

COMMUNICATIONS & STRATEGIES

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Technological convergence and regulation

Challenges facing developing countries

Edited by Jérôme BEZZINA & Bernard SANCHEZ

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Foreword

COMMUNICATIONS & STRATEGIES is proud to have been chosen by InfoDev to publish a special edition to mark the summit meeting in Tunis (WSIS, 16-18 November 2005).

As our readers may remember, COMMUNICATIONS & STRATEGIES published a dossier in the second quarter of 2005 tracing the links between development and investments in telecommunications networks and services (no. 58, edited by Bruno Lanvin & Gérard Pogorel).

This special issue focuses on the technological effervescence that is characteristic of the telecommunications sector in the all IP era. Such an approach has two implications. Firstly, the debate over regulation, which is the order of the day in the world's most advanced countries and their emerging counterparts, cannot be reduced to a debate of doctrines. It must be constantly informed by analyses of market transformations and dysfunctions, while bearing in mind the major objectives of social welfare.

Secondly, growth in the telecommunications sector was dominated for a number of years by growth in emerging economies. And, in many cases, it is these very countries that now stand to gain the most from cutting-edge technologies.

Edmond Baranes
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InfoDev designs and commissions a rich mix of research, pilot projects, capacity building activities, scalability experiments, project services for donors and communities of practice around key theme in ICT for development. All infoDev research activities are designed to enrich the knowledge base to support donors' operational work and all InfoDev field activities and capacity building exercises contribute to enhance impact on the ground. Linking research and action-on-the-ground is one of the key distinctive elements of InfoDev's approach, and assures that our services are relevant, scalable and rooted both in global best practice and local experience.

Call for papers

Dossiers

No. 61 – 1st quarter 2006

Competition in two-sided markets:

Application to information and communication industries

Editors: Marc BOURREAU & Nathalie SONNAC

In many information and communication technologies industries, markets are "two-sided," i.e. platforms compete in two different markets that are related due to network effects. Recent literature on "two-sided markets" provides interesting insights into understanding competition and regulatory issues in these markets. We would therefore like to call for the submission of papers on the economics of two-sided markets, with a focus on the media and digital industries (the Internet, software, telecommunications, etc.). Theoretical approaches are welcome, but the emphasis will be on empirical and policy-oriented papers.

Please send proposals to:

marc.bourreau@enst.fr - nathalie.sonnac@ensae.fr

As far as practical and technical questions are concerned, proposals for papers must be submitted in Word format (.doc) and must not exceed 20-22 pages (6,000 to 7,000 words). Please ensure that your illustrations (graphics, figures, etc.) are in black and white - excluding any color - and are of printing quality. It is essential that they be adapted to the journal's format (with a maximum width of 12 cm). We would also like to remind you to include bibliographical references at the end of the article. Should these references appear as footnotes, please indicate the author's name and the year of publication in the text.

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Special issue, November 2005

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Introduction

New Technologies and ICT Regulation Towards a Paradigm Shift?

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The ICT sector has undergone some dramatic changes in recent years, triggered by the development of new technologies and the convergence of existing ones, leading to a merging of markets and services. These developments affect traditional policy strategies, raising the question of how to deal with growing pressure to adopt converged regulatory regimes and how to successfully realize the potential of alternative network infrastructures.

Over the past few decades these dramatic technological advances have coincided with a first wave of reform in developing countries, which has had a positive impact. However, this positive impact was largely accidental, resulting from a combination of internal and external pressures to open telecom markets and the transfer of GSM technology, which had achieved economies of scale from deployments in more mature markets. With digitization, all media become translatable into each other and escape from their traditional means of transmission: convergence relates to the merging of separate fields. What is primarily conceived of as merged relates to technology, but in a secondary sense, a number of other fields come into play including services, markets, related player configurations (industry alliances and mergers) and regulation.

The regulatory changes and transformations related to new technologies are likely to dramatically affect 'plain old telecommunication regulatory models'. A major challenge for regulators, policy makers, and development agencies will be to anticipate the regulatory and policy models that should emerge to deal with issues and opportunities related to new technologies, particularly the migration to packet switched networks. Typically traditional regulatory and policy approaches may hamper these new models and it is

therefore important to develop new analytical tools and methods to address this paradigm shift. For example, the relevance of separating infrastructure from service or the separation in terms of optimal public/private financing mixes are issues that will need to be considered with the enabling of new technologies.

A primary question in designing this special issue of *COMMUNICATIONS & STRATEGIES* was the need to understand how, in a fast moving technological environment, effective policy and regulatory policies may be developed to fully leverage the opportunities created by rapid technological changes. The purpose of this issue is therefore to initiate the development of an intellectual framework and gather innovative content that explores issues related to new technologies and regulation policies. This is intended to help key players in regulation to keep track of new technologies and enable them to respond to new innovations "just in time" by adjusting regulatory frameworks and legislation.

Specifically, this special issues aims to:

- charter technological trends and their implications and document the consequences and repercussions on key regulatory issues;
- highlight the various options and debates surrounding these issues;
- use examples of developing and developed countries to provide a global overview of new telecommunication regulation best practices;
- understand how regulators in developing countries should tackle the paradigm shift and re-formulate questions related to classical regulatory and policy issues, such as licensing, interconnection, numbering, frequency management and regulatory structure in this context;
- examine the impact of new technologies on the feasibility of the open/ extending access models doctrine.

The idea here is not to provide definitive answers to such a wide agenda. Instead, this special issue aims to give to the reader some theoretical and empirical elements to understand the extent and range of issues at stake by investigating the implications of technological changes on ICT regulations.

To gain a better understanding of the forthcoming challenges for the telecommunications industry and regulators, an analysis of the premises of regulation in network industries, and particularly in the telecommunication industry is required. The aim of the first paper by Jérôme BEZZINA & Mostafa TERRAB is to describe the relevant technological trends, their impact on the traditional understanding of the telecommunication industry, and the way in which they may affect regulatory regimes. The other articles

in this special issue can be read as specific aspects of this global concern, but all contribute to an understanding of the central problem. The paper by Emanuelle AURIOL explores the following questions: what role should the regulator, and more generally public policies, play in developing countries and is the privatization policy justified from an efficiency point of view? She points out that while drastic changes in cost structures induced by technology advances explain the competitive structure of the internet or mobile markets, the characteristics of former public monopolies would seem to support arguments for maintaining them as public enterprises. The paper by Peter CURVEN & Jason WHALLEY, which investigates mobile markets in Africa, comes to the same conclusion as Auriol, namely that there is a need to regulate mobile markets which are controlled by a small number of groups as this jeopardizes the competitiveness of these markets.

