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DESIGNING NEXT GENERATION TELECOM REGULATION: ICT CONVERGENCE OR MULTISECTOR UTILITY?*

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The **World Dialogue on Regulation for Network Economies (WDR)** facilitates an international dialogue to generate and disseminate new knowledge on frontier issues in regulation and governance to support the development of network economies. The Dialogue Theme for 2002 is: *The Next Step in Telecom Reform: ICT Convergence Regulation or Multisector Utility Regulation?* WDR research teams have produced a series of discussion papers and reports on the theme to support the ongoing dialogue.**This is the final paper in the series**.

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1. Infrastructure for 21st Century Network Economies

Continuously expanding applications of information and communication technologies (ICT) are transforming local, national, regional and international economies throughout the world. Just as electricity, the telephone, railroad and automobile each provided a major stimulus to economic growth and a significant restructuring of economies and societies during the 20th century, so the ICT revolution is in the process of creating another "paradigm shift" for 21st century economies and societies[1]. This has been recognized in recent years at the highest levels of national, regional and international government in a variety of "Information Society" policy statements and reports, culminating in the adoption of the *Charter on Global Information Society* at the Year 2000 G8 Summit in Kyushu – Okinawa[2].

Although the information society perspectives, objectives and characteristics that are outlined in these policy statements and reports vary considerably, they are all based upon a common premise – that the extensive use of advanced telecommunication (telecom) networks for the communication of vast amounts of information will enable significant improvements in economic productivity, and provide a wave of opportunities for economic, social and individual growth. These advanced telecom networks will become the *information infrastructures* for a cornucopia of new services - sometimes called next generation Internet services – that will transform economic and social relations and activities. The foundation of information societies will be their information infrastructures, the transformed and upgraded telecom networks[3].

1.1 Participation and Opportunity

The point of entry to participation in information societies is the communication networks that provide both access to services and information, and opportunities for participation. The productivity improvements and benefits that are actually realized by people, organizations and countries will depend upon how effectively these networks can be used. Therefore, as a descriptor of the new economies we have selected the term "network economies". It is the network characteristics of economic activity that will be changing quite dramatically, and it is the capability for exploiting the potential benefits of these new networks that will drive economic growth and productivity improvements. The networks determine the boundaries of participation and opportunity.

The relationships described here are illustrated in Figure 1. The telecom infrastructure provides the foundation resource that is being transformed into a broadband information infrastructure capable of supporting next generation Internet services. It is expected that these services will be applied widely across most institutions in society, bringing about the paradigm shift to network economies and information societies. Those countries with a modern telecom infrastructure providing a universal service have a much stronger foundation on which to build than do poor countries with very limited telecom networks. But they all have many formidable challenges to confront.

[1] Freeman, C. and F. Louca (2001) As Time Goes by: From the Industrial Revolutions to the Information Revolution, Oxford. Oxford University Press.
[2] Digital Opportunities for All: Meeting the Challenge, Report of The Digital Opportunity Task Force, G8 Meeting of Foreign Ministers and G7/G8 Summit Geneva, and 20-22 July 2001.
[3] Melody, W.H. (Ed.). (1997). Telecom Reform: Principles, Policies and Regulatory Practices. Lyngby: Technical University of Denmark. Chapter 32.

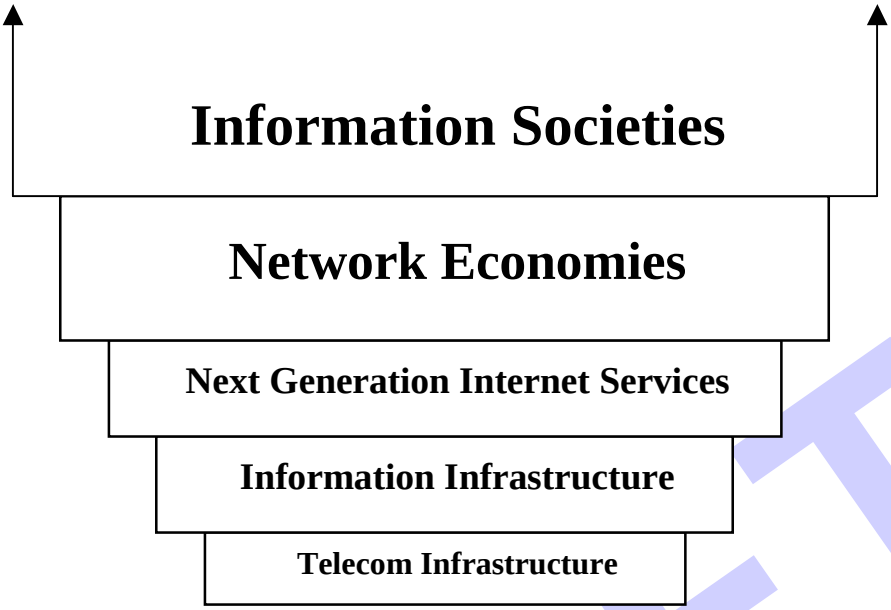


Figure 1: The Building of Information Societies

1.2 Slow Development

In its early stages, the pace of information infrastructure development has been unacceptably slow, at least with reference to the expectations of many analysts, policymakers and potential users. In the home of the Internet, the US, The Communications Act of 1996, and its key implementing agencies - the Federal Communications Commission (FCC) and state regulatory agencies - have not provided as strong a stimulus to information infrastructure development by the telecom industry as anticipated. In Europe, the long awaited European Union (EU) "Telecommunications Package" of new Directives is widely seen as catching up to the present rather than preparing the ground for the future[4].

In developing countries more than two-thirds of the people have never made a telephone call and have no access to a phone, let alone a PC. During the last decade, more than 100 countries have restructured their telecom institutions, providing for market-based development, the licensing of additional operators and the establishment of sector specific regulators to drive network development. This has provided explosive growth in basic mobile services in a number of countries, but only very limited improvements in fixed network capabilities. In most countries new regulator agencies have had difficulty establishing and maintaining transparent and independent processes during the early stages of telecom reform; and about half the developing countries in the world have not yet implemented telecom reform.

For most developing countries, the task of rolling out a national telecom network where there was none before is daunting. But the Internet, and next generation Internet services, help make a business case for greater network rollout on a financially sustainable basis, although by no means approaching general standards of universal service. The potential for next

[4] A Framework for 21st Century Communication. The Parliament Magazine. 19 November 2001.

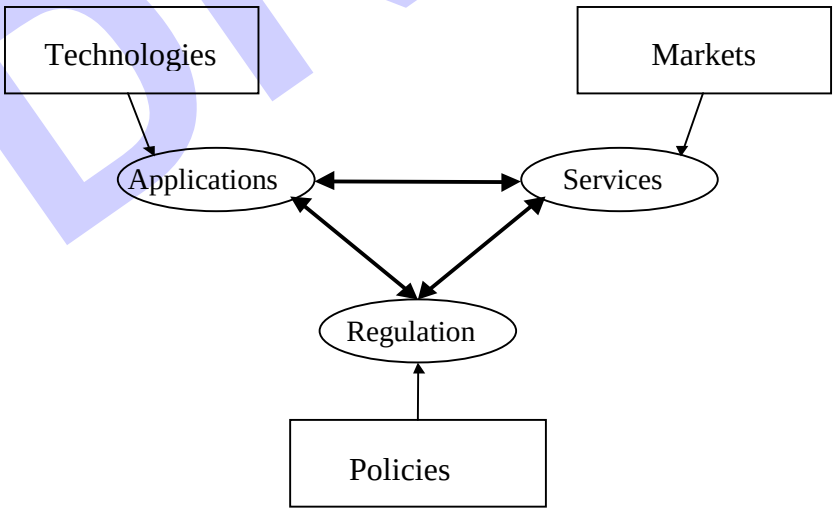
generation Internet services makes all telecom networks more valuable. The challenge for developing countries is finding ways to leverage the potential of next generation Internet services to stimulate the roll out of national networks that will meet both basic communication and advanced Internet services needs.

It is apparent that national telecom policy and regulation - both the regulations and the regulators - will play a major role in implementing structural reforms. The distinctive network and public interest characteristics of the information infrastructure will require a continuing proactive role for regulation if network development objectives are to be met, and the foundations prepared for the next generation Internet services that will support new network economies[5]. What is unclear at the moment is how direct regulation by independent regulators can best facilitate the achievement of these objectives. Should industry specific telecom regulators be redesigned as convergence regulators so they can more comprehensively and systematically address the full range of next generation Internet issues? Or should they be redesigned as multisector utility regulators so they can leverage synergies across infrastructures to promote the most rapid information infrastructure network rollout. The best solution may vary from country to country. What seems very clear, however, is that it is highly unlikely that industry specific telecom regulation will be able to do the job.

2. The Dynamics of Technologies, Markets and Regulation: Synergy or Blockage?

The development path of any industry or economic sector is significantly affected by the opportunities provided by, 1) the available technologies; 2) the particular characteristics of its markets; and 3) the directions and priorities of related government policies and regulations. These factors can be mutually supportive in stimulating growth and creating benefits, or they can conflict with one another, creating major blockages to development. Potential opportunities for development in the sector will unfold along a trajectory arising from the interrelations among technologies, markets and policies. This is illustrated in Figure 2.

Figure 2: Criteria for Economic Growth



However, the existence of development opportunities does not guarantee the delivery of benefits in the real economy. Technological opportunities must be productively applied; market opportunities must be converted into desired services; government policies must be

[5] Melody, W.H. (1999) .Telecom reform: progress and prospects. Telecommunications Policy, 23.1.

implemented through effective regulation. The development path of the real economy is governed by the interactions among these *implementation* factors, also shown in Figure 2.

In a dynamic environment, it is often technological change that leads the way by creating new opportunities, which are then exploited in the marketplace, before policy and regulation are adapted to the new circumstances. But not always. It can be observed that the most successful countries implementing telecom reforms over the past decade have been characterized by proactive regulatory agencies driving the process of adjustment to new technological and market opportunities. This is especially true in developing countries, where telecom reform has been highly dependent on the effectiveness of the new regulators. Regulation can be a catalyst for development or a constraint upon it. Information infrastructure development requires that regulation be designed as a highly productive resource – a creator of synergy and a catalyst for growth.

2.1 Moving Beyond Industry Specific Telecom Regulation

Today there are many policy visions of information societies on the horizon. They are founded on opportunities now coming into sharper focus in the form of network economies, where next generation Internet services will be provided over ubiquitous broadband information infrastructures. The technologies are improving rapidly, and markets and industries are in a continuing process of realignment as reflected in the many mergers, joint ventures and strategic alliances taking place. But the policy and regulatory frameworks until recently have remained focused on, and constrained to the inherited boundaries of the telecom industry. Policy and regulation is lagging behind technology and markets in adapting effectively to the changing environment.

As regulation is presently structured in most countries, industry specific telecom regulators cannot come to grips with the challenges of fostering a rapid and efficient rollout of information infrastructures, and building the regulatory platforms needed to promote electronic trade, network and information security, consumer protection, and other requirements for widespread take-up of next generation services. It is time to examine more closely the design of next generation regulation that is capable of building the regulatory foundations for growth in network economies. This is an important matter for all countries. They will all be part of the global information infrastructure network, so there will need to be a high degree of international compatibility across many of the network regulations.

2.2 ICT Convergence Regulation

One direction for next generation regulation gives priority to ICT convergence issues. Regulation must focus on the ICT sector and the issues associated with converging technologies, the digitalization of all forms of content, electronic trading and other core next generation Internet services.

Yet, it is noteworthy that telecom reform so far has been driven more by the unbundling and separation of network activities than by converging activities. During the national monopoly era, there was a high degree of convergence of activities. More recently, telecom has been separated from post; telecom services have been unbundled from facilities; IT hardware has been unbundled from software; broadcast television, cable, satellite, mobile and Internet services have all developed as independent networks or relatively independent components of the larger telecom network, for the most part outside the control of incumbent telecom operators.

Does technological convergence that allows the transmission of all forms of content in digital bit streams change this trend toward unbundling and wider participation of more diversified

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players from different industries? Does convergence point the industry in the direction of more integrated networks and services, major mergers and acquisitions, barriers to entry and monopoly power? Does it require that the more politically sensitive media content regulation somehow be integrated with telecom regulation, which historically has had quite different objectives? And if it is, will national regulation become more or less effective? What are the implications for policy development and the effectiveness of regulation? What is clear now is that industry specific telecom regulators generally do not have a mandate broad enough to enable them even to examine such questions effectively. So far, only a few countries have begun to respond to the policy and regulatory challenge of convergence.

2.3 Multisector Utility Regulation

A quite different direction influencing policy options and the design of next generation regulation gives priority to multisector utility developments, which unexpectedly have become a major part of the first stage of telecom reform in many countries. Most facilities-based network competition in the telecom industry has involved – indeed required – major co-operation with other utility sectors, resulting in many joint ventures, mergers, and a significant trend toward multisector utilities.

Would the establishment of multisector utility regulation provide both more efficient and effective regulation across the different utilities, and a more direct and immediate stimulus to investment not only in information infrastructure network rollout, but also network development in other infrastructure sectors as well? But is this not also a step in the direction of sanctioning, if not promoting excessive monopoly power, in this case by providing implicit policy and regulatory support for mergers among dominant incumbent operators in different utility sectors? Yet, is there not clear evidence of economies in addressing the many regulatory issues that are common to all utility sectors?

2.4 Designing Telecom Regulation

This paper critically examines the multiple rationales for information and communication technology (ICT) and media convergence regulation and multisector utility regulation and the practical questions of implementation that they pose with a view to contributing to informed policy choices. Both options involve substantive as well as procedural issues, not necessarily separable. Policy design is affected by overall policy objectives, not necessarily limited to extant and accepted objectives such as increasing investment in a particular infrastructure sector. The design may be driven by explicit objectives such as enhancing a country's comparative advantage with regard to advanced service industries, or implicit objectives such as minimizing the political or perceptual fallout of a change in regulatory regime or personnel. This paper examines the conditions that may affect the creation of convergence and multisector regulation, ranging from underlying commonality of inputs and the behaviour of regulated firms to considerations that are specific to the regulatory process such as scarcity of regulatory resources and safeguards for regulatory independence.

