

2. The second main change in industrial policy favouring national champions related to the expansion of the legal-institutional apparatus for the analysis of mergers and acquisitions by CADE. Before the reform, mergers and acquisitions could be negotiated without the prior analysis of CADE and such negotiations were rarely blocked by this institution. Now, mergers and acquisitions cannot be undertaken without previous analysis by CADE which has 240 days to approve (or not) a proposed merger[35].

In summary, the measures in Box 1, the antitrust reformulation and the creation of a national champion (Oi) are in line with a shift in approach to regulation, antitrust law and industrial policy more broadly.

## The National Broadband Program (NBP)

The main characteristics of the Brazilian media and telecommunications market are:

- It is highly concentrated (Table 4) and (Table 5)
- It has difficulty encouraging new broadband providers to enter the market in competition with the incumbents and, therefore, it does not increase user choice
- It has difficulty encouraging unbundling of network elements
- It does not have an institution to direct investment in the backbone network

In the light of these characteristics, the third industrial policy measure in the framework for state-led investments was the reactivation[36] of Telebras as the national wholesaler[37] and the main investor in the CIS broadband market in 2010. This was an important solution aimed at encouraging the unbundling of incumbent networks for potential new entrants in the retail market. Moreover, Telebras is expected to invest in its own broadband infrastructure, buy capacity from the incumbents to be sold to new entrants and, through the incumbents, provide download speeds of up to 1 Mb/s. It could thus be argued that there is now national direction that is leading investments in the CIS, with a target to achieve the NIS. The

[35] The analysis of the Brazilian trend towards higher concentration is not based on HHI values but on revenues. Proposals of mergers are analysed if the groups had revenues of £ 133 million and £ 10 million in the previous year.

[36] In the process of privatization, the assets of Telebras were divested and the company remained inactive, existing only as a legal entity.

[37] This was a similar solution as in the UK, with the BT´s Openreach established in 2006.

reactivation of Telebras is a main measure of the National Broadband Program with the objectives of expanding broadband coverage, increasing downlink speeds and making all of this affordable for users. There are four policy dimensions (Planalto, 2012):

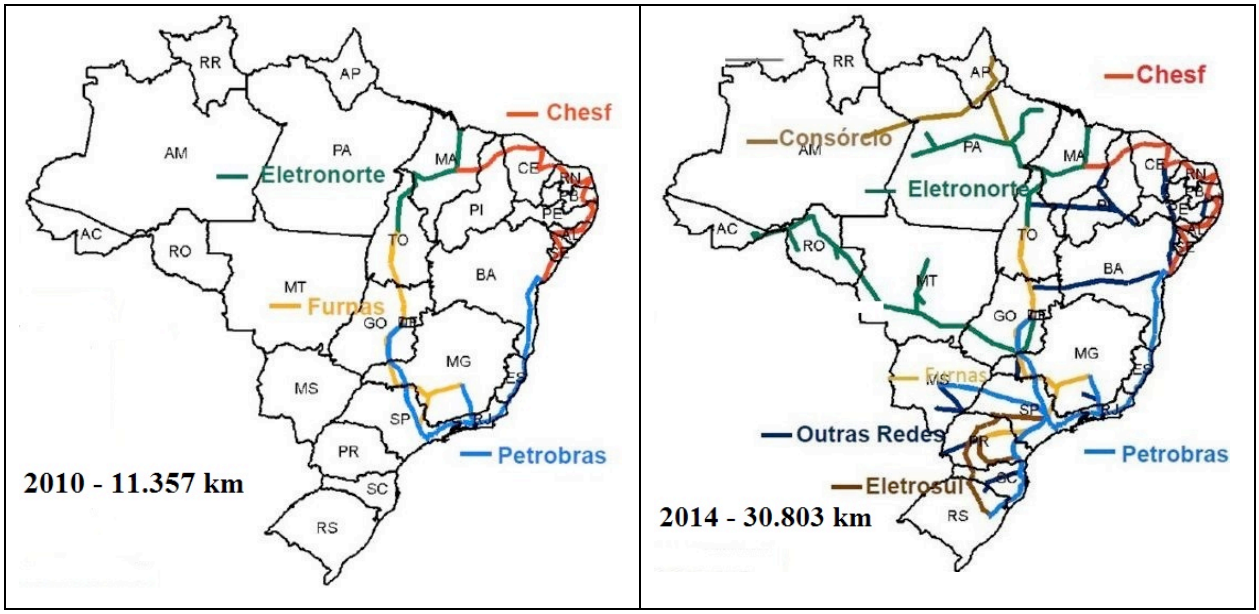
> First, there is the regulatory dimension under which the government intends to increase public investment in backhaul availability, open bidding for radio frequencies to provide wireless broadband with mandatory investment in R&D and for the use of equipment of domestic technology. There will probably also will be agreements among infrastructure providers to install telecommunications networks along their infrastructure routes (electrical network, highways, railroads, etc.).
>
> Second, there is a fiscal policy dimension, which will establish incentives for small service providers, tax relief for modems and special funding for LAN houses[38].
>
> Third, on the supply side, there is a production and technological policy dimension which is intended to reactivate and accelerate the development of the domestic ICT industry[39] through funding with special interest rates and tax relief.
>
> Fourth, there is the National Network dimension, where the government will build a federal network in the capitals of the States to serve the public sector and areas with low income. This action aims to reach 4,278 municipalities by 2014 (Brazil has more than 5,000) and to build a fibre optic network of 11,357 km by 2010 and 30,803 km by 2014[40] (cf. Figure 7).