The following papers, from Fernando BELTRAN, Alain BOURDEAU de FONTENAY & Marcio WHOLERS de ALMEIDA, and from Michel ROGY deal with the internet issue. The first paper defines the internet as a critical infrastructure and argues that the involvement of public policies is absolutely necessary. This definition of the internet as a critical infrastructure is particularly important with regard to public policy on universal access, not in terms of telephony penetration, but in terms of internet penetration. The second paper illustrates this concept by linking the viability of the ADSL business model in Sub-Saharan Africa to appropriate responses from regulators with a view to enhancing the development of broadband technologies. The author explores the different challenges faced by regulators to guarantee the viability of business models and those faced by traditional voice telephony challenged by VoIP, which explain the shift by incumbent operators to media markets. As demonstrated, if there is a market for the internet in Africa, we should not forget the absence of local contents in African countries and the low internet usage that results from this.

In such a context, the paper by Jean-Jacques GAUGUIER & Rémi DOUINE directly addresses the problem of local content and software production. After reviewing the policy framework suitable for the development of local content and software, as well as the difficulties encountered by developing countries in implementing such a framework, it proposes two pragmatic alternative transitory options: open source and creative commons paradigms. However, to benefit from paradigms and develop their own contents, developing countries have to appropriate those new technologies. Off-shoring is one of the more "natural" forms of appropriation. The paper of Rachele GIANFRANCHI, Carlo Maria ROSSOTTO & Yann BURTIN consequently investigates the role of offshore

outsourcing as a development opportunity for North African countries and as a way of integrating news technologies. The paper carefully details the conditions necessary to foster effective off-shoring in developing countries. The final paper by Bart CAMMAERTS address an issue that is often neglected in discussions of internet governance, namely how civil society, which is primarily concerned by NTIC, participates in the process and how it interacts with formal representatives of the State and transnational organisations via the internet. This paper points to the increasing influence of the internet as a counter power and a cradle of democracy.

Impacts of New Technologies on Regulatory Regimes

Introductory comments

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Abstract: Traditional regulatory doctrine has been called into question by rapid technological change and convergence. With the migration to packet switched networks, the emergence of the internet protocol (IP) and the expansion of the mobile industry, regulators are encountering major challenges in responding to new innovations "just in time" by adjusting regulatory frameworks and legislation. The paper's objective is to discuss the foundations of such a new regulatory framework and stimulate debate on how to ensure successful ICT/telecommunications regulation in a world of technological convergence. The paper opens with a presentation of the main technological trends at stake within the core of the traditional regulatory regime. Major consequences on the ICT sector are subsequently analysed in the second section of the paper, with an emphasis on structural change that may affect the sector as a whole. Taking overall market structure into account, the third section offers indications of the probable implications of technology trends on the very roots of regulatory regimes. The conclusion tries to represent the challenges of the new regulatory paradigm by addressing the probable implications of technology trends on a specific regulatory issue, namely interconnection.

Key words: regulation, convergence, technologies.

Regulatory intervention in network industries (electricity, gas, water, railroad and telecommunications) is based on the theories of natural monopoly and market failure. Insofar as the industry is considered a "natural monopoly," introducing competition is neither privately profitable nor socially desirable, and regulatory intervention is required to ensure the sector's optimal performance. While this traditional principle has some universality, careful adjustments may be required when considering the specificities of the telecommunications sector. Compared to other industries, telecom networks are characterised by a dramatic technological change and face the rapid diffusion of new technologies. A core question is how effective regulatory policies could be developed in order to fully leverage the opportunities created by rapid technological changes. The purpose of this introductory paper is to initiate the development of an analytical framework

and innovative content to explore issues related to new technologies and their impact on regulatory policies.

Traditional regulatory doctrine is thrown into question by rapid technological change and convergence. With the migration to packet switched networks, the emergence of the internet protocol (IP), and the expansion of the mobile industry, regulators are encountering major challenges in responding to new innovations "just in time" by adjusting regulatory frameworks and legislation. At a first glance, this emerging technological trend is likely to affect the main regulatory issues (interconnection, licensing, price regulation, spectrum management, numbering, security issues, and universal service obligations). Ultimately, the very boundaries and foundations of the overall regulatory paradigm are expected to be contested by this technological momentum.

The need for a new paradigm is even more meaningful in developing countries due to the opportunities to leapfrog technology and short-cut regulatory change. This new framework would ideally aim at facilitating the deployment of different technology options based on the establishment of an open, level playing field for all operators. The objective of this paper is to discuss the foundations of such a new regulatory framework, and to provoke a debate on how to ensure successful ICT/telecommunications regulation in a world of technological convergence. The paper begins with a presentation of the main technological trends at stake at the core of the traditional regulatory regime. Major consequences for the ICT sector are then analysed with an emphasis on structural change that may affect the sector as a whole. Considering overall market structure, the third section of the paper gives indications of the likely implications that technology trends may have on the very roots of regulatory regimes. Our conclusion tries to represent the challenges of the new regulatory paradigm by addressing the probable implications of trends in technology on a specific regulatory issue, namely interconnection.

■ Background

The rationale for regulation

Historically, the main objective of telecom regulation was to ensure the optimal performance of the POTS (Plain Old Telephone Services) network in terms of accessibility, affordability and QoS. This regulatory regime was based on the 'natural monopoly' doctrine. In the context of an increasing return to scale (large fixed costs) and/or market failure, if there is a cost advantage for a single firm to produce all given vectors of output more cheaply than any combination of several firms (cost sub-additivity), then the monopoly is "natural" and the introduction of competition is conducive to inefficiencies, involving the need for regulation. Therefore, as far as the industry being considered a 'natural monopoly' is concerned, the introduction of competition duplicates costs and is therefore neither privately profitable nor socially desirable.

Once telecom markets were liberalized and no longer subject to monopoly conditions, external regulation became necessary as part of the separation between operations, policy making and regulation. The main areas of regulation were interconnection, universal access/service and the management of limited resources. Licensing has also been a major tool in most countries with the purpose of either limiting the number of operators and ensuring that operators abide by rules and regulations, or just keeping track of the number and kinds of operators or simply extracting a fee on operation.

This paradigm is currently challenged by technological change. The ICT sector has undergone some dramatic changes in recent years, triggered by the development of new technologies and the convergence of existing ones, leading to a merging of markets and services. These developments affect traditional regulatory strategies, raising questions of how to deal with growing pressure to adopt a converged regulatory regime and how to successfully realize the potential of alternative network infrastructures. Indeed, the evolution of ICT technologies has had a decisive impact on the components of current regulatory design, and is also creating the need for changes and redesign. As a result, regulators and policy makers are aiming to keep track of new technologies and be able to respond "just in time" by adjusting their frameworks and legislation. Moreover, regulators may take advantage of the unique situation created by technological change to

provide access to unserved areas and to leverage information and communications infrastructures as tools for economic growth and competitiveness.

The technological trend

The technological development of ICTs can be seen as a two-stage process.