3. Definitions of Industry, Sector and Multisector

An industry is defined in terms of substitution possibilities in consumption.[6] Conceptually, complete substitutability would be the test of an industry. In reality, a high degree of substitutability defines an industry. For purposes of regulation, it is more common to define the scope of regulatory agencies in terms of 'sectors', rather than single industries. A sector is

[6] For discussion of industry (or market) definitions, including the principles developed in US anti-trust case law, see Scherer, F. M. and Ross, David (1990). *Industrial market structure and economic performance*, 3rd edition (Boston: Houghton Mifflin), pp. 73-79.

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a set of closely related industries, which have a degree of substitution possibilities or substantial economies of scope on the supply or demand sides. The higher the substitution possibilities, the more likely is it that the term "industry" will be used over "sector".

As consumption or production conditions change, the definitions of industries and sectors will change. For many decades, the telecom industry was seen as distinct from both the data communication industry and the broadcast industry because there were few substitution possibilities. Improvements in packet switching have increased substitutability for circuit switching on the production side. Substitution of IP based services for conventional voice telephony is becoming more feasible on the consumption side.[7] This has led to the classic telecom industry and the data communication industry being seen as converging into one industry. In regulatory terms, this is not as much of a watershed as claimed because the two industries have for a long time been seen as part of the same sector, evidenced for example by the Computer Inquiries initiated by the US Federal Communications Commission more than 30 years ago.[8]

In Canada and the United States, the broadcast and telecom industries have for a long time been regulated by the same federal agencies, albeit by distinct divisions. The United Kingdom is among the most prominent of developed countries considering establishing a convergence regulatory agency that would subsume the current Office of Telecommunications (OFTEL) and four other agencies including the Radio Authority and ITC. Bolivia, Brazil, Burundi, Guatemala, Honduras, India, Jordan, Kyrgyzstan, Nigeria, Tanzania, Venezuela and Zambia are among the developing countries said to have convergence regulatory agencies or to be seriously considering them.[9]

Recent technological changes have affected the substitutability of cable services, which may be considered a segment of the broadcasting industry, on the production side. This makes a stronger case for industry-level convergence among telecom, data communication and cable industries.[10]

In the same way that telecom, data communications and cable may be seen as constituting a sector because of the degrees of substitutability and economies of scope that exist, other sectors such as energy (gas and electricity) and transport (combining different modes) may be identified. By definition, therefore, multisector regulation must involve industries/sectors that do not have significant substitutability or substantial complementarity.

4. The Convergence Perspective: ICT and Media Convergence/Divergence

The broad range of industries involved in ICT and media convergence are IT, telecom, broadcasting and other media dealing with information and entertainment. Figure 2 illustrates the industries involved and the levels of activities from equipment/hardware and transport/software to content/service provision. Each of the different industries can be conceived as encompassing all three levels although they are not entirely comparable.

[7] International Telecommunication Union (2001). Secretary General's report to 2001 World Telecom Policy Forum: IP Telephony. At: http://www.itu.int/osg/spu/wtpf/wtpf2001/sgreport/

[8] Federal Communications Commission (1970). Regulatory and Policy Problems Presented by the Interdependence of Computer and Communication Service Facilities: Notice of Proposed Rulemaking and Tentative Decision, 28 F.C.C.2d 291; FCC (1971). Computer I final decision 28 FCC 2d 267.

[9] International Telecommunication Union Bureau of Telecom Development (ITU-D) survey, 2001. At: http://www7.itu.int/treg/profiles2/cntryprfiles/guide.asp

[10] For a strong assertion of telecom-broadcast convergence, see OECD Committee on Competition Law and Policy (1999). *Regulation and competition issues in broadcasting in the light of convergence*, DAFFE/CLP 99/1. Paris: OECD. At: http://www.oecd.org//daf/clp/roundtables/comp-broad.pdf

However, Figure 3 illustrates that there are many possibilities for convergence at a horizontal level between different industries as well as vertical integration between different levels. It also illustrates that divergence and disintegration are possible. Industries that formerly have witnessed (some degree of) vertical integration may experience new lines of divisions of labor between different actors in the field. Convergence / integration and divergences / disintegration go hand in hand.

Figure 3: Convergence/integration and divergence/disintegration

	IT	Telecom	Broadcasting	Other media
Content/ services	Software based content	Telecom based services and content	Broadcast programs	Film, music, newspapers, etc.
Transport/ software	Software	Network services	Transmission	Cinemas, video rentals, etc.
Equipment/ hardware	IT hardware	Telecom equipment	Broadcast equipment	Reproduction of films, printing, etc.

4.1 Technology Neutrality

There is thus both a horizontal and vertical aspect, and both aspects are subject to discussion in the paper. The horizontal level has hitherto been primarily concerned with convergence at the equipment / hardware and transport / software levels (in communications called infrastructure and associated services, in the terminology of the European Union[11]). Often countries have dealt differently - in terms of, for instance, licensing procedures and interconnection rules - with fixed telecom networks, mobile networks, and cable and terrestrial broadcast networks. At present, there is, however, a general shift in the rules and procedures in many countries towards an equal treatment (convergence) of different information and communication infrastructures. The EU is a case in point with its emphasis on technology neutral regulation.[12]

4.2 Content Issues

The horizontal level also includes the possible implications of convergence at the content layer. Types of content that, formerly, were dedicated for specific industries can be conveyed on different infrastructures because of the common digital form. This presents new possibilities for end users and new market potentials for producers, but it also presents regulatory problems that have to be solved. One of the problems is related to the provisions for public service in the broadcast area. Should such provisions be extended to the Internet web, or should convergence on the content level lead to an abolition of public service rules? Another issue relates to the extended access to different kinds of illegal or harmful information, for instance racist propaganda, which the Internet facilitates. What are the possibilities of countries to retain control of this? Yet another problem is related to the provisions for media responsibility that exist today for print and broadcast media but do not apply to Internet.

[11] See, for instance, European Commission (1999). *The 1999 Communications Review*. COM (1999) 539. Brussels.
[12] European Commission (1999). *The 1999 Communications Review*. COM(1999)539. Brussels.

4.3 Infrastructure and Content Together?

There is also a vertical aspect – not only in the sense that there are numerous examples of industries integrating or trying to integrate equipment and transport and content provision, but also in the sense that some countries integrate infrastructure regulation and content regulation. India is an example of this. The new Communications Commission of India (CCI), the Indian communications regulator, will integrate infrastructure and content regulation in one institution[13]. The UK is another example, in which the government is uniting five existing regulatory bodies dealing with communications into one regulator, OFCOM, with authority in both infrastructural and content questions[14]. Singapore and Malaysia are also examples of countries that have assembled the regulation of infrastructure and content. The InfoComm Development Authority of Singapore left the regulation of all forms of content to the Singapore Broadcast but it is envisaged that this too will be merged shortly.[15]

In the case of horizontal convergence, it is a matter of converging regulation and possibly converging regulators. In the case of vertical integration, it is mostly a matter of integrated regulators, as infrastructure and content regulation are two rather different fields, although integration of content and infrastructure provision may have implications not only for the industrial structure but also for the content itself. The EU, for instance, draws a sharp line between infrastructure (and associated services) and content. It is, however, a question whether this is possible without leaving aside important issues.

4.4 Is Convergence Something New?

Often convergence is described as something relatively new. But industrial convergence and regulatory dealings with convergence issues have existed for many years[16]. In many countries, there has been a deliberate policy to keep different communication fields apart for the reason of limiting media concentration. Formerly, companies have also had the intention of covering several media fields, and the question of benefits of complementarities between different media areas versus the problems of excessive media power is not new. What is relatively new is the technological foundation that digitalization of all media provides for convergence developments and complementarities between media area. What is also relatively new is the general trend towards liberal policies that has been seen during the past 20 years. Together, these developments constitute a new basis for the development of convergence and for the balancing of the benefits of complementarities versus the problems of media concentration and power.

The trend towards liberalization of telecoms is in part an expression of a convergence policy. The introduction of data communications on telecoms networks was an important technological basis for the regulatory changes in telecom and the motivation of the industrial interests that lobbied for the initial moves in this direction. Companies, first in the US and later elsewhere, argued for changes in the regulatory structure, as they wanted a greater liberty to use the telecom networks for data communications. The newer questions that are put forward today under the heading of convergence first and foremost deal with the development of Internet into a powerful communication infrastructure and the possibilities for integrating

[13] *The Communication Convergence Bill, 2001*. At: http://indiantelevision.com/indianbroadcast/legalreso/ccb2k1.htm.
[14] See Department of Trade and Industry: *A New Future for Communications, 2001*, http://www.communicationswhitepaper.gov.uk
[15] Effective regulation case study: Singapore, at www.itu.int/itu-d/treg; see also presentation by Leong Keng Thai 2nd Global Symposium for Regulators. Geneva, 2-4 November 2001, at http://www.itu.int/ITU-D/treg/Events/Seminar/GSR/WebDocuments/Leong_SGP_Casestudy.pdf
[16] This has been discussed by, for instance, in Winseck, D. (1998). *Re-convergence: A Political Economy of Telecommunications in Canada*. Hampton Press.

interactive one-to-one telecom and one-way one-to-many broadcast and print media, in addition to novel information retrieval capabilities.

4.5 The Main Issue

Convergence involves technological, market and policy/regulation dimensions.

The main issue in the convergence discussion is, therefore, concerned with the possibilities for exploiting the industrial opportunities in creating a new dynamic ICT sector encompassing hitherto separate sectors.[17] Apart from the broad diffusion and use of the new media and communication (universal access) and the protection of consumers in new media markets, this is the overall issue for convergence policy: to establish a framework for the growth of a dynamic communication and information industry. It is in this perspective that most convergence policies are seen. Regulatory policies with respect to telecoms and broadcasting have, of course, always had an influence on business developments. But with the growing importance of the ICT sector and the even greater importance in relation to other industries and social developments, regulation of converging communication and information industries assumes central importance in the economic development strategies of governments. A skeptical view, of significant import especially in countries with poor governance, holds that the absence or minimal enforcement of regulation is what caused the efflorescence of IT, and that one must be wary of increased intervention, especially by incompetent, if not rapacious, governments.

5. Convergence Technology Trends

This section provides a summary overview, or layman's guide to the major technological aspects of the ICT and media convergence processes. The focus is on the role of technological changes and developments in the creation of new conditions for production, aggregation, delivery and consumption of communication services.

The major technological changes that have facilitated the convergence processes are digitalization and computerization. Digitalization enables new possibilities for development and creation of services within and beyond the framework of traditional communication sectors. It is, for example, likely that services that go beyond the traditional broadcasting services, like Internet services, will have a certain weight on the broadcasting market in the future, as demand for these services is increasing with the penetration of the Internet. When transmission capacity for end-user sites reaches that needed for transmission of video services, the Internet can be one of the platforms for interactive TV services.

Emerging new infrastructures with more capacity, developments in the traditional networks enabling them to offer more capacity to end users, and developments in compression and coding technologies resulting in less bandwidth requirements for audio and video services all have diminished the technically based limitations for different networks to provide an increasing variety of different types of services. But there is still a long way to go before network capacity constraints are substantially eliminated.

The following analysis is structured around the value chain of communication networks depicted in Figure 4, so that different subsections deal with the technological aspects of convergence in different parts of the value chain.

[17] See e.g. the UK case, op.cit.

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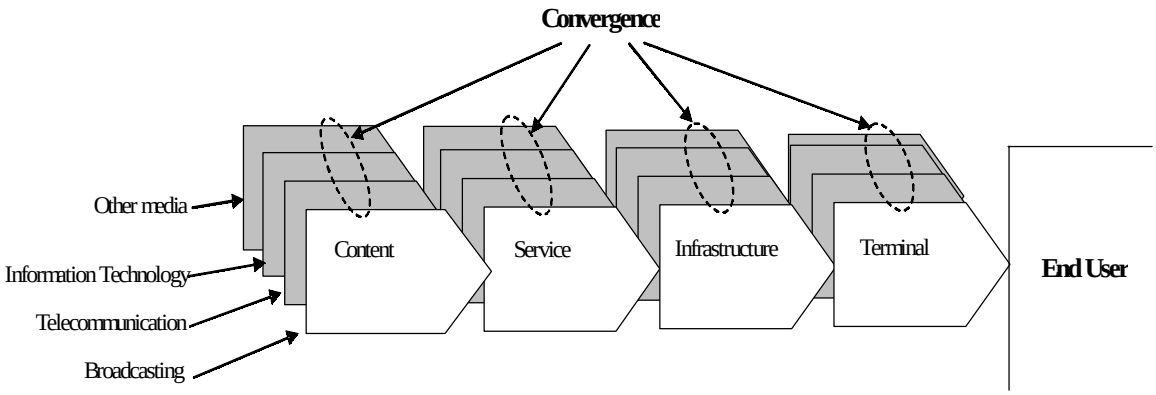

Figure 4 : Convergence in the value chain

The analysis aims at illustrating the technological drivers, but also barriers, for the convergence processes in different parts of the value chain.

5.1 Infrastructure

Traditionally, different infrastructures have been used to transmit and deliver specific information and communication services. Examples regularly mentioned in the literature include: dedicated telephony infrastructures for transmission of Plain Old Telephony Services (POTS) and broadcasting networks for casting Plain Old TV Services (POTVS). These infrastructures have been dimensioned and optimized to meet the specific requirements of their respective services.