[38] This is a small business similar to a cyber café.

[39] This is a very important measure since it stimulates the industry value chain. If industrial policy establishes a transparent decision about the technological trajectories to be adopted in the telecommunication network, the industry will have a stable environment to invest and, consequently, this will strengthen the ICT industry as a whole (telecom network + incumbents + manufacturers + ISP, etc). As pointed out by Dini et al. (2012:36): 'Investment decisions by the industry are determined largely by the available technologies; the policy objectives of the government relate broadly to capabilities'.

[40] The UK and the European Union have specific targets for the broadband expansion, focusing on ultra fast broadband. Dini et al. (2012:39/42) point out that the UK targets are: '100% fast broadband coverage by 2015, 90% superfast broadband coverage by 2015' and '[t]he best superfast broadband network in Europe by 2015. At the European Union the targets are: 100% basic broadband coverage by 2013, 100% coverage at 30 Mb/s (or more) by 2020 and 50% of households subscribing to Internet connections at 100 Mb/s (or more) by 2020'.

**Figure 7:** Evolution of the National Fibre Optic Network and Infrastructure Providers from 2010 to 2014




**Source:** Planalto, 2012

These three elements of industrial policy: The creation of the nationwide private telecom company (Oi), the reformulation of the Brazilian System of Competition Defence and the National Broadband Program (NBP), plus regulatory measures are basic steps towards the CIS, not yet towards the NIS. The government is still trying to build institutional arrangements that should have been put in place during the privatization process 15 years ago. Although most of these measures are corrective actions, they can still be implemented to target the NIS; i.e. state-led investment can still be made in fiber optics, provided this results in economies of scale and scope. This is because new convergent services and content will be available as soon as the NIS infrastructure is in place and the ultra fast broadband creates spillover effects that attract new investment. Even if internet speeds are sufficient to support existing online content and a higher speed will imply an extra cost to the government, it is still important to target the ultra fast broadband because all these investments can help to create an innovative environment.

Thus, investment in ultra fast broadband can result in positive externalities: high quality in the development of services, intense convergence, social and political integration, new knowledge creation, changes in product design and in the technology manufacturing process, intense competition in e-commerce and many other future services and content[41] in line with the continuing development of the paradigm. Therefore, even if the CIS has not provided internet everywhere in Brazil, it is important to begin to target the NIS by providing a basic

[41] Dini et al. (2012) point out bad effects that can intensify, as difficulty to control illegal copies, increasing risk to safeguard personal information, increasing harmful content and virtual exposure, flood of spam, health problems due excessive time spent in front the screen and so on.

downlink speed of up to 1 Mb/s. It is also important to establish ambitious targets to deploy ultra fast broadband.