In the first wave of technological change, three main developments (digitalization, computerization, and packet switched technologies) had a radical influence on the ICT landscape and the development and formation of different technologies/applications. The most fundamental precondition for the development of any other technological change is digitalization. It makes it possible to harness synergies throughout the whole value chain and consequently enables the expansion of resources in the access and core networks in a technical and cost efficient way. Computerization is another fundamental development and the role of computers has been vital in the development of infrastructures and the deployment of network nodes as a replacement for switches and as devices adding intelligence to network nodes. Lastly, packet switched technologies have played an important role in facilitating more effective use of available resources in different network infrastructures and enabling platforms for multi service delivery in the same network, and thus real convergence.

As far as the second wave of technological change is concerned, three different trends may be identified: the emergence of the Internet Protocol, new infrastructures and convergence.

The deployment of IP in virtually all infrastructures and services enables the fundamental separation between the transmission layer and the service and application layer below. The emergence of new infrastructures is identified as the second technological trend and may take different forms: new transport and network infrastructures in current legacy communication networks, a transport and network infrastructure in current legacy infrastructures, which are not designed for communication (like power line communication), and new physical infrastructures using wireless and wired technologies like WiFi/WiMAX, optical fiber, and hybrid optical & electrical infrastructures. The third technological trend, convergence, goes beyond the specific communication sectors and has a cross-sectoral impact. Digitalization, IP and advanced communication protocols/technologies

enable different services belonging to separate networks to come together. Convergence can be expressed as the ability of different network platforms to carry essentially similar kinds of services and the coming together of consumer devices such as the telephone, television and personal computer. It is therefore not just about technology, but about services, new ways of doing business and of interacting with society.

■ Three major consequences

Fundamentally, this two-stage technological development within the ICT industry has had three major consequences.

The end of the layered networks model

In the traditional model ICT networks were vertically integrated and mainly operated by the same entity. Infrastructures were organized based on a "Layered Network Model" composed of consecutive layers: duct and mast level, cable and antenna level, transmission level, network level and application level. The interface between layers was technically standardized by protocols and commercially agreed in service level agreements and other business and contract standardized commitments. For example, one player on the transport layer could rent fibre from several dark fibre providers to span its network and would need similar performance standards from each to simplify its offer to the service layer. Today these layers tend to be disintegrated at different levels. This very transformation from a vertically integrated system to more open platforms has a massive impact on the market for ICT services.

The decentralization of intelligence

Traditional telephony was a highly centralizing technology. The "intelligence" in the network was located centrally (in the functionalities of the switch) and usually controlled by one organization. In its historic form, largely "dumb" devices (telephones) were attached to the network and these had only a limited set of functions. By contrast, in the IP network no single entity controls anything but the most basic transport and relationships with other networks. The service-providing "intelligence" is deliberately designed out of

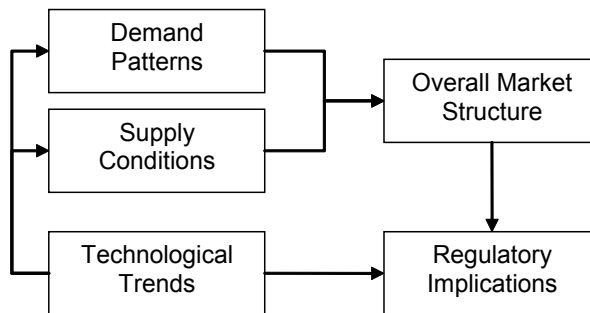
the network architecture: as a result, the network is "dumb" and intelligence is at the edge of the network. For example, a computer accessing the network has a far more complex range of service functionalities in its application programs and this is not solely related to its size. The decentralized "intelligence" in IP networks has consequently allowed strong growth in innovative services, content and applications in the developed world context.

The divergence of infrastructure and services

Another significant market development is the separation of infrastructure and services. Formerly, infrastructure and service provision were integrated in individual companies. The same companies rolled out the infrastructures and supplied the relatively few services provided on these infrastructures (such as telephony). With digitalization, the technological potential for separating the different layers in the provision of communication services has increased. Moreover, this potential has increased further with packet switching technology. For example, the growth of e-Bay and Skype is the product of a lively market of providers in the service layer outside the vertically integrated domain of historic operators. The ongoing transition from large vertically integrated organizations (like incumbents and second national operators) to a small number of infrastructure providers feeding a mass of service-based companies is likely to mean that there will be a far greater number of horizontal players with trading between the different network layers in the market. Furthermore, whether due to market imperatives or regulatory pressures, significant numbers of historic operators are separating out their different operations into more or less free-standing subsidiaries.

■ Towards a new regulatory paradigm?

Regulation may be affected by technological developments in two different ways. Firstly, new technologies lead to the development of new services and modes of delivery unforeseen by existing regulation. Secondly, they affect the overall market structure and the level of competition by changing the conditions for supply or patterns of demands, which again affect the need for regulation.



Innovation and expansion capacity

To introduce the impact of overall technology trends on market and regulation, one may consider the development of new types of infrastructures and the increasing use of IP and other packet switching protocols. As they facilitate service convergence through the provision of common protocol, the two technology trends mentioned above imply competition between different types of players at the network level.

At the infrastructure level, the most important trend is the development of a new type of infrastructure. A growing number of infrastructures are available and the capacity of each of these infrastructures is increasing. The expansion of transmission capacities is related to technologies like: compression and the development of more efficient transmission protocols, modulation and coding of signals, software defined radio transmission and digital access technologies. For example, the impact of use of optical fibres is firstly related to a dramatic expansion in network capacity.

This tendency impacts service development (development of high bandwidth capacity services), and the cost structure of telecom networks. Furthermore, the use of optical material is impacting network convergence through capacity increases as optical telecom networks have the capacity to carry broadcasting services and optical broadcasting networks the capacity to carry telecom services, including broadband internet access. In addition to this use of optical fibres enables infrastructure sharing between telecom and electricity networks as power lines and optical fibres can be laid in the same ducts or even integrated in the same cables.

From the regulatory side, this new type of infrastructure is related to an increased spectrum range. Increased spectrum range is one of the key

drivers of the expansion of the transmission capacity in optical fibres, but is at least as important for growth in the capacity of wireless networks. It is, however, important to note that not all frequency resources are equally suited for the transmission of all applications. Therefore scarcity in certain frequency bands may persist, even if there are ample resources in other bands. The use of high frequencies eases the use of small cells in cellular networks. Capacity can therefore be increased, but the costs are also increased.

The increasing use of IP and other packet switching protocols IP/TCP is another element to be taken into consideration. For example, the dominance of IP as a transmission protocol increases interoperability between different services, as well as different service providers. This reduces barriers of entry, as it is easier to make a new service or new content available to a wide audience. Furthermore, through network intelligence, most functions including routing can be entirely separated from network operations. This enables a vertical separation of service provision from network provision.