The technology of information and communication services has, however, been subject to radical changes during the last 20-30 years. Technological developments have resulted in the emergence of new infrastructures and better integration of services across infrastructures mainly due to digitalization.

Integration and convergence occur at different speeds in different levels of the network. Core networks have other characteristics than access networks resulting in different conditions for their levels of convergence. The focus of the following is on the access networks.

Apart from digitalization, there are other important factors that impact on the convergence processes:

- Network architecture
- Capacity requirements of the services
- Quality of Service (QoS) requirement of the services
- Way of use requirements of the services

5.1.1 Network architecture

We can roughly distinguish between two types of networks: telecom networks and broadcast networks. Traditionally, broadcast networks do not have the return path necessary for interactive services. Digital broadcast networks, however, have a return path, either integrated in the network or using other networks.

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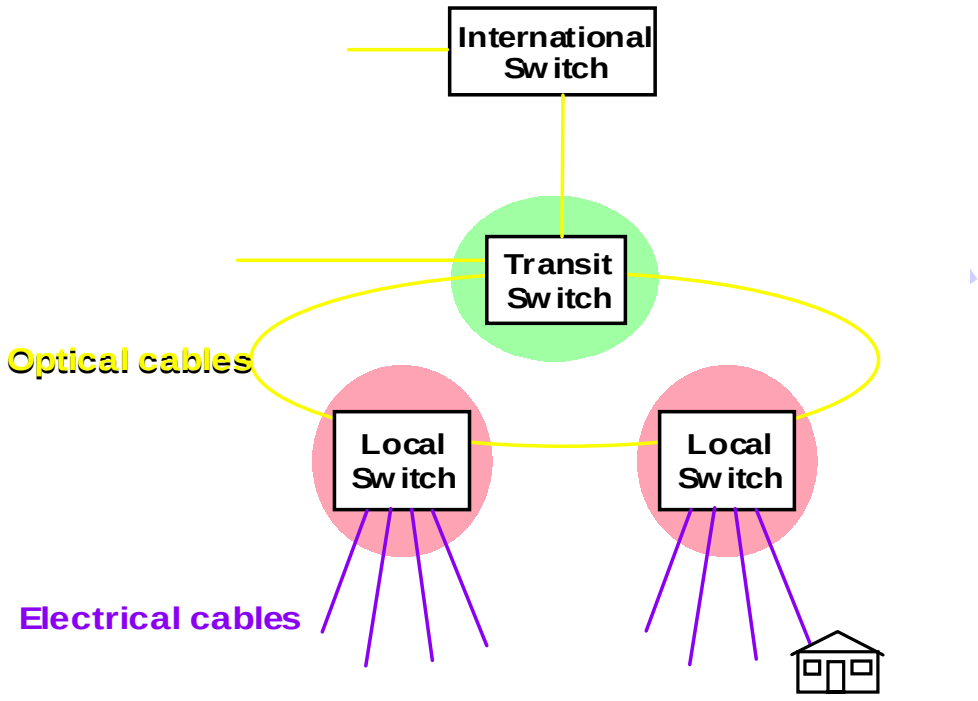
Traditionally, telecom networks are built to provide point-to-point services resulting in network architectures where the network resources between the user and the first switch in the networks are not shared (see e.g. Figure 5). This enables the service providers to offer customized services to individual users. However, the cost of operation and maintenance of these networks is high and the increase of capacity at end user site is developing slowly, making it impossible in the short term to integrate all kinds of services. In the long term, the development in audio / video compression technology and new access technologies will make it possible to offer new services in these networks.

Figure 5: Switched network, POTS network is depicted as an example for a switched network



In broadcast networks (see Figure 6 [18]), users are connected to distribution points in the network and share the network resources. The capacity allocated to a broadcast service is dimensioned to give a good technical quality of the service; however, the Capacity per User (CpU) is very low. These types of networks are not optimized for point-to-point services but are well-suited for services with common interest.

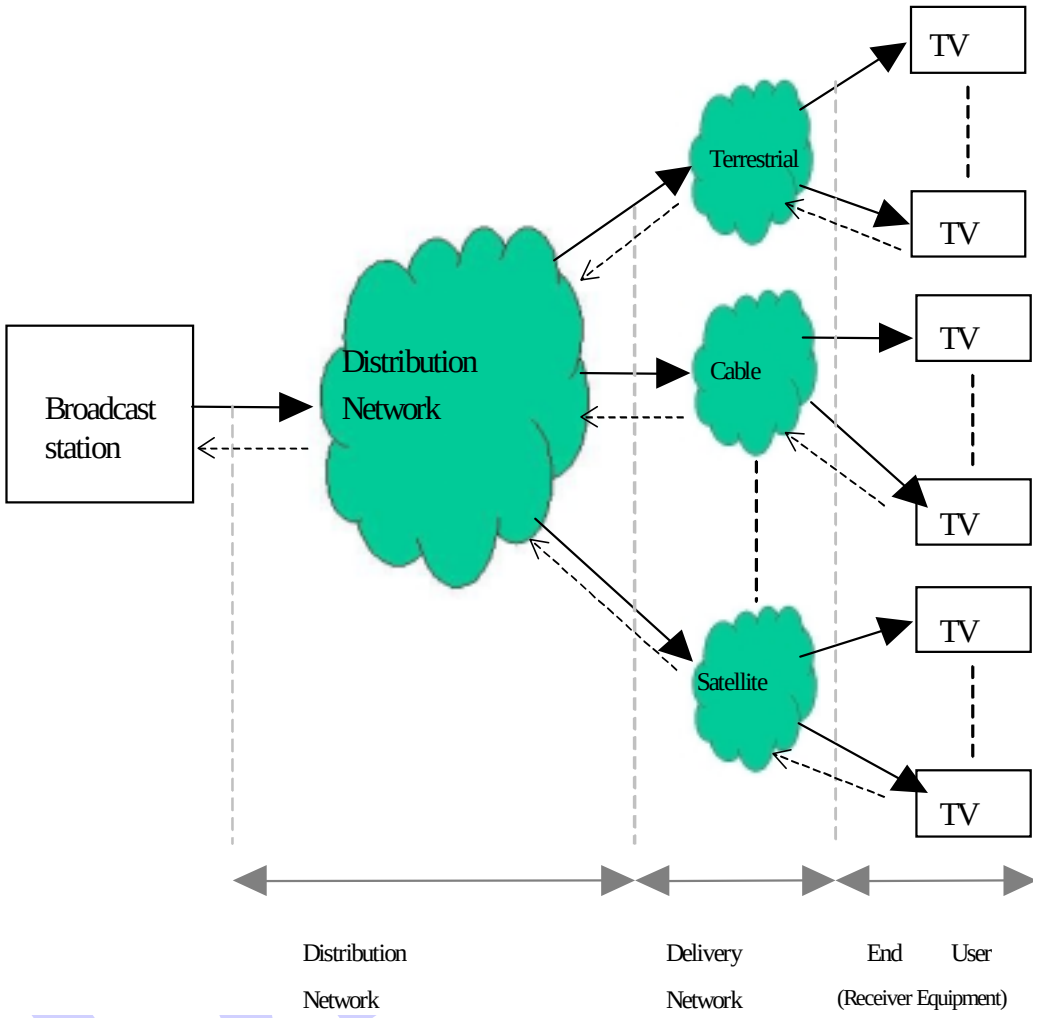
Transmission of broadcast services over switched / routed networks is not necessarily an efficient way of utilizing network resources. Especially when 'broadcast service' denotes a service that is transmitted to many users and these 'many users' demand the service. All switches and routers in the network will then do a simple job of connecting the same input to many outputs, which is an in-efficient way of using a switched / routed networks.

To a certain degree, this is in line with the experiments in the UK in the early 1980s, where the cable companies implemented switched cable networks. The cable companies observed that the vast majority of users watched the same kinds of programs for most of the time,

[18] The dashed arrows in the figure indicate the possibility for interactivity in digital broadcasting

reducing the function of the expensive switches to a wire connecting these inputs to all outputs.

Figure 6 : Broadcast network



A precondition for Internet TV (TV over the Internet) being comparable to traditional (digital) TV is an exponential increase in transmission capacity to end user sites. By using a simple assumption that two or three services must be available for a household (different family members must have the opportunity to watch different programs, at the same time, and be able to record a program on VCR), the necessary capacity will be about 40-60 Mbit/s in the case of HDTV and 8-12 Mbit/s in the case of SDTV.

For some time to come, the broadcasting networks with their one-to-many structure will be the most optimal way of transmitting broadcasting services to the vast majority of end users. However, when capacity is sufficient to provide broadcasting services over the Internet other parameters like the way services are used can limit the provision of broadcasting over Internet. If a service is used by the majority of people, it is a waste of resources to provide it through a switched / routed network, as it can easily be broadcast to all people using broadcast networks.

A scenario might be that web TV (web on broadcast TV) co-evolves with digital TV and exists as a complementary and competitive platform to other delivery networks. As a complementary platform, special types of services that will not to be provided on other

platforms can be provided on the Internet. And as competitive platform, services like special narrow types of services provided on cable and satellite delivery networks can be provided on the Internet and compete with these infrastructures.

5.1.2 Capacity / bandwidth

The capacity or bandwidth of different networks varies considerably. To provide convergence services, different networks must be able to transmit "the same kinds of services". Video services have the most demanding capacity requirements and are one of the major components in all 'convergence services'. In the following we examine the capacity requirements of video services.

A bandwidth of 4 Mbit/s corresponds to regular PAL quality in the analogue world and is denoted as Standard Definition TV (SDTV). It is quite certain that traditional broadcasters will not accept a quality less than SDTV.

Looking at the current capacity available at the end-users' site (regular modem up to 56 Kbit/s, ISDN up to 128 Kbit/s, and even available DSL technologies of up to 512 Kbit/s), it is obvious that allocation of 4 Mbit/s for a TV service is not currently possible on the Internet.

The capacity problem is not only relevant for the access network. Even if the access networks in some residential areas are increased to be able to provide the required capacity, it is far from certain that the backbone network is upgraded accordingly. There are firms specializing in provision of new infrastructures, which offer LAN types of networks of 10 and even 100

Mbit/s to residential premises. But their backbone capacity can not match this development.
Regarding video services over the Internet, other coding schemes are used that do not offer acceptable broadcast quality but are feasible for narrowcast purposes, where the picture quality is not as important, and other Internet related added values compensate for the lack of quality to some degree.

5.1.3 Quality of Service

Traditionally, QoS has been associated with the ability of telecom networks to guarantee a predefined level of quality for specific services when these are established and transmitted from point A to point B. These QoS-concepts are meticulously described in ITU / CCITT recommendations and have been among the arguments for establishing dedicated networks for different services, as this makes it easier to optimize the networks with respect to the QoS-parameters. A simple example is POTS, which demands specific quality levels for end-to-end delay, delay variation and noise when the connection is established. QoS requirements are not applied only in the transmission part but also in other levels of communication. An example is the establishment phase of a POTS connection, where a set of other QoS parameters like the blocking rate and the number of lines in the access network and the capacity of the core network are needed.

Video services, especially interactive video services, are very sensitive to end-to-end delay, delay variation and noise / interference, etc. As far as a dedicated network is deployed for the distribution of video signals, these QoS parameters can be kept under control. When integrated networks are used, where video services are one of the services in the network, then different methods must be used to guarantee some minimum QoS parameters.

One method to guarantee a given level of service is that every service negotiates parameters over the network (delay, loss-rate etc.). This method is now current for connection-oriented networks as ATM-networks (Asynchronous Transfer Mode), but is still a challenge in

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connectionless networks as the Internet. Another approach is the establishment of a prioritizing scheme that can be applied to IP types of networks and will be applied to IPv6. Meeting the QoS requirements of different services in integrated networks is considered as one of the barriers to the convergence process.

5.1.4 Way of Use

Another important aspect is the way in which services are used. One of the major differences in Way of Use is mobility versus fixed use. There will certainly be substitution between mobile and fixed networks but some services will only be relevant in mobile networks.

An example frequently cited is radio services. These services are consumed mainly in mobile and portable environments. In this case the Way of Use is one of the major reasons for establishing mobile networks for provision of radio services. The question of the necessity of dedicated networks for provision of radio services or the possibility of using, e.g., mobile communication networks for the provision of radio services is another question that is determined by a combination of other parameters.

5.2 Content / Service

Digitalization of content is one of the major drivers of convergence. In the digital world, the same content can be transmitted across different networks, and different services can be offered based on the same content. The synergy achieved goes far beyond the electronic communication forms and includes among others the printing press.

The above mentioned capacity-per-user problems and the problems associated with return paths in broadcasting networks will influence the development of data services that will be available in the broadcasting networks.
The following provides examples of interactive services offered in broadcasting networks without using a return path:

- Download of software: The broadcasting networks are mostly used in the daytime and evening hours. The transmission capacity in the night-time can be used to download, e.g., new versions of software to the set-top-boxes.
- Download of newspapers: In a similar way, newspapers can be downloaded to the set-top-boxes.
- Internet on TV: Access to the Internet as it is known in the communication networks will not be possible because of capacity-per-user problems of digital TV networks. The solution can be to broadcast a limited version of Internet.
- When using return paths, the traditional interactive services can be offered within broadcast networks. The spread of TV services within the Internet is the major example of the reverse process, namely provision of services that traditionally belong to broadcast sector within the communication networks.

5.3 Terminals

Terminal convergence denotes the coming together of consumer devices such as the telephone, television and personal computer.

Penetration of TV is much higher than PC. Providing interactive services, including Internet, on TV can potentially benefit especially the ‘information poor’ and thus reduce the ‘information gap’ in the society. This is an important implication of convergence, as a part of society will only benefit form the new services of the information society if it can receive the data services on TV.