## CONCLUSIONS

As argued above, after the regulatory changes in the 1980s and, subsequently, the fast diffusion of internet, important technical, economic and social changes started to take place. The technological changes were related to digital convergence on ultra broadband internet, known as the Next Generation Network (NGN), which demands a high level of investment to build fibre optic networks and WIMAX. The economic changes imply the offer of one subscription for a single ultra broadband connection for users and the use of advanced mobile handsets. The social changes have also involved regulatory changes. In the New Information Society (NIS), ultra broadband will support all kinds of content, ranging from education, to commercial content, entertainment, and even possibly harmful or criminal content (pornographic content, malware, etc.) from all geographic locations. Thus, the main issue is how to build a regulatory framework that considers these cultural and moral aspects and how to manage the high volume of investment that is needed.

Furthermore, the evolution of the media and communication industry towards the New Information Society (NIS) was divided into three paradigmatic periods. The first period comprises the regulation of the communications industry until the Second World War. The second period includes a political discussion about the significance of mass media for political and social life favouring democracy during the post-war reconstruction (1945–1980/90). The third period consists of changes in the revolutionary Current Information Society (CIS) due to the pervasiveness of the ICT and, consequently, to the technical feasibility of building the NIS. Therefore, technical, social, political and economic arrangements have been made favouring the emergence of the NIS based on an infrastructure of regulatory institutions from the CIS. These institutions, established in a technological environment of low complexity – where the main focus was on competition in the media and communication industry – are still on course, trying to regulate technical and economic changes according to the rules of competition in a regulated market.

In light of the important changes in the Third paradigm, this paper discussed various scenarios for competition in the broadcasting and telecommunications services. Due to convergence, the broadcasting market can become contestable, since every broadcaster and content producer can broadcast any content everywhere. The possibility of new entry in the market depends on the viability of a hit-and-run strategy and on the scale of returns in promising markets. The unbundling of network elements is undoubtedly the main factor to

achieve the NIS in the telecommunications market. In the UK, for example, an agreement between Ofcom and BT led to the unbundling of network elements in 2006 which was the first step towards the NIS.

With respect to the development of the Next Generation Network (NGN), this paper evaluated the evolution of the CIS in Brazil as compared to the Top 5 countries and in Russia, India and China (RIC), taking into account the ITU IDI and IPB indices. It was shown that although advances have been made in the Brazilian CIS, there is considerable room for improvement of regulatory policy. With its current CIS organization, the country will not catch up unless an exogenous effort is made by the State to complement the necessary investment by the private sector. According to data from ITU (2010), a structural break is necessary to change the position on IDI in BRICs. It is argued that these countries need to increase the volume of their investments in telecommunication infrastructure significantly, in addition to their investment since the early 90s. In Brazil, even after telecommunications privatization in 1998, the volume of investment remained the same as it was when the state-owned company was operating. This demystifies the idea that telecommunications has been improved due to the increasing volume of investment by private incumbent companies. Overall, not much has been done to change the CIS structurally in Brazil.

Recently, the Brazilian government launched three important measures aimed at the construction of the NGN: the nationwide Telecom Company (Oi), the reform of the Brazilian System of Competition Defense and the National Broadband Program (NBP). In addition, many regulatory measures have been taken to increase investment in the backhaul network since 2003. The first measure was the merger of two regional incumbent companies led by the government, taking industrial policy for national champions into account. This company, Oi, has been providing services on a regular basis in the country. As an instrument of industrial policy aimed at universal service, BNDES, a government bank for public investment, has been encouraging and financing Oi to encourage investment for the provision of broadband and landlines. This measure gives rise to market concentration, so the second measure was the strengthening of antitrust regulation through the Brazilian System of Competition Defense. Finally, the third measure was the establishment of the Brazilian wholesale market with the reactivation of the previous State-owned Company, Telebras which is expected to build and buy capacity from incumbent companies in order to sell it to new ISP entrants.