Implications for overall market structure

Technology impacts the telecom market in many different ways. As pointed out above, new network technologies may be seen as process innovations, as they enable expansion of network capacity. On the other hand, expansion of capacity opens up the network for a wide range of new applications. For this reason, it is more meaningful to distinguish between different types of technology implications for market structure than different types of technologies. We will focus here on types of implications with an impact on the need for and design of regulations for the telecom market. These implications are horizontal integration and vertical separation.

New innovations have blurred the boundaries of the telecom sector. A wide range of new telecom service products have been created. Some of these products incorporate service elements from other sectors (such as IT or broadcasting). At the same time, digitalisation and the expansion of network capacities enable network convergence, namely the transmission of IT, telecom and broadcasting services on the same networks. The moving boundaries between telecom and relates sectors are best illustrated when one considers the layered network model outlined above.

Horizontal integration involves convergence between two or more of the different branches of the sector (IT, telecoms, broadcasting and other

media). Convergence, on the other hand, can take place in one or more of the three levels in the value chain (content/services, transport/software and equipment/hardware). The digitalization of voice and other communication services means that it is now possible to handle many different services on the same network (network convergence). Examples of these services include: cable telephony, internet via cable, IPTV, VoIP, triple play and 3G broadcasting. These trends do not imply the immediate unification of these different markets. Different services will continue to be transmitted on a number of competing networks using different technology platforms (wired and wireless). However, each type of network will have its own comparative advantages in providing particular services in a particular environment. Although a unified pure optical network providing all sorts of communication services may be the optimum solution in the long run, this will not materialize in the immediate future, particularly not in low and middle income countries.

The competition between network types will be shaped by the availability of existing network structures, as well as demographic factors such as customer density and the demand for particular services. It is a regulatory challenge to ensure fair competition without favouring particular technologies. If not properly designed, regulation can skew competition between different networks.

The vertical structure of telecom markets has undergone considerable changes since the 1980s. Previously, the telecom sector was dominated by national or regional monopolies controlling all levels of the value chain and with close ties to the national equipment industry. In some countries operators even produced parts of their own equipment. Since then the market has become much more disintegrated, and different levels in the value chain may be controlled by different companies. One reason for this is that use of digital transmission technologies and of the IP protocol has made it easier to separate the various functions. It has become easier to separate network and service provision. This enables the development of a market structure with a vertical separation of network operators and service providers, as seen in the internet market. This has created a market structure with different levels of competition within different market segments, and a supply structure with a wide range of companies representing different degrees of vertical integration. The first category only includes incumbent operators, as they are the only players with a fully developed fixed access network. The second category includes companies supplementing their own infrastructure by leasing raw infrastructure facilities from others. This enables them to maintain full control over all network functions. They may, however, also outsource part of their transmission by

use of switched interconnection to other networks. Mobile virtual network operators (MVNOs) belong to this category. Another possibility is to act only as a service provider and let another telecom company be responsible for all network operations. In this way some of the most important barriers to entry found in the telecom market are avoided. The last category includes companies from other public utility sectors with their own network facilities such as railway and electricity network companies. Such companies may wish to profit from their access to infrastructure without engaging in all segments of the value chain in an entirely new business area.

One of the major aspects of vertical separation is that it becomes possible to provide services without local presence. This implies that services like VoIP may be provided by companies that are outside the jurisdiction of the national regulator.

Impacts on cost structure

Although telecom networks were seen as natural monopolies with a limited scope for competition a few decades ago, it has become feasible to establish competition in most segments of the telecom market. The natural monopoly doctrine is largely based on cost concepts such as cost-subadditivity, increasing return to scale and economies of scope. New innovations have not only made substantial cost savings possible, they have also impacted the cost profile for telecom networks. From a market regulation perspective, the impact of new technologies on cost structure is important. In order to address this question, a rapid overview of the economics of the various network technologies at stake is given below.

To establish a copper based network demands substantial long term investments, particularly in the access network. Here the major cost driver is total cable length, which again depends on the number of connections and the density of customers. Therefore it can cost five times as much to connect customers in rural areas as in metropolitan areas. A major part of the costs are related to the laying of cables underground. Here substantial savings can be obtained by using ducts that can be used for several cables. The digging costs are highly dependent on the geo-type of the site. It should be noted that digging costs per kilometre are often much higher in metropolitan areas than on open land.

Cable TV networks are established to provide broadcasting services. The total costs for a cable TV network are somewhat lower than for a copper-

based telecom network. The costs for an upgrade in order to provide data services are comparable with those for upgrading telecom networks to xDSL. However, the share of fixed costs is lower.

Due to their very high capacity optical fibres have first been installed in the core network. This has reduced the costs of long distance communication to less than 1% of the former costs per traffic unit. This has implied that the costs of fixed network services are concentrated in the local loop and convergence between the costs of local and long distance communication. It follows that the installation of an optical fibre network involves substantial long term fixed costs and that there are very high levels of economies of scale and scope. However, the costs of end equipment are largely variable, as the costs of transmitters converters etc. depend on bandwidth capacity.

The cost of establishing a new wireless network are considerably lower than for a fixed network, as the costly last mile can be completely bypassed. 2G networks in particular have proved to be a cost effective viable alternative for provision of telephony. The establishment of 3G networks is, however, much more costly, particularly in low density areas, as maximum cell size is much smaller than for 2G services. In high density areas the costs per bit may, in some cases, be even lower than in 2G networks. The major cost driver for 2G and 3G networks is geographical coverage. When density of use increases a certain point, usage becomes the major cost driver, and the fixed costs constitute a lower share of the total costs than for fixed networks. The lifetime of the investment is also shorter.

A Wi-Fi network can be set up at very low cost and demands no long term investments. Wi-Fi is often seen as an alternative to 3G as it offers higher bandwidth capacity at lower costs. At present the limited range of coverage implies that Wi-Fi can not be used as a substitute for the entire local loop in rural areas. The WiMAX standard provides similar functionality as Wi-Fi, but with a much higher range. In contrast to Wi-Fi, WiMAX uses licensed frequency resources in some cases, which may add to the costs, and also make it more difficult for small local operators to use this technology.

■ Conclusion: an example of regulatory challenge

An implicit idea of this paper is that, to understand technological implications on the level of regulatory issues, their impact on regulatory foundations must first be analysed (see figure below). This calls for a transversal analysis, with an emphasis on the principles embedded in regulations and underpinning them, to understand their probable consequences on well-known regulatory areas such as licensing, universal access and interconnection.