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The PC itself is developing into a real competitor to TV as an access device to broadcast services. Additional low cost TV tuner cards are needed to be able to see traditional broadcast services on a PC. On the other hand, the PC is a well designed medium for consumption of Internet services and is a good medium for convergence

Here also the way of use will be a vital parameter that determines if PC and TV will substitute or replace each other.

The development in the last four to five years shows, however, that the direction of convergence is not only bringing together different consumer devices. There is also a trend toward the development of a variety of different access terminals for dedicated services and applications.

5.4 Heterogeneity versus Integration

One of the major barriers for convergence relates to the transport and delivery part (i.e. the infrastructure part) of the value chain. It is shown that although digitalization is a major parameter, it is still only one amongst several parameters that influence the convergence at the infrastructure level. It is important, however, to have a clear distinction between convergence and integration at the infrastructure level and to emphasize that the success or failure of convergence is not directly connected to the capability of one infrastructure to integrate all services.

None of the infrastructures available can integrate all the services in their current state. While integration of the back-bone parts of the networks have had better conditions to evolve, integration of the last mile coverage has shown to be dependent on many different parameters. However, some infrastructures have better potential to be upgraded to integrate more types services. Cable TV networks are examples of this. On cable networks, it is possible to offer several broadcasting services of acceptable quality and at the same time deliver Internet and basic communication services. Also new LAN types of networks in residential areas (and different wireless solutions on the market) can provide acceptable performances. However, when upgrading cable TV networks and establishing new networks, huge costs must be paid in one way or another.

One way of implementing convergence and delivering ‘convergence services’ is to utilize the synergy between different networks and consequently to utilize the strength of different networks. In this way, different components of the same service can be transported over different networks. This organization of heterogeneous network can be totally seamless for the end-user and seam like an integrated network.

There are, therefore, choice to be made between an integration model and a heterogeneous model. This choice depends partly on the characteristics of the types of communication in question and the characteristics of different kinds of networks and partly on the history of network developments in the different countries. There is a certain path dependency in the possible choices countries make, hinging on the former history of network development.

5.5 Developing country perspectives

The overall technological aspects of convergence in developing countries are not different from developed markets. There are, however, some specificity and certain possibilities for developing countries to leapfrog stages of technical network development that developed countries have gone through. While in developed markets, the convergence process (both in integrated and heterogeneous network versions) mainly facilitates a platform where the same

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service is delivered through different infrastructure, for developing countries it mainly facilitates increased penetration of services. In developed countries, convergence facilitates more competition, in developing markets it is more likely to facilitate complementarity.

One of the main aspects of convergence is that different services can be transmitted within different networks. This can be used in developing countries to extend the penetration of basic communication services. For example, cable TV networks can be used to offer telephony and Internet services. However this possibility of reuse of infrastructure is only possible if a regulatory framework is established that facilitates the efficient utilization of available resources in different networks. This is often not the case.

Another important aspect concerns geographical regions where communication infrastructure is not available. This gives more freedom in the design of the future networks, because the demand for other services than telephony can be taken into account from the beginning, if policy and regulation permit it.

In many developing countries mobile communication is seen as a replacement for fixed telephony. The development of new generations of mobile networks can be utilized to offer mobile Internet and other advanced services. This is important for the provision of 'convergence services' in developing countries as the penetration of PCs is low (and is likely to remain low due to the costs of PC, electricity, etc.) in these regions.

In many developing countries the broadcast frequencies are underutilized. Establishing digital TV networks in these countries will give the providers the possibility to go beyond the traditional broadcast services. For assignment of broadcast frequencies, it is important to consider that other than broadcast services can be offered over these networks. This is important both for regulators working to extend advanced services and for market actors that can find new business opportunities in digital broadcast services.

Furthermore, the technological development that enables using electrical power lines for communication (PLC) is of special interest for in the developing countries as communication services can be offered without the need for laying new wires to cover the last-mile. In many developing countries, power lines are extended to many small local areas that lack communication. And in areas unserved by either electricity or telecom, the combination of delivery of electricity and communication services will give new incentives for this development.

6. Convergence Market Trends

In this section, current trends in convergence of markets are discussed. The sector has been reshaped through a series of alliances and mergers. This has resulted in a more globalized ICT and media industries and created new relations both between various layers in the value chain and across industries. Vertical integration between different levels in the value chains and international integration of national markets are also important aspects in many alliances and mergers.

Convergence is shaped by the combination of the technological trends described above and of financial and strategic considerations, which can be independent of the convergence of the underlying technologies. Until the 1970s, large industry conglomerates saw diversification as part of their strategy. Companies spread their activities on a wide range of industries, and quite often there were no or very weak links between the divisions. This financial strategy began to fall out of fashion in the 1970s and was replaced by a trend towards concentration on core competencies. According to this strategy, involvement in other sectors should only take place if it possible to create symbiotic advantages through cross-sectoral activities.

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6.1 Vertical Integration

Vertical integration generally related to integration of the three horizontal layers depicted in Figure , and can take place within all of the four mentioned sectors.

6.1.1 Telecom

Telecom services markets were highly vertical integrated up to 1980. The telecom operators focused on delivery of end-to-end services and they either produced their own equipment or had a close relationship to national equipment suppliers. In the ’80s much of equipment production was divested from service operations. This was partly a consequence of the emerging liberalization of the telecom sector. The equipment manufacturers wanted to sell their products to the incumbent as well as the new entrants. Too strong links with one operator will limit this potential and most manufacturers therefore benefited from a position as independent companies. However many operators still maintain, however, substantial R&D departments mainly in software and service development, in order to create a competitive edge through provision of the most advanced and innovative services. So, in innovation some integration between the production of technology and service production still persists.

6.1.2 IT

The IT sector also experienced a kind of unbundling as hardware and software gradually became still more separated. From the outset hardware manufacturers (e.g. IBM) developed their own software, but later on software production were outsourced to independent companies and soon software became a separate industry. Hardware has become primarily a mass production commodity industry. Software has tended to become highly diversified with a primary focus on services and applications.

6.1.3 Broadcasting

For terrestrial broadcasting, equipment production and service production have in general been two separate activities. However, distribution and content production is highly integrated. In satellite and cable there is some vertical integration between content and distribution, as well as equipment production. The basic distribution by cable or satellite may be separated from content production, but most broadcasters act both as gatekeepers and producers of content although they also buy content from others.

6.1.4 Content and Distribution

Integration of content and distribution is also seen in other sectors. Many telecom operators are producing still more content for their networks. This can be seen as just a continuation of the end-to-end philosophy that has dominated the telecom sector, but digitalization and convergence with other media have drastically increased the market opportunities for delivery of various sorts of content via the telecom network.

Reuters is an example of a content provider that has expanded its operation downwards to distribution and equipment production. Reuters has expanded its activities in IT service consultancy and has recently formed an alliance with the network computer maker Sun Microsystems.

6.2 Convergence

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Convergence can take place at all three horizontal levels depicted in Figure 3 (page 8) . Each level is related to one of the technical dimensions of convergence:

- Convergence in content production is related primarily to service convergence
- Convergence in distribution is related to**"** network convergence
- Convergence in equipment production is related **"**to terminal convergence.

Convergence in equipment production is also related to a convergence between network technologies, as equipment suppliers produce equipment for use both in production and distribution as well as consumption of content.

6.3 Convergence in content and services

Convergence between services implies that the same content can be reached from different types of technical platforms (e.g. either through the Internet accessed via the telecom network or through a DVB based broadcasting service delivered through a broadcasting network). This will lead to increasing competition between different platforms. Customers may, therefore, face a convergent market for various types of information services.

This does not imply that the different platforms will be used for provision of the same services - a certain specialization is likely to remain. But the former boundaries between IT, telecom, broadcasting and other mass media companies are going to be redefined and less visible. Even if a broadcasting company will choose to remain basically as a broadcaster, it will be necessary to become visible on other platforms as well. New service integrating elements from IT, telecom, broadcasting or other mass media will constantly be developed. These new services will not always be a source of creation of new companies but will contribute to the blurring of boundaries between the different industry sectors.

Service convergence implies that content providers will become cross-sectional in the sense that they provide content to more than one sector. Most content providers are, however, still rooted in one sector and their new activities are mainly in the new sectors. This is seen most clearly in content provision to the Internet. Both newspapers and TV broadcasters have developed their own web-sites, where they exploit the economies of scope related to provision of the same content to different platforms.

These activities may expand in such a way that this will lead to a convergence between providers of content to the Internet and either newspapers or broadcasters. But it is also possible that provision of news services to the Internet will develop into separate entities that may be spun off as independent companies. Or the market will be taken over by completely new companies that have content provision for the Internet as their core business.

An important barrier to the development of cross-sectional content providers is that it is not enough to provide the same content on different platforms. In order to remain competitive, content must be designed in a way that takes the potentials and limitations of each platform into consideration. As long as the technical capabilities vary across platforms and networks, there will always be a scope for development of content designed for a particular platform.

6.3.1 Convergence between telecom and broadcasting

Another trend is the entry of telecom operators into the broadcasting sector. In Denmark, for instance, the incumbent operator TDC tried to establish its own TV channel in the mid 1990s; Telecom NZ has bought a stake in Rupert Murdoch's Sky Network Television; and British Telecom has recently applied for a broadcasting license.

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One of the most convergent content providers is probably BCE Bell Canada. This company is not only Canada's largest telecom company, it also owns the best selling newspaper, the Globe and Mail, the largest commercial television network, CTV, wireless data and telephone services, satellite television services, the popular Lycos/simpatico Web portal, the Teleglobe global Internet protocol and data network, Workopolis job finding database and many other online media activities. Thus, BCE is active in content production in all of the four sectors and in distribution of both broadcast and telecom services.

These examples deal both with horizontal and vertical integration. The philosophy is to ensure content to the networks. For example, BT seeks to distribute its broadcasting service via its own broadband network. But in all of the examples, the input is provided by entering content provision in other sectors.

Not all of these attempts have been successful. TDC had to realize that broadcast and telecom are two quite different types of businesses and their TV channel was closed down due to lack of subscribers. It has also been questioned whether the strategy of BCE has paid off in terms of generation of revenues[19].

6.3.2 Convergence between IT and broadcasting

Some of the larger IT companies have shown their interest in broadcasting. Providers of content as well as software and hardware to the IT sector have a strong interest in promotion of a pc-based approach towards digital television. On the content side, Microsoft is involved in development of the American cable TV industry and they have also acquired WebTV Networks for nearly half a billion dollars[20].

Many of these initiatives cannot be seen only as a result of technical convergence. They must also be seen in a financial perspective. Many telecom operators had an overflow of capital after liberalization and were looking for new investment opportunities. It was not always possible to find attractive investments within the telecom sector. The hype surrounding ICT shares at stock markets provided easy access to more capital and contributed to the overflow of capital within the sector.

6.4 Convergence in distribution

6.4.1 Telecom and broadcasting

The most important trend in convergence of distribution networks is between the telecom networks (which also provide the infrastructure for many IT services) and the broadcasting networks. The telecom networks are used for telephony as well as data services. Broadcasting services are still mainly distributed on separate networks, but broadcasting can also take place via the Internet. On the other hand, cable-TV networks can offer telecom services as well. In the UK, cable operators have upgraded their cable networks to provide telephony, and cable modems are used to offer Internet access in many countries.

In some countries, the incumbent operators have from the very beginning been among the major cable-TV operators. This has tended to slow down convergence as telecom operators have been hesitant to introduce new services in the cable network (such as cable-modem access to the Internet) that compete with services delivered in the telecom networks. In the US, AT&T has through its acquisitions of TCI and MediaOne become one of the two major

[19] Geoff Wheelwright: 'North American Convergence Plays - Canadian convergence in doubt', *Communications Week International*, 24 September 2001 http://www.totaltele.com.
[20] J.F. Moore & S. Koprice: 'A digital Television Ecosystem', in D. Gerbarg (ed.) *The economics, technology and content of digital TV*. Kluwer, 1999.

cable-TV operators. AT&T has since the divestiture in 1984 lacked a direct network access to its customers. Through this acquisition it seeks to regain direct access.

6.4.2 Divergence: Mobile operators

There is, however, also a trend towards divergence. Mobile communication, for instance, has emerged as a new sector. The largest player on the market for mobile communications, Vodafone, is an independent company with focus on mobile businesses. In addition some of the fixed operators, e.g. BT, are considering divesting their mobile activities.

6.4.3 Divergence: Networks & operators

Another possible trend of divergence is separation of supply of telecom services and operation of the physical network structure. Today a number of telecom operators base their operations in part on access to other operators' networks through leasing and interconnection agreements. In addition, a number of infrastructure providers have emerged. These are often public utility companies, which are in possession of their own telecom infrastructure but do not have any intentions of entering the retail market for telecom services. The financial crisis following the UMTS auctions may be the decisive factor in this development, as some of the incumbent operators may be forced to sell off their infrastructure in order to reduce their debts. Among others, BT has received offers for their infrastructure from at least two different consortia. Although these offers have been rejected, analysts say that BT (as well as other debt burdened telecom operators such as KPN, Deutsche Telekom and France Telecom) must decide whether they want to be pure network operators or service providers in the future.[21]

6.5 Convergence in equipment production

Convergence in equipment production is not a new phenomenon. Many industrial corporations such as Philips and Siemens are involved in many different industrial activities in most of the ICT and media sectors. The reasons for this is the above-mentioned strategy of conglomeration and the synergies between equipment production of different types of electronic equipment that also existed before the digitalization

In the past decade, convergence is most visible in the IT and telecom sectors. The liberalization of the telecom sector has made it possible for new entrants to start up production of telecom equipment. At the same time, the technical convergence between IT and telecom equipment has made it easier for IT manufactures to enter the telecom market. One example is Cisco which supplies routers to private data networks as well as public telecom networks (in particular IP-networks).

Convergence is not only a matter of utilization of synergies in development and production. It is also a question of development of new types of equipment providing features originating from different industries. This is clearly seen in development of terminals for digital TV. These terminals not only combine broadcasting and IT technologies in their technical design. The services they provide are also a result of the convergence between the different industries.