Ideally, Brazil should invest more than it has historically to achieve an improved level of development in the CIS. Although the country has not reached the full potential of the CIS, recent regulatory and industrial policies, implemented by the government, are consistent

with the foundations needed to catch up and build the NIS. State-led investment, mainly in fiber optic backbones, is an achievement that is leading Brazil towards the NGN, enabling the country to not only reach the CIS, but also to leapfrog to the NIS. If the CIS has not been completely achieved because of the inefficiency of previous institutional arrangements based mainly on market forces and global players, there are high hopes now for the country to achieve the NIS.

For this purpose, a huge volume of investment in infrastructure is expected as a result of the new institutional arrangements. For the first time after more than 30 years – a similar industrial policy on this scale was implemented long time ago, in the beginning of 1970s; the state has taken a pro-active position in terms of industrial policy and regulatory change. Thus, these measures to build the NIS represent the resumption of a national project of development. However, although such actions represent important promising and necessary measures, it is not certain that these high expectations will be met as the result of such policies cannot be evaluated yet. But it is important to emphasize that those possible changes, despite being very relevant since they can boost the information society, still do not mean a revolutionary modification in the institutional arrangements. The physical infrastructure is still in the hands of private telecom companies, which were bought during the privatization process in 1998 and the regulation framework can not be structurally changed by law on the subject of property of assets. The partial reformulation that allowed the creation of Oi was due to circumstantial events that occurred in the company Brazil Telecom, which led to the merger with Telemar. Despite being an important instrument for industrial policy now, Oi is still in the process of organization and is not really leading the investments towards the NIS. However, the pace of the planned investments by Oi and Telebras will be crucial in the future. Considering that the country has the 64th IDI in the world, a higher volume of investments should be made intensively (as it happens in Australia nowadays). Hence, Brazil would be able to move from being just the 6th biggest public investor in broadband in the world to a higher position as well (Table 6). The country has many geographical difficulties which mean diseconomy of scale, and consequently, demand intense State-led investments. This would be a real revolutionary change. Finally, an important step has been taken: a new political attitude from market-led investments to State-led investments has already started.

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## REFERENCES


ANATEL (2011) Panorama dos Serviços de TV por Assinatura ( 47.ª Edição ). Available at http://www.anatel.gov.br/Portal/verificaDocumentos/documentoVersionado.asp?numeroPublicacao=266956&documentoPath=266956.pdf&Pub=&URL=/Portal/verificaDocumentos/documento.asp/. [Last accessed on 11/10/2011]

Attuch, Leonardo (2012) Por tráz dos espiões. Magazine ISTO É DINHEIRO (online) Available at: http://www.istoedinheiro.com.br/noticias/7029_POR+TRAZ+DOS+ESPIOES. [Last accessed on 11/10/2011]

Benkler, Yochai (ed) (2010) Next Generation Connectivity: A review of broadband Internet transitions and policy from around the world. Final Report. Cambridge, MA: Berkman Center for Internet and Society at Harvard University.

BNDES (2009) BNDES aprova financiamento de R$ 4,4 bilhões ao Grupo Oi. Available at: http://www.bndes.gov.br/SiteBNDES/bndes/bndes_pt/Institucional/Sala_de_Imprensa/Noticias/2009/Telecomunicacoes/20091118_Grupo_OI.html. Access on 11/04/2012.

CGI (2010) Survey on the Use of Information and Communication Technologies in Brazil. BRAZILIAN INTERNET STEERING COMMITTEE (CGI.br). Available at: http://www.cgi.br. Access on 10/04/2012.