Why interconnection (still) matters

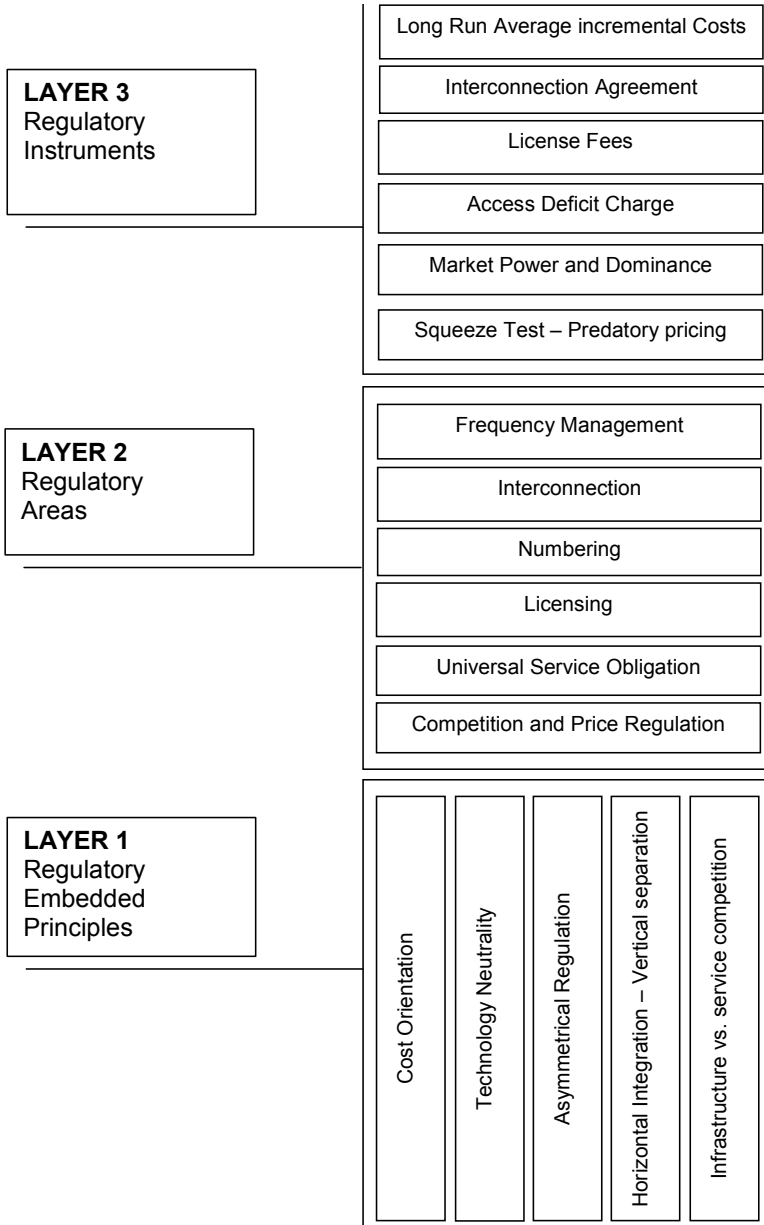
In enabling the creation of new alternative communication networks, new technologies confirm interconnection as an important tool for the facilitation of competition in both services and facilities. Convergence and the increasing importance of packet switched services are bound to affect the kind of interconnection products developed. These products include new network products in both the access and the core network.

They also raise challenging issues: what interconnection service products are relevant for the provision of voice telephony (including mobile, fixed and VoIP), internet access, broadcasting services etc.? What interconnection products will become relevant in next generation networks (for example, constant bitrate, variable bitrate and available bitrate)?

Another issue related to the 'disconnect' between infrastructures and services is the changing environment for interconnection. Interconnection basically depends on two main questions: standards and the incentives for operators to interconnect (including the regulatory obligations on operators).

The standardization question (see below) has partly become more transparent with the layered structures of communication networks and partly more complicated because of the abundance of standards for the different layers. The question of interconnection regulation becomes more diversified with the many different forms of interconnection agreements regarding the different layers in the communications processes.

As a consequence, switched interconnection of voice telephony and the related charging mechanisms will, de facto, become less important.



As phone calls will only be one out of a number of different types of communication services in a packet switched network, the core issue will be interconnection between unbundled network elements and exchange of data in an IP network, rather than mediation of voice calls between different networks. Moreover, the current regulatory framework for interconnection focuses on interconnection of telecom networks, while for instant broadcasting networks are either unregulated or subject to different types of regulation. Convergence implies that harmonisation is necessary in order to achieve technology neutral regulation.

Should regulation be cost-based?

As mentioned earlier, the change in technology from circuit-switched to IP-based networks affects the cost of providing and running networks. Consequently, regulators must be aware of new cost structures. They will need, if they don't consider moving to something like capacity-based interconnection rules, to revise the figures they determine (and the basis of their determinations) to take into account the change in the nature of the networks.

IP telephony for example, has dramatic impacts by reducing the costs of providing voice telephony services. Technology is steadily decreasing the cost of networks, while the costs of billing and customer service may be falling more slowly. This creates strong downward pressure on retail prices. As a result, POTS operators may be obliged to undertake unanticipated write-offs of the value of their existing assets. In African countries, this issue may be relevant, as many new entrants are already IP-centric (i.e. use IP in their core backbone networks), as opposed to incumbents that are only starting to move away from their legacy systems and upgrade to IP-based backbones.

Should regulation be sector specific?

The question of sector specific and/or general competition regulation is related to two intertwined issues – firstly, the market implications of technology convergence, and secondly, the development of the telecom markets towards more 'normal' market conditions. The reason that they are intertwined is that convergence – insofar as it opens up telecom markets to increasing competition, provides new modes of access and eases the

restrictions on radio frequency usage – will contribute to a 'normalization' of the telecoms area.

The present sector specific regulation in telecoms was implemented in connection with the liberalization process in the area. The main fields of sector specific regulation are universal service/access, interconnection and the regulation of limited resources (radio frequencies, rights of way and numbers). Although this may not have been generally agreed from the beginning, a main goal of sector specific regulations has been to reach a stage in market developments in the area, where special regulation can be lifted. This applies to interconnection when it is clear that unregulated market mechanisms are able to see to the optimal spread of access technologies in the specific markets and where, at least, the asymmetric parts can be disbanded once it can be determined that there is sufficient competition between different providers. An open question remains, however, whether interconnection regulation of the relations between equal sized operators must continue or whether network effects will automatically lead operators towards interconnection. It finally applies to the regulation of limited resources if new technological solutions will partly solve the scarcity issues. However, as there always will be some kind of exclusivity aspect to these questions, some kind of regulation (or self-regulation) will always be necessary.

Technology neutrality and standardization

Technology neutrality is a prescription for avoiding (too much) public intervention in the choice of technology solutions in markets. It has become a basic guidepost for regulatory intervention around the world. Technology neutrality is partly based on technology convergence, as similar services can be supplied on different technology platforms, and as regulations should seek to promote competition between different technology solutions, instead of 'picking a winner'. However, the prescription for technology neutrality goes beyond technology convergence, as it is based on a more profound policy of limiting public intervention in the directions of technology development. The idea is that market mechanisms are better at making these choices, and that the risks of 'wrong' technology choices by the public sector are substantial.