6.6 Summary of market trends

Convergence is shaping the present development of the ICT and media industries in ways that challenge the existing institutional set-up. The market trends can be describes as follows:

[21] Michelle Donegan: 'Local Loop Selloffs - all eyes are fixed on local network assets', *Communications Week International*, 10 September 2001. http://www.totaltele.com

Company and market structures are formed by other factors than convergence such as financial considerations and corporate strategies (conglomeration vs. focus on core competencies).

A large number of mergers and alliances have been made. Most of these mergers and alliances have taken place between actors within the same market segment, and may rather be attributed to internationalization than to convergence. Still, a number of cross-sectional and vertical mergers have taken place.

Vertical integration has mainly taken place between content production and distribution. At the same time there has been a trend towards disintegration of service production and manufacturing particularly in the telecom sector. It is possible that a further disintegration in the telecom sector will take place through a separation of network provision and telecom service provision.

Many companies have set up new activities in other sectors in order to complement their core business. Content providers such as newspapers and broadcasters are becoming multi-channel content providers, although they keep their main activities within one sector. Telecom companies are going into content provision (including broadcast) in order to ensure content to their networks.

Convergence takes different forms in the different layers of the value chain. Convergence in content production includes all of the four sectors, while convergence in distribution is most prominent between telecom and broadcasting sectors. In equipment production it is the IT and telecom sectors that are converging (Figure 3).

New ICT and media sectors are emerging. These sectors may in a certain phase be dominated by companies from other sectors but can develop to sectors that in spite of a deep integration with services from other sector may become dominated by independent companies. The most obvious candidate is the mobile industry. In spite of a considerable overlap between the markets for fixed and wireless services, operators tend to separate their mobile operations into independent activities, which later may be spun off as new independent companies.

7. Convergence Policy Issues

From a policy and regulatory point of view, convergence in the ICT and media areas raise a number of issues. There are issues that are related to all three levels (equipment/hardware, transport/software and content/services) in the convergence model (Figure). The ones that will be dealt with here take up the issues of the general societal importance of convergence policies, the balance between benefiting from industrial complementarities and the problems of media concentration, and access to networks and content. Other issues are related to the infrastructural levels (equipment/hardware and transport/software), where the overall question is to what extent it is possible to subject all infrastructures to the same regulation. At the content level, there are a large number of issues that have to be resolved, including the question of whether all content areas can be treated in similar ways regarding, for instance, what it means for public service provisions in the broadcast area and what it means for media responsibility rules.[22] Other questions deal with privacy protection, security, consumer protection, intellectual property rights, and illegal information.[23] Finally, there is the issue of the possibilities and problems regarding the separation of regulation of infrastructure and content.

[22] First raised in Pool, Ithiel de Sola (1983). *Technologies of Freedom*. Cambridge MA: Belknap.
[23] Samarajiva, R. (1997). Telecommunication regulation in the information age, in *Telecom reform: Principles, policies and regulatory practices*, ed. W. H. Melody, pp. 421-39 (Lyngby, Denmark: Den Private Ingeniorfond).

7.1 General Societal Importance

The general societal importance of convergence policies lies in the large and growing importance of ICT and media industries in societies in terms of size of the industries themselves and the broader social implications. ICT elements are integral components of products and services in many sectors, and information and communication systems constitute infrastructures for many functions in society. Information and communication infrastructures are, for instance, crucial in importance for the many service activities that play an increasing role in social developments. Many countries have, therefore, devised information/network society visions and plans to be prepared for and take advantage of the potential applications of in the new information and communication technologies and services.[24] Countries strive to establish the best possible economic and regulatory framework conditions for the development of dynamic information and communication industries and innovative use of ICTs.

7.2 Benefits and Problems in Media Complementarities

The balancing of benefits and problems in relation to complementarities and market power is not a new issue. Public policies have been seeking to strike such balances in many areas for a long time, and a large number of countries have for years had regulations limiting cross media ownership.[25] However, technological developments including digitalization of different media areas, political developments in direction of increasing liberalization and a less stringent view on economic power concentration, and increasing business internationalization leading to larger corporations and political support for such tendencies, have altered former balance points between benefits and problems. There is today a political trend towards loosening the restrictions on media concentration, including cross media ownership provisions, in order to take advantage of complementarities between media and technology areas. However, the issue is still there. New balances have to be struck in view of benefits and drawbacks in loosening the ties on media concentration.

7.3 Access to Networks and Content

Access to networks and content is also an important issue. Many countries have some form of universal service rules in telecom, or are in the process of developing such rules. Countries often also have provisions for access to public service broadcasting, even though in many countries there is an unfortunate conflation of public-service and government broadcasting. The question is whether and to what degree such access provisions should be extended to new networks and services, reflecting developments relating to convergence, i.e. broadband, Internet, public information services, etc. The arguments in favor have centered on the issues of limiting the social divides and the advantages of a broad take-up of new technological possibilities, including both democratic aspects and the industrial growth potentials in a broad diffusion. Arguments against have mostly been concerned with creating a situation where the mass of users support the most advanced early adopters of new technologies and the dangers of subsidizing technologies that quickly are made redundant by new and more powerful technologies. However, some developed countries have gone beyond the mere provisions for universal service in basic telephony and there is generally open-mindedness in relation to the possible inclusion of new technologies, services and content in some sort of universal access provision, e.g. broadband access; and increasing attention is being paid to the "digital divide" between developed and developing countries.

[24] See, for instance, the Danish report *Det Digitale Danmark* (Digital Denmark), published by the Ministry for Research, Copenhagen, 1999.
[25] Henten, A. (1999). Convergence, Synergies and Media Power. ITU Policy and Regulatory Summit, Geneva, http://www.itu.int.

7.4 Technology Neutral Regulation

With respect to information and communication infrastructures, there is a general trend in policy discourse towards uniting the regulation of the different infrastructures. Most countries have operated with different rules applying to fixed networks, mobile networks, and broadcast networks. But with the convergence between these networks and the possibilities for conveying similar services over different networks, the foundation for differences in rules are beginning to be questioned. Countries are, therefore, seeking to harmonize regulatory frameworks of different communications infrastructures based on the principle of technology neutrality. However, there are some problems attached to this approach. In many countries, there are special requirements and user protection rules regarding telephony provided on the fixed public network. But telephony can also be provided on the Internet – yet, Internet telephony[26] is not always subject to the same rules as circuit-switched telephony, which a totally technology neutral regulation would require. Also, the levels of competition in the different infrastructure areas may differ, for instance, with greater competition in mobile services than in fixed. Such differences may require different forms of regulation in the two areas.

7.5 Converging Content Regulation

Similarly, it is an open issue to what extent regulation in the different content areas should converge. In the broadcast area, many countries have public service provisions of some kind, though they may be very different. Some broadcasters have responsibilities for providing services under certain quality obligations but have, at the same time, a number of privileges in terms of, e.g., frequencies for terrestrial transmission. In other media areas, for instance print media, there are no such arrangements, and when content can be used across different infrastructure platforms, the question is what the implications are for the specific public service provisions in the traditional broadcasting area. It will surely be more difficult to maintain a central position for public service broadcasters, but will public service provisions have to disappear? Conversely, is it possible and desirable to extend public service provisions to the Internet web in the sense that public service broadcasters that also have web services become obliged to develop web pages with a public service type of content?[27]

Another example of a similar question relates to the media responsibility rules that print and electronic mass media often operate under. Authors/journalists and editors are in most countries responsible for what is printed and broadcasted. However, such rules seldom apply to information on the web, and the issue is whether it is possible and desirable to uphold such rules in a situation with a growth of information spread over the web, or whether it is possible to extend rules for content responsibility to new media platforms.

7.6 Other Content Issues

Privacy protection gets a new dimension in a converged Internet environment. Not only is it much easier to transmit files with personal information, it also becomes much easier to collect information on people and their interests and buying habits by means of automatic registration. Security problems involve both the security of information transmitted on networks, i.e. that information is not disclosed and not tampered with, for instance, and the security of payments made on electronic networks. Consumer protection is also an important

[26] Defined as telephony conveyed wholly or partly over the Internet, and distinguished from voice over IP (VOIP). See, International Telecommunication Union (2001). Secretary General's report to 2001 World Telecom Policy Forum: IP Telephony, para. 1.2. At: http://www.itu.int/osg/spu/wtpf/wtpf2001/sgreport/

[27] For an early discussion of this issue, see Industry Canada (1995). *Final Report of the Information Highway Advisory Council*, Chapter 3. At: http://strategis.ic.gc.ca/SSG/ih01070e.html

issue. When buying goods and services on networks, consumers must be protected against low quality products, late delivery or pure and simple fraud. In some countries, there are actually stricter rules protecting customers in e-commerce, but this does not apply to the great majority of countries, and there are certainly problems in relation to international transactions.[28] Intellectual property rights constitute an example of another area, where a converged Internet environment creates many new problems. The Internet provides new possibilities for spreading cultural products – which is a great advantage. But for the holders of intellectual property rights, these new possibilities create new problems with respect to protecting their rights against infringements. Finally, illegal information such as racist utterances and child porn can be spread much wider on the Internet, and the question is how to protect citizens against such information and how to hinder people from spreading it in an international Internet context.[29]

All these issues have existed for many years. They have not been created by the development of convergence in the media and Internet areas. However, convergence and the Internet create a new environment in which these known issues acquire new dimensions. Parts of the issues and the regulatory rules that they give rise to are, therefore, connected with the issue of media convergence, and rules taking account of this should be developed. However, this does not necessarily mean that these issues should be part of a united convergence regulation nor that they should be dealt with by a single regulatory authority.

7.7 Converging Infrastructure and Content Regulation

Having looked at issues that relate to all three levels from equipment/hardware and transport/software to content/services or that relate to either the infrastructural part or the content part, the major questions then are:

- whether infrastructure and content issues should be dealt with under a common regulatory framework, or
- whether problems are created by the separation of the two sets of issues.

In the overview presented here, there are three types of issues that are related to all three levels: general information society policies, complementarities vs. concentration, and access to networks and services, but none of these issues requires a common regulatory framework.

In discussions of the separation of infrastructure and content matters, it is often stated that there are companies covering the whole value chain from infrastructure to content provision and that, therefore, it is more appropriate if these companies are regulated by one common regulatory framework. There are companies that can leverage their power in one area to another, and it is true that there will be questions regarding the delimitation between infrastructure and content provision, in the sense that a software tool may encompass both infrastructure and content elements.

However, it seems as if these problems are at the fringes of the issue and are minor in comparison with the overall benefits of differentiating between infrastructure and content problems. There is also the question of the influence of initiatives in one area on the other. When, for instance, the terrestrial broadcast infrastructure is dealt with in the same way as the telecoms infrastructure, it may be difficult to uphold the preferential status of public service broadcasters. But this is mainly a question of coordinating the two sides of the media and communication regulation. However, there are problems of structural adjustment to be discussed in relation to a separation of infrastructure and content regulation.

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[28] For a discussion see, Samarajiva, R. (1997). Interactivity as though privacy mattered, in *Technology and privacy: The new landscape*, eds. P. E. Agre & M. Rotenberg, pp. 277-309 (Cambridge MA: MIT Press).

[29] Hadley, P.D. & R. Samarajiva (1997). Regulation of on-line content in the new trade environment: NAFTA and communication policy, *The Communication Review*, 2(2): 207-33.

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8. Regulatory Convergence: Organizational Aspects

To the extent that convergence between telecom, IT and broadcasting takes place technologically and in the market place, or to the extent that it is a political aim to promote such convergence tendencies, regulations of hitherto separate communication areas must also converge – or regulations must at least adapt to or accommodate a new convergence environment. Whether this also must lead to regulatory convergence in terms of joining existing regulatory agencies or building totally new converged regulatory organizations is a matter to be examined further. Although it is possible to regulate a converging market place by means of separate regulatory organizations, there may be a number of advantages in joining together the regulatory forces. But there may also be serious problems. Advantages and problems of regulatory convergence are the primary matters discussed with in this section of the paper. Secondly, the scope and degree of regulation is examined.

8.1 Some Advantages and problems

Tendencies towards convergence have been known through most of the history of communication and media, and it is important to distinguish convergence from simple monopolization. Regulations have sometimes been implemented to avoid the establishment of too powerful communication and media conglomerates.[30] Regulators covering a broader array of communication and media areas have been seen. In North America, for instance, telecom and broadcasting have been regulated by unified regulatory agencies - FCC (Federal Communications Commission) in the US and CTRC (Canadian Radio-television and Telecommunications Commission) in Canada – but applying very different standards of regulation. Furthermore, regulatory institutions even cover a broader range of utility areas as in the case of the US stats PUCs (Public Utility Commissions).[31] In the North American cases, the different areas of regulation typically have been quite apart even though they have been dealt with by unified organizations. The possible synergies of convergence between the different areas of regulation would not seem to have been widely exploited.

Even though convergence developments have been known for many years, the main thrust in recent research on convergence has been that the degree and character of convergence developments are different today because of ; (1)technology developments, first and foremost the digitalization processes; and (2) the political liberalization, including more liberal policies in relation to market convergences[32]. There is, consequently, an increasing necessity of a closer relationship in the regulation of the different communication and media areas. It is not sufficient to have the different areas under the same roof. The synergies between the different regulatory areas must be developed more proactively, encompassing the regulatory 'contributions' of the different areas. Telecom contributes with infrastructure regulation and access issues; broadcasting with access and content issues; IT contributes with, e.g., privacy and security issues; and together the different areas contribute with new regulatory issues such as IPR (Intellectual Property Right) and e-commerce regulation.