Coutinho, Luciano (2012) Teles, Opção a um Grande Equivoco, Folha de São de Paulo (daily newspaper) 07/06/1998. Available at: http://acervo.folha.com.br/fsp/1998/06/07/73/. [Last accessed on 11/10/2011].

Czernich, Nina (2011) The emergence of broadband internet and consequences for economic and social development. Volume 37 of *Beiträge zur Wirtschaftsforschung*. p. 111

Dini, Paolo, Milne, Claire and Milne, Robert (2012) Costs and Benefits of Superfast Broadband in the UK. London: LSE. Sponsored by Convergys Enterprise - Smart Revenue Solutions.

Dosi, Giovanni (1982) Technological paradigms and technological trajectories. A suggested interpretation of the determinants and directions of technical change. *Research Policy* 11(3): 147-162.

Forgan, Liz and Tambini, Damian (2001) Content Regulation: A New Settlement, 45-64 in Damian Tambini et al [Forgan, Liz; Verhulst, Stefaan and Hall,Clare] (eds) *Communications: Revolution and Reform*. London: IPPR.

Foster, Richard & Kiedrowski, Tom (2006). Overview. In: Richards, Ed; Foster, Robin & Kiedrowski, Tom (eds.) Communications: The Next Decade. A Collection of Essays prepared for Ofcom. Available at http://www.ofcom.org.uk/research/commsdecade/. [Last accessed on 11/10/2011]

Freeman, Christopher (1991) Innovation, changes of techno-economic paradigm and biological analagies in economics. *Revue Economique* 2(2): 211-32.

Ingenious Consulting Network (2010) Optimal investment in broadband: the trade-off between coverage and network capability. Report for Vodafone. http://www.commcham.com/TheTradeOffBetweenCoverageandNetworkCapability.pdf?attredirects=0 [Last accessed on 11/10/2011].

ITU (2010). World Telecommunication/ICT indicators database 2010. CD-ROM.

ITU (2011). Measuring the Information Society. Available at http://www.itu.int/net/pressoffice/backgrounders/general/pdf/5.pdf. [Last accessed on 11/10/2011]

Mansell, Robin. (2008) Technology and Communication, pp. 5011-23 in Wolfgang Donsbach (ed.) *The International Encyclopedia of Communication*. Malden, MA: Blackwell Publishing.

McChesney, Robert W. (2003) Thesis on media deregulation. *Media Culture & Society* 25(1): 125-133.

Noam, Eli M. (2006) Why TV regulation will become telecom regulation, pp. 67-72 in: Ed Richards, Robin Foster and Tom Kiedrowski (eds) *Communications: The Next Decade. A Collection of Essays prepared for Ofcom*. Available at http://www.ofcom.org.uk/research/commsdecade/. [Last accessed on 11/10/2011]

Noam, Eli M. (2010) Regulation 3.0 for Telecom 3.0. *Telecommunications Policy* 34(1-2): 4-10.

Ofcom (2012). http://stakeholders.ofcom.org.uk/market-data-research/market-data/communications-market-reports/cmr11/telecoms-networks/5.61. [Last accessed on 11/10/2011]

OFT (Office of Fair Trading - 2012) http://www.oft.gov.uk/about-the-oft/faqs#named1. [Last accessed on 11/10/2011]

Pavitt, Keith (1984). Sectoral patterns of technical change: towards a taxonomy and a theory. *Research Policy* 13(6): 343-73.

Planalto (2011). LEI Nº 12.529, DE 30 DE NOVEMBRO DE 2011. Available at: http://www.planalto.gov.br/ccivil_03/_Ato2011-2014/2011/Lei/L12529.htm. [Last accessed on 11/10/2011]

Planalto (2012). Programa Nacional de Banda Larga (PNBL) - Brasil Conectado. Available at: http://www4.planalto.gov.br/brasilconectado/pnbl. [Last accessed on 11/10/2011]

Puppis, Manuel (2010) Media Governance: A New Concept for the Analysis of Media Policy and Regulation. *Communication, Culture & Critique* 3(2): 134-49.