Technology-neutrality is still considered as a fairly good regulatory principle in a converged environment. Neutrality ensures a fair and predictable regulatory regime, flexible enough to embrace technological

changes and market developments. The question of how to adopt a technology-neutral interconnection regime, in a context where IP-based networks are becoming the main voice traffic carriers, is of growing importance for regulators. The spread of IP telephony raises dramatic interconnection payments issues. In a classic direct regime interconnection payments are possible because of the regulatory requirement of cooperation between origin, transit and termination operators. In a VoIP context, levying different levels of interconnection charges may simply not be possible for terminating operators due to the use of virtual numbers and the difficulty of locating the origin of calls.

Standardization activities have changed immensely since liberalization started in the telecoms sector. The focus has shifted from network aspects towards application and service issues. With growing convergence between telecoms and IT, securing interoperability between applications and services is a key task. This does not mean forcing private companies and citizens to use specific standards, but there can be important public assignments in promoting the use of standards and specifically open standards in and between public organizations, thus also influencing the use of standards not only between public institutions and citizens and private enterprises, but also among citizens and private enterprises. These kinds of standardization activities at a national level, specifically on the application and service levels, should not seek to restrain the use of new standards. The aim should be to facilitate the interoperability between different applications and services. The approach should be open to the introduction of new standards and to promote the use of open standards. The standardization activities should thus be seen as facilitation activities for market development.

Telecommunication Reforms in Developing Countries

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Abstract: Major innovations have pushed telecommunication costs down and demand up since the mid-1980s. The new segments of the mobile and the internet markets are hence suitable for oligopolistic competition. Reforms of the former public monopoly have been necessary to accommodate the entry of new operators. It is important to disentangle the effect of market liberalization that occurred in response to technological change and demand growth from the effects of privatizations resulting from structural adjustment programs. In line with popular opinion, privatization per se did not benefit consumers much. The biggest improvements for consumers have been driven by competition from mobile telecommunication firms. Governments should concentrate on liberalizing the mobile and internet segments. For the incumbent telecom operator, allocative inefficiency combined with the critical budgetary conditions found in most developing countries favour public ownership. This is an effective way of combining the regulation of the firm with a maximum level of taxation.

Key words: telecommunication, privatization, liberalization, regulation, developing countries.

The percentage of countries that allowed private shareholders to own stakes in their incumbent telecommunication operator rose from 2% in 1980 to 56% in 2001 (International Telecommunication Union, ITU 2002). Simultaneously, markets worldwide have opened up to new entrants in the mobile and the internet segments. In the mobile market 78% of the 201 countries included in the ITU database had adopted some degree of competition by 2001; while this figure was 86% in the internet market. The massive trend towards privatization and liberalization should not mask the fact that almost half of the countries in the world still have a public incumbent operator and that roughly 20%, mainly developing countries, have no private operator in their telecommunication industry at all. Similarly poor countries have limited their liberalization reforms to the mobile and internet segments. In the fixed telephony market over 60% of the world's countries have a monopoly.

The differences between telecommunication industrial policies from country to country raise the issue of how optimal reforms have been. Are poor countries lagging inefficiently behind, as is sometimes argued by the advocates of privatization, or is there a rationale for keeping the incumbent telecommunication operator public and monopolistic? The answer to this question is not clear. Assessment of reforms varies widely depending on the assessor. Since they have led to improvements in the financial and operating performances of divested firms, and in many cases also to network expansion, specialists tend to think that the reforms have been successful. This positive appraisal contrasts sharply with the popular view among consumers in developing countries, where there is a widespread perception that the reforms have hurt the poor, notably through increases in prices and unemployment, while benefiting the powerful and wealthy. In a 2001 survey of 17 Latin American countries 63% of participants disagreed or strongly disagreed with the statement: "The privatization of state companies has been beneficial" (*The Economist*, July 28th-August 3rd 2001, p. 38). Similarly in Africa, reforms have been qualified as "re-colonization" due to the participation of foreign investors in many cases. It seems hard to reconcile consumer dissatisfaction with specialists' contentment. On the other hand, the unpopularity of the reforms cannot be disregarded by those who promote decentralization and democracy. This paper thus aims to clarify this issue. It analyses the advantages and drawbacks of telecommunication privatization and market liberalization in developing countries.

■ Privatization and consumers' surplus: allocative versus productive efficiency

Productive efficiency

Transfer of public ownership to private ownership has generally been grounded in the poor economic performance of public enterprises. A critical problem induced by public ownership, first identified by KORNAL (1980), is the lack of any commitment on the part of the government not to bail out or subsidize money-losing firms. This commitment problem is referred to in literature on the subject as the soft-budget constraint (interesting surveys are available in KORNAL, 2000; KORNAL, MASKIN & ROLAND, 2002):

"The softening of the budget constraint appears when the strict relationship between expenditure and earnings of an economic unit (firms, household, etc.) has been relaxed, because expenditure will be paid by some other institutions, typically the paternalistic state." (KORNAI, 1980).

The author shows that soft-budget constraints explain many inefficiencies occurring in socialist economies such as shortages or low price responsiveness. KORNAI (2001) provides evidence of the use of soft-budget constraints by state-owned enterprises (SOEs) in developing countries. Since less efficient firms have been allowed to rely on the government for funding, they lack the financial discipline required for efficient management (DEWATRIPONT & MASKIN, 1995; SCHMIDT, 1996). In DEWATRIPONT & MASKIN (1995) and MASKIN (1999) the soft-budget constraint is caused by the contract incompleteness between governments and firms. In these two papers soft budget constraints affect the level of un-contractible investments made in firms by managers. By hardening the firm's budget constraint, privatization helps to restore appropriate investment incentives and improves production efficiency. Another part of the theoretical literature stresses that public ownership is associated with a lack of economic orientation in governments' objectives. For instance, in KORNAI & WEIBULL (1983), SHLEIFER & VISHNY (1996), DEBANDE & FRIEBEL (2003), governments are described as adopting 'paternalistic' or political behaviour as they seek to protect or increase employment; in SHAPIRO & WILLIG (1990), governments are simply malevolent.

The main conclusion of this theoretical literature is that privatization improves the internal efficiency of firms. Empirical evidence supports this result. MEGGINSTON & NETTER (2001) offer an extensive review of the literature available on the subject covering 61 empirical studies at a company level (both within and across countries). They conclude that privatized firms are more productive and profitable than public firms in both developed and developing countries. This result, which is theoretically robust and empirically grounded, seems incontestable ¹.

¹ This does not mean that privatization always improves firm performance. In three studies, looking at 204 privatizations in 41 countries, between 1/5 and 1/3 of privatized firms have registered very slight to no improvement, and even occasionally, worsening situations (MEGGINSON & NETTER, 2001).