[30] See for example Dwayne Winseck, *Reconvergence: A Political Economy of Telecommunication in Canada*, Cresskill, NJ: Hampton Press, 1998.
[31] The Idaho PUC, for instance, regulates electric, gas, telephone water, pipeline safety, and rail. The Colorado PUC regulates electric, gas pipelines, natural gas, rail, telecommunications, transportation, and water utilities.
[32] The whole discussion on convergence is based on the assumption that "something new" has happened, see for instance the so-called 1999 Communications Review of the European Community, European Commission: "Towards a New Framework for Electronic Communications Infrastructure and Associated Services", COM (1999) 539.

In a situation where these diverse regulatory areas really converge, there may be number of advantages to be reaped when dealing with them in a unified regulatory institution, but there are also some challenges to be met.

The potential advantages would seem to be the following:

- To the extent that markets are converging, better to apply the same provisions across communication and media areas.
- In regulatory interventions, it is important to be able to build on a greater knowledge of corporations with activities in different communication and media areas and to understand the inter-relationships between areas.
- To take advantage of the economies of scope and scale, especially the economies of scope in the sense that some of the regulatory issues are the same across industry platforms, for example in the case of price cap regulation. This is important in any country trying to economize on the costs of regulations, but can be essential for countries with too little properly educated manpower for the different regulatory assignments.
- Possibilities for a greater political independence in relation to implementing policy decisions, with administrative relationships to more than one ministry.
- One-stop-shopping for users of the regulatory institutions, as complaints and applications only have to be filed with one organization.

The potential problems would seem to be the following:

- Unclear regulatory principles because of the unification of different regulatory rationales, for instance, the unification of the infrastructure regulation tradition from telecom and the content regulation tradition from broadcasting.
- More bureaucratic working procedures with the enlargement of the regulatory organizations.
- Danger of less scope for independent implementation of policies as more than one ministry will seek to influence regulatory decisions and procedures (in contrast to the above-mentioned possibilities for greater independence).
- Opaque structure for the users of regulatory organizations, as they may not be able to 'see through' the organizational maze in unified organizations (in contrast to the positive side of one-stop-shopping mentioned above).

From the advantages and problems described it seems clear that it cannot in advance be determined whether the primary overall outcome of an organizational unification will be positive or negative. It depends very much on the specific circumstances and the ways in which the unified organization is constructed and managed.

In order to strengthen the positive potentials and weaken the negative possible implications, both with clarity and flexibility, at the same time are needed, in the conceptualization of the processes of how to implement regulation and in a converging environments how to structure the regulatory organization. Clarity and flexibility are more important than ever in a situation where different areas are joined together organizationally. This implies that the different goals of regulation (remedying market failures, social concerns, and industry policy directions) must be clear in relation to the different communication and media areas. As a corollary, it must be recognized that that infrastructure regulation and content regulation have partly different rationales and will have to be governed, to some extent, by different principles.

The extent to which a unified regulatory organization must adhere to different regulatory rationales, of course, depends on the variety of media areas included. The convergence most often discussed, currently, is the convergence between IT/telecoms and broadcasting[33]. In this

[33] The UK OFCOM initiative is one of the more debated examples of regulatory convergence between telecommunications and broadcasting regulation.

case, the different rationales of infrastructure and content regulation are important. However, if the focus is on the convergence of telecom and IT, problems may be less accentuated even though the new areas raised by the inclusion of IT, e.g. new security issues, also are challenging[34].

Furthermore, regulations of different communication and media areas cannot just be joined together organizationally, expecting synergies to develop from the mere organizational unification process. It must be clearly determined how the different functions relate to one another. A type of matrix structure may be necessary as a possible solution for reaping the 'scope advantages' and for avoiding the development of a disjunct organization.

It is important to uphold the principles of independence and accountability. There may be good possibilities for developing a greater independence of the ministerial levels when having links with more than a single ministry. However, the outcome of this multi-relationship may also be negative. In a multi-relationship situation, the specific independent character of the regulatory institution must be clearly defined.

Finally, the organization must be easily accessible to its users: network operators, content providers, end-users, and policy and administrative decision-makers. The fact that users only have to approach one, or a more limited number of organizations, when seeking a solution to regulatory matters, should be an advantage. However, if the organizational unification process leads to more complexity and to less transparency, special attention will need to be paid to access procedures and the public face of the organization.

8.2 Scope and degree of regulation

Regulations of communication and media areas may have many different forms, both in terms of the scope of regulation, i.e. the different kinds of communication and media areas included, and the depth or degree of regulation, meaning how strongly regulated an area is. If taking telecommunications as the point of departure, telecom may be regulated in the following different settings:

- Light specific telecom regulation, first and foremost regulation of scarce resources such as frequencies, rights of way, and names and numbers.
- Stronger specific telecom regulation, also encompassing interconnection and universal service/access regulation.
- Convergence regulation, encompassing telecom, IT and broadcasting.
- Multisector regulation, where telecom is joined together with other infrastructural utilities such as electricity, gas and railroads.
- Competition regulation of a broad range of different industries, where telecom is only a tiny fraction.

In this list of regulatory settings, the scope of regulated areas is growing from the first mentioned to the last. However, there is also another dimension of categorization, namely the depth or degree of regulation. When crossing these two dimensions, scope and degree, different kinds of regulatory settings can be illustrated graphically, as in Figure 7.

The figure illustrates that in the lower left hand corner, with a low scope of regulatory areas and a low degree of regulation, we find 'light telecom specific regulation'. In the upper left hand corner, we find 'strong telecom specific regulation', as the degree of regulation is increased in this case. In the upper right hand corner, two regulatory settings are placed, 'convergence' and 'multisector'. The degree of regulation is often high in the case of

[34] In Denmark, for instance, IT has more extensively been included in the responsibility of a newly expanded IT and telecom regulatory agency, IT- og Telestyrelsen.

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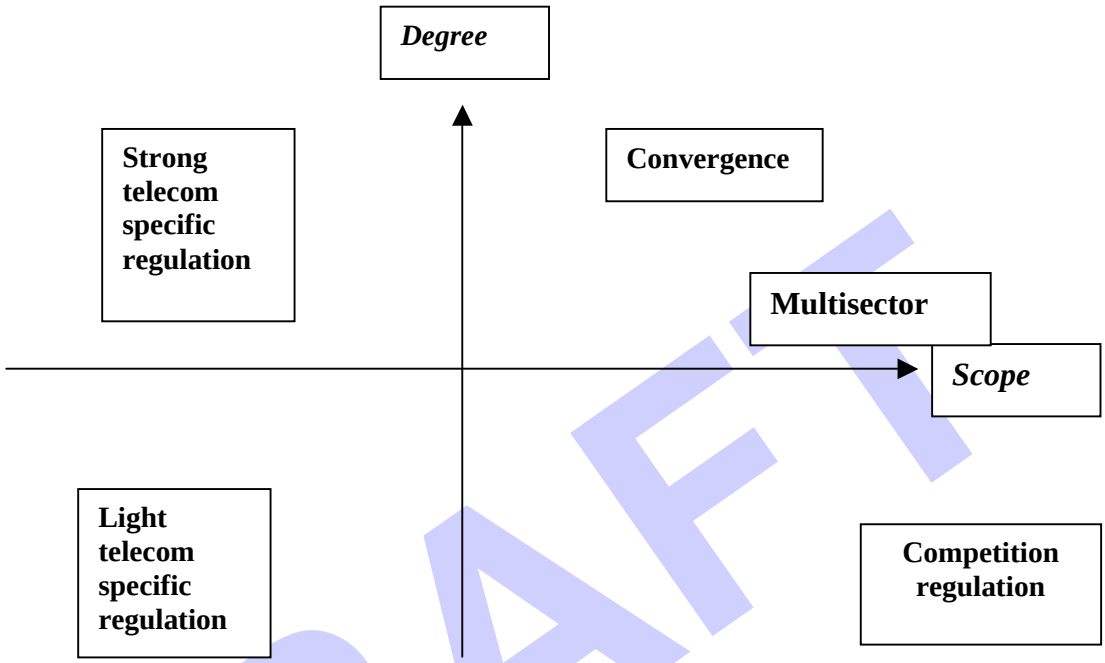
convergence regulation, while with the inclusion of more sectors in the case of multisector regulation, the degree of regulation is typically lower, reflecting the diversity of the different sectors. Lastly, in the lower right hand corner, we find 'competition regulation' with a high scope of sectors but typically with a low degree of regulation. However, competition regulation can be mixed with any of the other regulatory settings, but taken by itself; it cannot be characterized as a strong regulatory setting.

Figure 7: Regulatory settings



9. The Multisector Utility Perspective: Bases of Multisector Regulation

The multisector utility regulation perspective is based upon different trends, priorities and conditions than the convergence perspective. This section of the paper examines next generation regulation from a multisector perspective. In common usage, multisector regulation is understood to be the functioning of a single regulatory agency that has responsibility for diverse sectors such as telecom, energy, water and transportation. The classic multisector regulatory agencies are the State Public Utility Commissions (PUCs) in the United States, many of which precede the Federal Communications Commission, generally portrayed as the oldest telecom regulatory agency in the world. The original name of the association that represents the PUCs (now known as the National Association of Regulatory Utility Commissioners or NARUC) tells the tale of their origins—the National Association of Railroad and Utility Commissioners.[35] What were once independent agencies mandated to regulate the railroads, gradually accumulated mandates that included energy, telecom, other forms of transportation, water, and in some cases such as Virginia, even insurance.

A natural question that arises in relation to this historical process is why railroad regulatory agencies were given additional mandates. Was it because of commonalties in the object of regulation, or was it because of commonalties in the form of regulation? Leaving aside insurance, what is common in the objects of regulation such as transport, telecom and energy

[35] http://www.naruc.org/

is the monopoly associated with essential rights of way. Common use of rights of way by different infrastructure sectors such as ICTs, energy, water and sewage is perhaps a justification for multisector regulation.[36] Rights of way are scarce and many countries are bound to allocate them fairly because of their WTO commitments, among other things.[37] If indeed there is substantial common use of conduits and rights of way, and those common elements constitute a major portion of the supply chain, one might argue that the multisectors have converged, and that what exists in fact is a sector – an infrastructure sector.

9.1 Right of way and conduit sharing

Rights of way refer to the permissions granted by a property owner or government to dig, build, or otherwise use a specific stretch of land to install some form of permanent infrastructure (a road, railway line, telephone line, underground pipe, and so forth), and subsequently to maintain (and upgrade) that particular infrastructure as required. Historically, rights of way have been granted to monopoly providers of infrastructure because the provision of the service was important to the economy and society. The grant of rights of way was subject to conditions that the provider would not abuse, nor exploit the rights of way beyond the extent that it served public interest of infrastructure provision and that necessary compensation would be paid to the affected property owner.[38] This regulatory framework has been evolving with the opening of infrastructure services to competition. The 1996 US Telecommunications Act requires non-discriminatory access to existing rights of way in specific instances between utilities – except when there is "insufficient capacity and for reasons of safety, reliability and generally applicable engineering purposes."[39]

The US Telecom Act of 1996 reaffirms "the authority of a state or local government to manage the public rights-of-way or to require fair and reasonable compensation from telecom providers, on a competitively neutral and nondiscriminatory basis, if the compensation required is publicly disclosed by such government."[40] Although subject to non-discrimination, municipalities are increasingly taking a hard line on the granting of permits due to considerations such as the cost of streets being torn up (in terms of inconvenience, safety and reduction in road life-span) and the sheer number of service providers wanting to lay cable and other conduits. In some US municipalities, telecom conduit space is said to be saturated to the point of causing danger to other conduits such as gas.

In many countries, multiple levels of government exercise authority over rights of way. Where government works well and is not corrupt, this is not a significant barrier to effective operation of telecom and other utilities. However, where government is inefficient, dealing with multiple layers of government can prove expensive and frustrating. Where corruption exists, these problems are exacerbated. The assigning of sole jurisdiction over rights of way to

[36] For example, South Africa has justified the mandated participation of the government-owned energy and transport companies in the planned fixed-access licenses on the basis of "optimisation of infrastructure" -- Gush, Hilary (2001, July 26), "South Africa plans two rivals to Telkom next year," *Total Telecom*. At: http://www.totaltele.com/view.asp?articleID=42260&Pub=TT&categoryid=627&kw=South+Africa

[37] "Any procedures for the allocation and use of scarce resources, including frequencies, numbers and rights of way, will be carried out in an objective, timely, transparent and non discriminatory manner. The current state of allocated frequency bands will be made publicly available, but detailed identification of frequencies allocated for specific government uses is not required." World Trade Organization (1997), *Fourth Protocol to the General Agreement on Trade in Services* (Geneva: WTO), Reference Paper, article 6. At: http://www.lanka.net/trcsl/wtodocs.html

[38] Melody, W.H. and Møller, D. (1997). "Rights of Way as a Foundation for Infrastructure Competition" in W.H. Melody (Ed.), Telecom Reform: Principles, Policies and Regulatory Practices (Lyngby, Denmark: Den Private Ingeniørfond. http://www.lirne.net/library/tr/chapter10.pdf.

[39] FCC. "Telecom Act of 1996". Sec. 703. Pole Attachments. ftp://ftp.loc.gov/pub/thomas/c104/s652.enr.txt

[40] FCC. "Telecom Act of 1996". Sec. 253. Removal of barriers to entry. ftp://ftp.loc.gov/pub/thomas/c104/s652.enr.txt.

a single regulatory agency may be is a solution, but its implementation depends on the specific Constitutional circumstances of a country.

Rights of way are a key asset for those who hold them, and access to them is essential for new entrants. Historically granted at minimal cost to encourage infrastructure development, they are becoming increasingly expensive and time consuming to acquire as more and more players vie for them.[41] In the US, for example, rights of way permits can account for 20% of the cost of a fiber build, and can take over a year to acquire.[42] And, of course, discriminatory access to rights of way is a barrier to market entry. Thus, in conjunction with legislation targeted at leveling infrastructure playing fields,[43] there are also incentives for achieving viable technological solutions, in particular for last mile distribution to the end-user.