Reding, Viviane (2006) Foreword, in Ed Richards, Robin Foster and Tom Kiedrowski (eds) *Communications: The Next Decade. A Collection of Essays prepared for Ofcom*. Available at http://www.ofcom.org.uk/research/commsdecade/. [Last accessed on 11/10/2011]

Shima, Walter (1999) Regulação e Concorrência no Serviço de Telefonia Fixa Comutado do Brasil. PhD Thesis, 197 p. Ciências Econômicas, IE/UFRJ, Rio De Janeiro.

Steindl, Josef (1976) *Maturity and Stagnation in American Capitalism*. New York: Monthly Review Press.

Steinmueller, Edward W. (2001) ICTs and the possibilities for leapfrogging by developing countries. *International Labour Review* 140(2): 193-210.

Teleco (2012a) Market Share de Banda Larga no Brasil. Available at: http://www.teleco.com.br/blarga.asp/. [Last accessed on 11/10/2011]

Teleco (2012b) Telefonia Fixa: Regiões e Setores do PGO. Available at: http://www.teleco.com.br/pgo.asp/ [Last accessed on 11/10/2011]

Teleco (2012c) Seção: Telefonia Fixa (01/04/2012). Available at: http://www.teleco.com.br/Operadoras/oibrt.asp/. [Last accessed on 11/10/2011]

USDOJ (2012) The Herfindahl-Hirschman Index. Available at http://www.justice.gov/atr/public/testimony/hhi.htm/. [Last accessed on 11/10/2011]

Van Cuilenburg, Jan and Mcquail, Denis (2003) Media Policy Paradigm Shifts: Towards a New Communications Policy Paradigm, *European Journal of Communication* 18(2): 181-207.

Waverman, Leonard (2006) The challenges of a digital world and the need for a new regulatory paradigm, pp. 158-175 in Ed Richards, Robin Foster and Tom Kiedrowski (eds) *Communications: The Next Decade. A Collection of Essays prepared for Ofcom*. Available at http://www.ofcom.org.uk/research/commsdecade/. [Last accessed on 11/10/2011]

Webb, William. (2007) Steady as she goes. *Engineering and Technology* 2(1): 35.

**Appendix A:**

*The ICT Development Index (IDI)*

This index comprises the average weight of 3 groups (sub-indexes) of indicators (Cf. Table 7).

**Table 7:** ICT Development Index: Indicators And Weights [42]

| Sub-index | Indicators | Weights in the sub-index (%) | Weights in the IDI (%) |
|---|---|---|---|
| ICT access | 1.Fixed-telephone lines per 100 inhabitants | 20 | 40 |
| | 2.Mobile-cellular telephone subscriptions per 100 inhabitants | 20 | |
| | 3.International Internet bandwidth (bit/s) per Internet user | 20 | |
| | 4.Percentage of households with a computer | 20 | |
| | 5.Percentage of households with Internet access | 20 | |
| ICT use | 6.Percentage of individuals using the Internet | 33 | 40 |
| | 7Fixed (wired)-broadband Internet subscriptions per 100 inhabitants | 33 | |
| | 8.Active mobile-broadband subscriptions per 100 inhabitants | 33 | |
| ICT skills | 9.Adult literacy rate | 33 | 20 |
| | 10. Secondary gross enrolment ratio | 33 | |
| | 11.Tertiary gross enrolment ratio | 33 | |

Source: ITU, 2011

To be a full-fledged information society with the CIS standards, the maximum reference value in all indicators needs to be reached. The ideal IDI is 10. The indicators in the first group reflect the level of network infrastructure and access to ICTs. The second group reflects the level of use of ICTs by society. These two sub-indexes represent the hard side of the IDI. Such elements represent anything by themselves and it is important to consider the third group, which comprises the soft side of the IDI represented by capabilities or skills as an input indicator. For example, an imaginary society with a high level of ICT access and use (hard), but with a low level of ICT skill (soft) would be an underdeveloped information society, since it would not be capable of using and creating knowledge from previous knowledge. This society would probably have the general purpose machines but would not have specialized professionals to design and operate software. On the contrary, an imaginary society with a high amount of engineers (soft), but with a low level of infrastructure (hard), would be an unbalanced information society as well. The combination of these 3 sub-indexes reflects the effort and the capacity a society has in order to enter the information age.