Allocative efficiency

It is indisputable that privatization tends to improve firms performance. In contrast the assumption made by advocates of privatization, namely that efficiency gains are automatically transmitted to consumers, merits further discussion. Let us assume for a moment that the social objective of government is to maximize the surplus of trade. In a perfectly competitive market where price equates marginal cost, it is true that consumers benefit from the efficiency gain generated by privatization. However, in increasing return to scale industries, moving from public to private ownership does not offer a solution to the lack of competitive pressure. In the absence of government intervention, the number of firms that survive in equilibrium is small. Their rent seeking behaviour leads to high prices and allocative inefficiency and such market imperfections hurt consumers. Empirical studies hence reveal that privatization results in lower prices and higher output in competitive industries, but not in oligopolistic ones (see NELLIS, 1999). For instance, NEWBERY & POLLITT (1997) estimate the welfare consequences of the privatization of the UK electricity sector. They conclude that there were permanent gains equal to 5 percent of previous total generation costs, but at least in the first few years following privatization the new private shareholders reaped most of the gains, and both government/taxpayers and consumers lost out².

The fixed line telephone is characterized by large economies of scale. Since WALRAS (1936) such infrastructure industries have been referred to as natural monopolies. According to traditional regulation literature, a legal monopoly should be set to prevent wasteful duplication of investments. It thus seems natural that over 60% of the world's countries maintain a monopoly in the fixed line telephone segment (44% fully public and 16% with private participation). Moreover the legal monopoly should be regulated to avoid the deadweight loss created by monopoly pricing. Under the complete contract approach adopted in literature (see LAFFONT & TIROLE, 1993), there is no difference between public ownership and private ownership under regulation of entry and price. The result is important because it illuminates that ownership is not the key to the allocative efficiency problem; in increasing return to scale industries regulation is the key. Empirical evidence supports this result. Using a sample of 30 African and Latin

² The authors argue that the government underpriced the shares in order to ensure political success. The outcry in Britain concerning the windfall gains to shareholders in this privatization helped Tony Blair's Labour party regain power. It also led to the imposition of a special tax on the profit of the shareholders (see BIRDSALL & NELLIS, 2002).

American countries, WALLSTEN (2001), for instance, finds that privatization alone is uncorrelated with improvements in the telecommunication sector, and, in fact is negatively correlated with mainlines per capita and connection capacity. However, privatization combined with a separate regulator is positively correlated with connection capacity and payphone penetration. Similarly the experience in industrialized countries shows that regulation, especially the regulation of access pricing to bottleneck facilities (for example, the fixed distribution network) is a key component of successful liberalization reforms. The result is worrying because governments in developing countries, which used to control prices and production in telecommunication through public ownership, have not been very successful in establishing regulatory institutions. They usually lack the human resources, the experience and the credibility necessary to control large corporations. A major concern with privatization reforms has been government commitment ability. According to a World Bank database on Latin America, the concessions that were granted to private operators following the divestiture of public firms were renegotiated after an average of only 2.1 years (see LAFFONT, 2001; GUASH, LAFFONT & STRAUB, 2002). This problem is reinforced by the fact that, in practice, governments in developing countries are not focused on consumer surplus.

Opportunity cost of public funds

Government pursues multiple objectives, such as the production of public goods, the regulation of non-competitive industries or the control of externalities, under a single budget constraint. Since the latter usually binds the opportunity cost of the public funds (i.e., the Lagrange multiplier associated with the constraint) is strictly positive. Concretely increasing investment in infrastructure such as a telecommunication network means decreasing the production of essential public goods such as national security, law enforcement, or commodities that generate externality such as health care and education, or alternatively, increasing the level of taxes or debt. All these actions have a social cost, which must be traded off with the social benefit. Symmetrically when the government is able to tax an industry such as the telecommunication industry it can increase its investment in education, health care or other areas. The social benefit generated by this investment must be compared with the reduction in consumer surplus generated by taxes. Contrary to the price mechanism, government intervention is not, and cannot be, anonymous; it depends on the opportunity cost of public funds.

The opportunity cost of public funds, defined as the Lagrange multiplier of the government budget constraint, is higher when, everything else being equal, government revenue is lower³. Tax revenue as a proportion of GDP is typically much lower in developing countries than in rich countries. The tax revenue-GDP ratio for 1995, for example, was 36.1 % for OECD countries (see official statistics on the OECD website) versus 18.2 % 1995-1997 for developing countries (TANZI & ZEE, 2001 based on a sample). The difference in taxation level reflects the fact that taxation is a non-convex activity (see WARLTERS & AURIOL, 2005). Drawing the first euro involves sunk cost. For instance, to transform the informal sector into a formal one firstly requires investment in education, so that all firms' managers are able to keep records. The government must also provide incentives for firms to register officially, train inspectors to control corporate activities etc. Developing countries are too poor to invest heavily in education, or even in their tax administration. They cannot match OECD countries' direct taxation level. Other sources of public funds are crucial to them. This includes revenue from public firms. The following sections examine how macro-economic budgetary constraints affect privatization decisions.

■ Privatization and government revenue: the fiscal argument

AURIOL & PICARD (2002) study the impact of poor public budgetary conditions on the privatization decisions of infrastructures and public utilities. Their paper offers a theoretical analysis of the relationship between the financial constraints of a country and its industrial policy. The opportunity cost of public funds summarizes the tightness of government budget constraints, with larger costs stemming from tighter constraints. Utilitarian governments maximize the sum of net consumers' surplus and of transfers to the firm weighted by the opportunity cost of public funds. The paper then focuses on the impact of the opportunity cost of public funds on the privatization decision. It shows that the privatization of natural monopolies

³ The opportunity cost of public fund is different from the marginal cost of public fund (i.e., the dead weight loss created by increasing marginally a specific tax). The MCF is a general equilibrium concept. It is relevant in the long run because it indicates the social cost (or benefit) of tax reform (for more on the MCFs in developing countries see WARLTERS & AURIOL, 2005). However in the short run the taxation level is more or less fixed. The Lagrange multiplier of the government budget constraint, referred to as the opportunity cost of the public funds, then is the relevant parameter for cost benefit analysis.

with price liberalization depends on firm profitability and on the tightness of the government budget constraint. This implies that optimal industrial policy is generally different in rich and in poor countries.

In the model the government assumes responsibility for a public firm's profits and losses. It subsidizes the firm in case of loss and sizes its profit in case of benefit. Disturbed by the situation of incomplete information, the government can hardly discriminate between high and low cost firms. This creates an incentive problem. *Ex-post*, it transfers too many resources to firms (through subsidies, for example). In contrast managers and/or owners of privatized firms assume responsibility for the firm's cash flows. One benefit of privatization is that it reduces government subsidies to money losing firms. For instance, the privatization commission of Burkina Faso, reported that government subsidies to SOEs dropped from 1.42 percent of GDP in 1991 to 0.08 percent of GDP in 1999 as a result of privatization (OECD-BAD, 2003). However, privatization has a price. On the one hand, the government is not able to take advantage of positive cash flows in profitable firms. On the other hand, it abandons direct control of the firm's operations, especially prices, which has a cost to consumers. Indeed empirical evidence shows that the output prices of natural monopolies increased as a result of privatization ⁴.