Utilities can share rights of way and conduits in two ways. *First*, companies can obtain the right to common use of rights of way from other utilities. This includes laying cable or conduits side-by-side or using the actual conduit in common, as in the case of Power Line Telecom (PLT, or Power Line Carrier [PLC]). *Second*, many non-telecom utilities have their own telecom infrastructures in place (installed for operations, monitoring, maintenance and billing), which can be leased for use by others. The technical features of optical transmission which make it immune to interference from electromagnetic fields generated by electric lines has contributed to the proliferation of telecom capacity owned and operated by electricity utilities. Fiber is installed because of the non-interference qualities, but once installed the electric utility can use only a minuscule portion of the capacity, creating the incentive to lease the extra capacity for telecom use.

The recently heightened importance of rights of way and conduit sharing (including power line telecom, which is perhaps the ultimate expression of common use) is a subject of legitimate interest to regulators, not only in telecom but also in other sectors. The question of whether rights of way and conduits constitute inputs so important that one must consider the possibility that the hitherto distinct sectors are in the process of converging is one that is currently under discussion.[44]

One must, however exercise caution with the argument that common use of inputs or economies of scope on the production side justify common regulation. As commentators on the subject have pointed out,[45] the fact that SIM cards of GSM mobile terminals are being upgraded to function simultaneously as credit or debit cards does not necessarily justify a single regulatory authority for telecom and financial services.

The regulatory issues that are posed by these forms of common and joint uses of rights of way and conduits, include the prevention of anti-competitive behavior (e.g., cross-subsidy) by

[41] http://www.fhwa.dot.gov/realestate/rowutil1.htm
[42] Gerwig, Kate. "Can They Dig It?", tele.com. March 19, 2001. www.teledotcom.com/article/TEL20010319S0026. Previously, ROWs accounted for about 10% of a fiber build. The author notes that the rule of thumb for building a network is each mile requiring a separate ROW agreement.
[43] See US Telecom Act of 1996, noted above; and for example Directive 90/388/EEC, http://europa.eu.int/ISPO/infosoc/legreg/docs/90388eec.html as amended by Directive 96/19/EC, http://europa.eu.int/eur-lex/en/lif/dat/1996/en_396L0019.html which requires that telecom network operators be granted ROWs on a nondiscriminatory basis.
[44] See, for example, the dialogue on "The next step in telecom reform: ICT convergence regulation or multisector utility regulation?" at http://www.regulateonline.org/theme2002.htm
[45] Arnbak, Jens C. (2002). Multi-utility regulation: Yet another convergence, in *Networking Knowledge for Information Societies: Institutions and Intervention*, Robin Mansell, Rohan Samarajiva & Amy Mahan (eds.), p. 144. Delft: DUP Science.
[45] See, for example, the dialogue on "The next step in telecom reform: ICT convergence regulation or multisector utility regulation?" at http://www.regulateonline.org/theme2002.htm
[45] Arnbak, Jens C. (2002). Multi-utility regulation: Yet another convergence, in *Networking Knowledge for Information Societies: Institutions and Intervention*, Robin Mansell, Rohan Samarajiva & Amy Mahan (eds.), p. 144. Delft: DUP Science.

firms with significant market power in their "home" markets and ensuring non-discriminatory access by new entrants to rights of way and conduits as well as consumer-protection issues such as energy disconnections caused by failures to pay telephone bills. These issues do not, by themselves, constitute a case for multisector regulation. However, they do make a strong case for increased cooperation and coordination among infrastructure regulators.

9.2 Market Trends and Strategies of Utility Companies

Mixed-infrastructure use of conduits is not a new phenomenon. In Canada, for example, at the beginning of the 20th century, telephone rates and interconnection fell under the purview of the Railway Act – justified by telephone and telegraph lines being part of railway operations. In the Netherlands, Nederlandse Spoorwegen (NS), the national railway monopoly, was looking for ways to exploit its private network, resulting in the creation of Telfort – a joint venture of NS and British Telecom (BT). Grameen, the largest provider of telecom services in Bangladesh, used railway rights of way to build its national network.

In the energy sector, utility companies are consolidating into larger operating companies within all utility sectors as well as across industry boundaries. The entry of utility companies into the telecom market is considered by many to be a natural evolution. The prospect of expanding income and profits from existing assets has prompted energy utility executives to seek to exploit complementarities with telecom companies.

The rationales for participation by energy utility companies in telecom are varied. The primary reasons given for penetrating telecom markets range from the need to improve operational efficiencies to the overall strategic objectives of the company. It is generally assumed that improved efficiencies include economies of scale and scope, eliminating redundant or overlapping activities, efficiencies in procurement, production, marketing, and administration. Strategic objectives include remaining competitive in a rapidly changing environment, building core competencies, acquiring additional managerial and technical expertise, etc. When energy utility executives were questioned on the actual reasons for entering into the telecom market, however, the three reasons provided were "sharing of infrastructure, bundling of opportunities and gaining experienced people."[46]

Most energy utilities became active in the telecom business by leveraging their under-used internal telecom assets (network, rights of way, construction expertise, etc.) and selling bandwidth to telecom service providers. The more adventurous companies look beyond mere wholesale provisioning and fiber leasing to direct participation in more profitable services.

Regulatory practice has long rested on ring-fencing specific regulated activities and the associated costs and revenues. Holding company legislation and requirements for separate subsidiaries and accounting separation have been among the regulatory instruments used to ensure the proper application of regulatory rules and the prevention of undue cross subsidy.[47] The contemporary efforts of utilities, in particular energy operators, to cross industry boundaries therefore pose a problem for regulators. Both obvious responses are unattractive. The conventional response of insisting upon separate subsidiaries is likely to generate criticism on the ground that regulatory convenience is preventing innovation and the realization of economies of scope. The other alternative of following the regulated company could create jurisdictional overlap, unless a multisector regulatory agency is created.

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[46] Woods, Bob. "Most Energy, telecom firms converging – KPMG", April 2001, http://www.opticallynetworked.com/features/article/0,,10516_745781,00.html.

[47] Rosenberg, E. A., Borrows, J. D., Hunt, C. E., Samarajiva, R. & Pollard, W. E. (1993). *Regional Telephone Holding Companies: Structures, Affiliate Transactions, and Regulatory Options*. NRRI 93-05. Columbus OH: National Regulatory Research Institute; Bonbright, J. C. and Means, G. C. (1932). *The Holding Company: Its Public Significance and Its Regulation*. New York: McGraw Hill.

10. Multisector Organizational Issues

The classic case for multisector regulation is presented by Schwartz and Satola.[48] They concentrate on developing countries, but their arguments also apply, to some extent, to developed countries that wish to create efficient regulatory organizations. The basic argument is that regulatory skills and the money needed to obtain the skills are in short supply in developing countries (and were possibly in short supply in the US states where multisector regulation first emerged in the 20th century). In light of this scarcity of regulatory resources, Schwartz and Satola see the necessity for multisector regulatory agencies. Multisector regulation may also prove useful for developed country governments seeking to economize on regulatory resources.

10.1 Are Regulatory Resources in Short Supply?

The market for regulatory skills is no different from other markets; the price is set by the interaction of supply and demand. Given the explosion of regulatory activities across the world in the last decade of the 20th century, it is reasonable to expect that

Persons with the necessary regulatory skills are in short supply worldwide, the educational system not having geared up for increased production in the short term; and
The prices for the persons with skills have been bid up by increased demand.

In addition, there is no worldwide market for regulatory personnel, except in the case of consultants and in a few exceptional cases such as Bosnia-Herzegovina, Hong Kong SAR and Singapore that have purchased skills on the world market. Because regulation is considered a core part of government, many governments have sought to staff their regulatory agencies with citizens. They have sought to purchase these skills at local market rates rather than at international rates. When the market for regulatory skills is conceptualized as a series of insulated national markets, the mismatch between supply and demand becomes exacerbated, especially in developing countries where the educational systems are slower to respond and the overall depth of human resources is shallower than in developed countries.

But developed countries are not exempt from this problem. The proportionately smaller number of persons with regulatory skills will be able to demand much higher wages. The regulatory agencies can pay these high wages and recruit these persons. Alternatively or in addition, they can invest in fast-track training to build up a skilled cadre. For this option to be sustainable, the trained persons would have to be paid adequate wages subsequent to training. Otherwise, they may be attracted by higher-paying employers, particularly regulated firms, depriving the regulatory agencies of the benefits of their investment in training. Another alternative is to purchase regulatory skills on a short-term basis from international consultants through outsourcing. Again, the sustainability of the solution depends on a complementary effort to build up a permanent cadre through recruitment and/or training. Effective use of consultants requires a core staff capable of effective procurement, management of external consultants and implementation. All three solutions require money.

Liberalized infrastructure markets result in dramatically higher levels of investments and generate enormous amounts of revenues both for the investors and for the governments. It could be argued that a small proportion of the investments and/or revenues can be set apart for regulatory outlays, which are after all what makes the investment feasible, without

[48] Schwartz, T. and Satola, D (2000). *Telecommunications legislation in transitional and developing economies*. World Bank Technical Paper No. 489. Washington, DC: The World Bank Group. At: http://global011.worldbank.org/site/products.nsf

burdening the general treasury funds. The favored method of funding regulatory agencies worldwide, a levy on operator revenues and/or license fees, reflects this thinking. If this method of funding is adopted, the regulatory agency will have the resources to purchase the necessary skills, through direct recruitment, training combined with adequate salaries, and short-term outsourcing.

While many regulatory agencies have the revenues, there are barriers to spending the funds as described above. Most governments constrain the levels of government salaries with the good intentions of reducing expenditures on unproductive sectors of the economy and preventing inflationary wage spirals. Regulatory agencies being seen as part of government, the wages they can offer are also constrained. Except in the West European core and North America, procedures intended to prevent corruption as well as the generally archaic systems of public administration hinder the use of outsourcing. In most developing countries, outsourcing is possible only in cases where multilateral or bilateral technical assistance funds are available.

In sum, the scarcity of regulatory resources in developing countries is real, but it is caused by government procedures and policies that prevent relatively straight forward market-based solutions from being applied. In the absence of a short-term solution to the problem of ineffective government, designers of regulatory instruments for developing countries must take scarcity of regulatory resources as a given.

10.2 Case of Europe

Sector-specific ex-ante regulation is new to Europe. Starting from Oftel in 1984, separate regulatory agencies have been created in a majority of European countries.[49] Now that the initial task of establishing regulation is more or less complete, attention is beginning to be paid to the costs of regulation. In the absence of multi-country data, the costs of regulation in the country regarded to be the pioneer of ex-ante sector-specific regulation in Europe, the United Kingdom, is considered in this section.

A recent study of regulatory costs, conducted for HM Treasury of the UK government by WS Atkins Management Consultants, states that:

> *The cost of regulation is rising well in excess of inflation, but it is still very small in comparison to the turnover of the regulated industries and to the benefits received by customers…. The operating costs of the four utility regulators [energy, telecom, water, railway] have doubled from about GBP 50 million in 1996/97 to roughly GBP 100 million in 2000/01, an increase of 84% in real terms. Between 1990/91 and 2000/01, the average annual increase in operating costs in real terms has been 16.6%, 6.8%, and 7.4% at Ofgem [energy], Oftel [telecom] and Ofwat [water] respectively. At ORR [railway], between 1996/97 and 2000/01 the increase has been 14.4% p. a. . . . Across the regulators, support functions (HR, IT, finance, procurement, communications, quality assurance and estates) accounted for about 22% of total costs in 1999/2000. This is nearly double the figure for our comparator group of UK executive agencies and other regulators.*[50]

The above quotation illustrates what is likely to become a priority issue for European regulators in the coming years. Those who preach efficiency and accountability are likely to be held to those same standards. The question of efficient use of regulatory resources is not irrelevant to European regulators.

[49] http://www7.itu.int/treg/profiles2/cntryprfiles/guide.asp
[50] WS Atkins Management Consultants (2001, February). *External Efficiency Review of Utility Regulators: Final Report*, pp. vi-vii. At: http://www.hm-treasury.gov.uk/mediastore/otherfiles/35.pdf

10.3 Shared Use of Regulatory Resources Across Sectors

Examination of the actual organization of US state–level multisector regulatory agencies, the Public Utility Commissions (PUCs), does not provide much evidence of economies of regulation, except at the level of the decision-makers, or Commissioners. Generally, staff members specialize in a particular sector such as telecom or water and work within distinct divisions that are devoted to sector-specific regulation. Resources are shared at the levels of commissioners, who hear cases pertaining to all sectors, the senior staff who manage the agency as a whole, and the legal staff responsible for hearings and related procedural matters. Generally, the different divisions are located in common facilities and use common amenities such as libraries which may yield certain savings. The massive training and information sharing apparatus organized under the aegis of the National Association of Regulatory Utility Commissioners (NARUC) is organized on a multisector basis, which also may yield certain economies. For example, the basic two-week course on regulation that is offered at Michigan State University every August has plenary sessions that address topics that are of interest across all sectors and breakout sessions that deal with items of sectoral interest.[51] Most of the research reports that are generated by the National Regulatory Research Institute at the Ohio State University are sector-specific, but in a few cases, researchers from different divisions within the Institute collaborate to produce multisector reports.[52] It must also be noted that US PUCs do not have jurisdiction over frequency management, broadcasting, and cable. The former two areas are subject to federal jurisdiction, while municipal governments and the federal government share jurisdiction over cable.

The US PUC model may be useful if there is a shortage of persons suited to be decision makers at the top of the regulatory agencies. Careful analysis of the backgrounds of the approximately 200 commissioners of PUCs is likely to show that they are not selected primarily on expertise in the various sectors, though there is a strong representation of former staff members and lawyers who have spent their careers engaged in regulatory activities.