[42] For operational details see Annex 1 in ITU (2011).

**Appendix B:**

*The ICT Price Basket (IPB)*

This index is also very important since it indicates the consumers' affordability to use ICT services in a country. The diffusion of the ICT will be faster or slower, depending on the income and the level of prices. To better understand the whole development of the information society in a country, the analysis of the IDI should be considered along with the IPB, which is an index composed by three sub-indexes – sub-baskets of tariffs – that derives from the sum of the price of each sub-basket, represented by percentage of the country's monthly GNI per capita, divided by three. The value of each sub-basket ranges from 0 (services are free) to 100 (telecommunications services cost all the users' income) and weighs the same in the IPB. An information society characterized by affordable prices will have an IPB equals to 0 while an information society whose prices are unaffordable will have an IPB equals to 100. The tariffs considered in each sub-basket and the methodology to calculate the IPB is in (Table 8).

**Table 8:** ICT Price Basket Methodology[43]

| **Sub-basket Fixed telephone** | | **Sub-basket Mobile cellular** | | **Sub-basket Fixed broadband Internet** | |
|---|---|---|---|---|---|
| Monthly subscription<br>+<br>30 local calls (15 peak and 15 off-peak calls) of three minutes each | | 30 outgoing calls (on-net, off-net and to a fixed line, and for peak, off-peak, and weekend periods) in predetermined ratios<br>+<br>100 SMS messages | | Monthly subscription for an entry-level broadband plan (based on 1 Gigabyte of download volume) | |
| ---------- | + | ---------- | + | ---------- | |
| National average monthly GNI per capita | | National average monthly GNI per capita | | National average monthly GNI per capita | |
| 3 | | | | | **= IPB** |

**Source:** ITU, 2011

[43] For operational details see Annex 2 in ITU (2011)

**Appendix C**

**Table 9 -** Market Share and Herfindahl-Hirschman Index (Hhi) in the UK Broadband Market - 2011

| Companies | Market share | HH |
|---|---|---|
| BT | 29,20 | 852,64 |
| Virgin Media | 20,20 | 408,04 |
| Talk Talk | 18,50 | 342,25 |
| Sky | 17,90 | 320,41 |
| Others | 14,20 | 201,64 |
| **Total** | **100,00** | **2.124,98** |

**Source:** Ofcom, 2012. Available at: http://media.ofcom.org.uk/facts/. (Last accessed on 10/12/12)

**Table 10 -** Market Share and Herfindahl-Hirschman Index (Hhi) in the US Broadband Market - 2011

| Companies | Subscribers | Market share | HH |
|---|---|---|---|
| Comcast | 17.811.000 | 40,79 | 1.663,81 |
| Time Warner | 10.167.000 | 23,28 | 542,14 |
| Cox | 4.465.000 | 10,23 | 104,56 |
| Charter | 3.580.100 | 8,20 | 67,22 |
| Cablevision | 2.949.000 | 6,75 | 45,61 |
| Suddenlink | 937.200 | 2,15 | 4,61 |
| Mediacom | 850.000 | 1,95 | 3,79 |
| Insight | 543.800 | 1,25 | 1,55 |
| cable ONE | 448.143 | 1,03 | 1,05 |
| Others | 1.914.000 | 4,38 | 19,21 |
| **Total** | **43.665.243** | **100,00** | **2.453,57** |

**Source:** The companies and Leichtman REserarch Group, Inc. Available at: http://gigaom.com/2011/12/01/thanks-to-cable-firms-the-u-s-adds-635000-new-broadband-subs/broadbandsubscribersq32011/. (Last accessed on 10/12/12)

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