The ITU survey shows that Europe is currently evenly split between collegial telecom regulatory authorities and single-person regulatory authorities, at least for the 34 countries reporting data.[53] It is unlikely that there is significant difficulty in finding persons to serve as decision makers in regulatory agencies in most parts of Europe. The cross cutting skills of lawyers and managers may indeed be used in multiple sectors. However, it is unlikely that legal and specialized managerial skills are those that are most in short supply in developing countries. The case for multisector regulation will be strong if it can be shown that specialized regulatory skills such as those of accountants, economists and engineers engaged in interconnection, cost studies and tariff approvals can be used across sectors. At issue here is not only whether the needs are common across sectors, but also whether, for example, the workload patterns allow staff engaged in tariff reviews, usually an activity that exhibits peak-load characteristics, to engage in multiple tariff reviews that are evenly distributed across a year. If this condition is not satisfied, what is likely to happen is not savings on staff, but the bloating of divisions.

The US PUC experience shows that there may be significant economies in areas such as use of buildings, libraries, and training facilities in common. The Atkins report cited above suggests that the UK regulatory agencies at least could use some new ideas in terms of saving on these types of non-regulatory costs. This does not, however, justify multisector regulation as such, only close collaboration and facility and service sharing among sectoral regulatory agencies.

[51] http://www.ipu.msu.edu/Camp%20NARUC.htm
[52] http://www.nrri.ohio-state.edu/
[53] http://www7.itu.int/treg/profiles2/cntryprfiles/guide.asp

The other problem with the cost-savings rationale for multisector regulation is the difficulty of actually realizing the promised savings from the common supply of regulation to the different sectors. Unless several infrastructure sectors are reformed simultaneously, which is not the case in most countries, a multisector regulatory agency would not be created from scratch, but would have to be the result of merging several existing agencies. In most countries it is not possible to dismiss employees in the course of such a merger, negating the realization of the hoped-for economies of regulation. In addition, a merger of two going concerns would create significant morale problems, the avoidance of which may require additional expenditures.[54] The significant increase in the expenditures of the merged UK regulatory agency OFGEM, which combined the former Office of Electricity Regulation (OFFER) and the Office of Gas Regulation, reinforces this point.[55]

Schwartz and Satola recognize practical difficulties of achieving economies of regulation through a multisector agency. They propose either that a multisector regulatory agency be established in the first instance, even if only one sector is reformed, or that the first sector-specific agency that is established be given added responsibilities and resources as the other sectors are reformed. They recognize the negative aspects of merging sector-specific agencies.

Despite these qualifications, the multisector solution should not be rejected out of hand. Informed by the debate, it may be possible to devise innovative solutions such as keeping the regulatory staff separate but sharing decision-making bodies; co-locating sector regulatory agencies and allowing and encouraging mutual learning and resource sharing; and creating a new category of regulatory organizations within government that would be subject to the most advanced forms of administrative controls and managerial incentives.

10.4 Pragmatics of Contemporary Sector Reform

One of the main advantages of multisector regulation, according to Schwartz and Satola, is the shield it provides against capture, both by industry and by political forces. The argument is that a multisector regulatory agency is more likely to be independent and, therefore, give greater certainty to investors through good governance.

In approaching the problem of workable independence from government for the regulatory agency, it is useful to begin by asking whether the desirability of insulation from political pressures is unique to regulatory agencies. Efficient and unbiased public administration requires a degree of protection from day-to-day political pressures. The civil-service protections written into many constitutions and laws around the world testify to this. Clear separation of the policy-setting function and the implementation function, with political accountability for the former, and administrative/legal accountability for the latter, is a basic element of sound public administration. Additional insulation from political pressure is provided in certain exceptional cases such as investigative bodies dealing with corruption, attorneys general and central banks. So, do infrastructure regulatory agencies warrant such protection?

Added insulation from political pressure is critical where the government as a whole does not work too well. In effect, the independence that is called for serves as a dike to protect the island of good governance that the regulatory agency is intended to be, from the surrounding ocean of bad governance. This is generally seen as a developing country problem. However, closer examination of European regulatory agencies, especially countries where the

[54] Towers Perrin (2001, October). *OFCOM Scoping Project: Report to Regulators' Steering Group*. At: http://www.ippr.org.uk/research/files/team25/project59/Towers%20Perrin%20report.PDF

[55] WS Atkins Management Consultants (2001, February). *External efficiency review of utility regulators for HM Treasury: Final report*. At: http://www.hm-treasury.gov.uk/mediastore/otherfiles/35.pdf

government continues to hold controlling shares in, and receives dividend income from, incumbent operators, is likely to show that independence from undue government interference is an issue in Europe as well.

Experience has shown that there are two major threats to the independence of sectoral regulatory agencies from the government side. One is the line ministry, which previously combined the functions of policy setting, regulation and operation, but following liberalization has been left with only the task of policy setting, if anything.[56] The second is the ministry of finance or equivalent, which is engaged in the privatization of the incumbent operator or is the major shareholder of the partially privatized incumbent.[57] The multisector solution, by definition, takes the regulatory agency out of the control of one line ministry (because there will be more than one) and will give it a reporting relationship to either a ministry devoted to economic reforms of the overall subject of finance, or the president, or prime minister, or the legislature. An alternative solution to the problem of line ministries is to abolish them altogether, as Senegal has done.[58] Japan, which has yet to create a separate regulatory agency, has replaced the well known Ministry of Posts and Telecommunications with a new Ministry of Public Management, Home Affairs, Posts and Telecommunications.[59] Following liberalization, it is difficult to see the rationale for maintaining an entire ministry for policy setting in a single field like telecom. The Japanese reorganization suggests that a ministry is not justified, even where the regulatory function is retained.

However, the solution to the line ministry problem should not aggravate the finance ministry problem. Unless proper safeguards are set in place, the multisector regulatory agency may be interfered with by other parts of government with vested interests in multiple incumbent infrastructure suppliers.

The question of how the regulatory agency is structured cannot be divorced from a realistic assessment of the process by which reform occurs. Comprehensive sector reform requires one or more champions—those who will make the public case for it; engage in debate with its many opponents and shepherd it through the appropriate governmental processes. Generally, infrastructure reform is championed by either the minister or by the senior civil servant in the line ministry. In cases of privatization, the Privatization Agency may assume a key role,[60] but even here, the process requires the participation of some actors from the line ministry. Not all reform champions are altruists. Even those intellectually committed to reform think about their positions in the new order. In some cases, opponents of reform may be converted to supporters on the basis of assurances of future roles.

The post-reform roles for the reform champions could be in the operating entity, the regulatory agency or in the ministry. Reform of the operator usually results in greatly reduced powers of direct involvement by the minister. Therefore, it is natural for the minister to seek

[56] See for example the continuing struggle between the Moroccan telecom regulatory agency, ANRT, which has been recognized as one of the exemplary regulatory agencies in the world and the Ministry, SEPTI. Bouzerda, Ali. Head of Morocco telecoms watchdog resigns. *Totaltele.com.* 11 Jan 2002. http://www.totaltele.com/view.asp?ArticleID=47597&Pub=TT&CategoryID=627; and Bouzerda, Ali, Moroccan regulator signals resignation, *Totaltele.com.* O3 December 2001. http://www.totaltele.com/view.asp?ArticleID=46417&Pub=TT&CategoryID=627

[57] See for example, the tensions in Sri Lanka between the Public Enterprise Reform Commission of the Ministry of Finance and the Telecom Regulatory Commission after the partial privatization of the incumbent in 1997. Samarajiva, Rohan. The role of competition in institutional reform of telecommunications: Lessons from Sri Lanka, *Telecommunications Policy*, 24(8/9), 2000: 699-717. At: http://www.tpeditor.com/contents/2000/24-8+9.htm

[58] Pan African News Agency (May 24, 2001). "Workers in Communication Ministry ill at ease." At: http://allafrica.com/stories/200105140793.html

[59] http://www.soumu.go.jp/english/index.htm

[60] E.g., see Rogozinski, J. (1998). *High Price for Change: Privatization in Mexico*. Baltimore MD: Johns Hopkins University Press.

authority over a specialized entity that will exercise oversight over the entire sector, namely the new regulatory agency. Generally, reform requires the installation of professional specialist managers from outside at the helm of the operational entity, limiting the opportunities for generalist civil servants. Therefore, it is also normal for the civil servants at the helm of the reforms to position the new agency in a way that would enhance their career paths. These factors create conditions that are conducive to the creation of sector-specific regulatory agencies, rather than multisector agencies. They do not determine the ultimate outcome, which is the result of multiple forces, but tilt the balance toward agencies defined in terms of the pre-reform department/agency.

The decision to create a multisector agency improves the chances of creating a modern, competition-oriented agency that will not be beholden to incumbent operators. The possibility that the regulatory agency will be staffed more or less completely by people who have spent their entire careers in incumbent operators is a very real one, in the case of industry regulators. With a multisector agency there is no direct path from incumbent to regulatory agency. While some staff may be recruited from an incumbent, they will at least be balanced by staff from another incumbent. Hopefully, the new organization will recruit economists, lawyers and other professionals from the private sector who are not impaired by government monopoly mindsets and who will be capable of balancing the recruits from the restructured incumbents in the various industries. The key to this will of course be the early decisions taken on organizational structure. If an industry-based structure is adopted, not only will it be more likely that government-monopoly thinking will predominate, but also the desired economies of regulation will not be achieved. If a skills-based organization with interdisciplinary teams being constituted for various regulatory tasks can be established, it is more likely that an investor and customer friendly organization which enjoys economies of regulation will emerge.

11. Conclusions and open issues

This paper is based on the assumption that sector-specific ex-ante regulation of telecom and infrastructure utilities is necessary for the development of these industries, including broad public access. This does not mean that convergence and efficient development of infrastructure utilities will not be seen in countries that mostly rely on general competition regulation and other sets of general regulation. But it means that there generally are societal benefits to be gained by establishing a regulatory foundation for the development of these industries because of a broad range of market failures and the high degree of public interest to which they are subject.[61]

The point of departure is, therefore, that sector-specific ex-ante regulation is potentially beneficial. The open questions are how to combine them, on the one hand, in the ICT and media area (convergence), and across utilities (multisector regulation).

The paper deals with both ICT and media convergence regulation and multisector utility regulation, but does not preclude the possibility that both directions can be taken at the same time. Is it an ‘and’ or an ‘or’? In principle, they are not mutually exclusive; however, in practice it may be difficult to combine multisector infrastructure regulation with regulation of both infrastructure and content. However, close examination of the North American practice of convergence and multisector regulation would suggest that it may be feasible to structure a regulatory agency that is converged at the top, but organized in separate divisions that correspond to the current separate regulatory agencies in Europe and elsewhere.

[61] See William Melody (2002): *Building the Regulatory Foundations for Growth in Network Economies*. WDR Discussion Paper #1. http://www.regulateonline.org

The focus generally, and in this paper too, in the ICT and media convergence area is on the object (substance) of regulation, i.e. the extent to which regulation of different areas should be combined, taking technical and market-based convergence developments into consideration. With respect to multisector regulation, the focus is mostly on the organizational aspect. In the former, the subject matter is convergence regulation; in the latter, it is regulatory convergence.

Even though the substance and the organizational aspects of regulation are not necessarily directly related – it is possible to regulate closely interrelated subjects in separate institutions just as well as it is possible to regulate relatively separate issues in crosscutting institutions – combinations of institutions are most often built upon combined issues. This also applies to multisector regulation. As documented in the paper, different kinds of utilities can make use of the same conduits, and mergers and acquisitions may also occur across sector boundaries. Thus it could be argued that a common basis exists for regulatory coordination, if not for joint regulatory organizations.

However, the main arguments for multisector regulatory organizations deal with institutional questions of resource allocation and independence from undue government interference. The first point taken up is the costs of obtaining the requisite expertise. There are two sides to this. The first is the existence of adequate expertise in a national labor market. The second is whether regulatory institutions can afford to, or are allowed to, hire existing experts. The problem is found in all countries, but is exacerbated in developing countries. Multisector regulatory agencies may, under certain conditions, allow for a least-worst solution for regulation using a limited pool of qualified persons. If not a fully-fledged multisector regulatory agency, some aspects of a multisector organizational structure may assist European regulatory agencies combat administrative bloat.

The second point relates to the potential of multisector regulatory agencies to allow for a greater degree of independence from line ministries, again a question that is of obvious importance in developing countries, but not irrelevant in European countries, particularly those that have not yet let go of their incumbents. But the analysis contains a caution about the solution sometimes being worse than the original problem, in terms of making the regulatory agency vulnerable to the improper influence of finance ministries.

Third, the multisector option has the potential of preventing the wholesale transfer of government-monopoly mindsets through the staffing of the new agency by persons from the restructured incumbents. There is no guarantee that this outcome will be achieved, but a multisector agency organized on the basis of skills and interdisciplinary teams constituted for specific tasks is more likely to break free of incumbent mindsets than an industry regulatory agency.

With respect to ICT and media convergence, the main questions in the paper are to what extent different communication infrastructures can be regulated in the same manner and to what extent infrastructure and content can be regulated by one common set of regulations. The general trend around the world is to move towards common infrastructure regulation encompassing formerly more separate infrastructures, e.g. fixed telecom, mobile communications, cable and possibly terrestrial broadcasting. However, there are also some inchoate tendencies towards institutions with responsibility for joint infrastructure and content regulation.

The paper does not provide definite answers to these questions but seeks to raise the policy and regulatory issues of ICT and media convergence as precisely as possible. Indeed, the answers will be different in different countries. There is no one formula that can be used in all countries. Yet, countries will have to approach the issues of ICT and media convergence in a

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forward looking manner not only for determining new rules for interconnection, universal access and access to scarce resources, but also for building a regulatory framework for increasing the growth potentials in a networked economy.

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