Prices are sometimes increased ahead of privatization in order to reduce the SOEs financing gaps and attract buyers. This, for instance, was the case with electricity tariffs in Zimbabwe, Kenya and Senegal, which the government increased by 10% after reaching an agreement with Vivendi Universal (see OECD-BAD, 2003). An unaccounted part of price increases stemmed from the termination of illegal connections (BIRDSALL & NELLIS, 2002; ESTACHE *et al*, 2002; OECD-BAD 2003). Privatization in developing countries should be treated as the move from public ownership with regulation of entry and price to private ownership with price liberalization. It not only involves a transfer of ownership, but also includes price deregulation. Nevertheless it is not equivalent to *laissez-faire* because entry remains regulated (through licence and entry fees).

One question addressed in the paper is whether the elimination of subsidies to unprofitable firms and the cash-flow generated by the sale can compensate for the price distortion associated with privatization and the loss

⁴ "Steep price increases following privatization have been quite common in divested network or infrastructure industries, e.g. electricity and water and sewerage, and common but not universal in telecommunications." (BIRDSALL & NELLIS, 2002).

of revenue from profitable public firms. The answer is positive. This result is not obvious because a benevolent regulation should be able, at worst, to mimic the private monopoly outcome. This is at least what the revelation principle suggests. However, because of the *ex-post* profitability constraint in SOEs (and not in private structures), this intuition turns out to be false. When public finance matters, privatization without price control can dominate a benevolent regulation. The optimal decision depends on the profitability of the industry.

Low profitability segment

When the profitability of a market segment is low, the optimal industrial policy is monotone in the opportunity cost of public funds. For low opportunity cost public ownership dominates privatization, while the reverse is true of high opportunity cost. This implies that governments in developing countries should get rid of their unprofitable public firms, which in practice they do. One third of the privatizations to end 1996 in Africa, for example, were liquidations or asset sales of unprofitable firms (SARBIB, 1997). The result also applies to investment with low anticipated profitability. For instance governments with abundant fiscal resources subsidize the construction of a new infrastructure and let consumers use it at marginal cost. This policy maximizes the consumer surplus, which in the case of low opportunity cost of public funds, is equal to utilitarian social welfare. On the other hand, when the opportunity cost of public funds is high, the government objective function is tilted towards transfers. Subsidizing the infrastructure is socially costly. Privatization is an appealing alternative to the scarcity of public funds. To illustrate this point consider the limit case where the government cannot finance an extension of the fixed-line telephone network, for instance in a rural area. If a private company is eager to expand the network in exchange for the freedom to charge monopoly pricing it is optimal to let the firm do so. Indeed, it is better to have a privately owned and operated infrastructure, even with the monopoly distortion, than no infrastructure at all. By continuity the result still holds when the government is able to finance the infrastructure. The drawback of this policy is that it increases inequality (the rich have access to new services while the poor are deprived from them). To avoid popular outcry the government should consider subsidizing access for the poorest segment of the population. The subsidies can be financed with public funds when there are enough of them (see AURIOL & PICARD, 2005) or by the wealthiest segment of demand (namely cross-subsidies). It is worth noting that OECD countries have traditionally relied on cross-subsidies. The U.S. Congress, for example,

directed the Federal Communications Commission to subsidize internet services to schools and libraries in the Telecommunications Act of 1996. The internet access discount, estimated at USD 2.25 billion per year, was funded by an increase in the price of interstate telephony services. HAUSMAN (1997) estimated that this indirect taxation cost USD 2.36 billion (in addition to the USD2.25 billion granted to schools and libraries). Taxation by regulation arises because Congress wants to implement social programs, but is unwilling (unable) to increase general taxes. Implementing cross-subsidies calls for close monitoring of firms' pricing policy. Governments in developing countries eager to do perform this task first need to establish an efficient regulatory authority.

Profitable monopoly

When the public utility is profitable in the natural monopoly segment of the service, the optimal industrial policy is non-monotone in the opportunity cost of public funds. The result is a consequence of the difficulties encountered by developing countries in attracting investors while auctioning off their profitable state owned enterprises (SOEs). Indeed, country risk analysis is very important in today's global investment strategies because it forms the basis of determining future expected returns on investment. Since the perception of business risk is higher in poor countries, as for instance illustrated by the International Country Risk Guide, this negatively affects the supply and cost of international capital flows for these countries. Empirical studies thus show that SOEs are generally sold at a discount (see BIRDSALL & NELLIS, 2002). With under priced public assets, AURIOL & PICARD (2002) show that the optimal policy is non-monotone in the opportunity cost of public funds⁵. When the opportunity cost of public funds is low, the government sets prices close to marginal cost and subsidizes the regulated firm to cover fixed costs. Rises in the opportunity cost of public funds increase the social cost of such transfers. The government prefers to let a private firm take over for intermediate values. Finally, for large values the government, which focuses on revenue, prefers to keep profitable firms public rather than to sell them off. Prices are set close to the private monopoly level in order to maximize profit and thus government revenue. For low and high value opportunity cost scenarios (i.e. when bailouts are cheap or when 'hold-up' on profitable industries are valuable) public

⁵ On the other hand if a government is able to sell a SOE for its full expected profits, the optimal industrial policy is monotone in the shadow cost of public funds.

ownership is preferred to privatization. The reverse holds true for intermediate opportunity cost.

The non-monotonicity result has important policy implications for the telecommunication industry. In other words, while divestiture of the profitable public firm may be optimal in developed countries, it is not necessarily ideal in developing countries, where budget constraints are tight and market institutions weak. This result is especially relevant for the traditional local and international segment of telecommunication industry.

"A PTT [Post and Telecommunication Company]'s yearly revenues (especially charges from international calls) were used by governments to subsidize mail services, or ease yearly budget deficits. Given this public convenience and necessity, the interests of third world governments are often diametrically opposed to telecom policies of privatization and the network deregulation favoured by wealthy nations." (ANANIA, 1992).

It is wrong to believe that the governments of advanced economies do not care for the revenues generated by the telecommunications industry and focus on consumer surplus. The fiscal argument works for every country in the world. The difference between them lies in the weight that this argument assumes. In the USA, for example, a federal excise tax on local and long distance telephony services was created in 1898. It has been repealed occasionally and re-enacted ever since. The tax's opponents argue that it is regressive and distortive; while its proponents insist on the need for revenues in order to reduce federal budget deficits. It is hard to get around this argument: at a tax rate of 3% tax collection reached USD 5.185 billion in fiscal year 1999 (reported in the *Budget of the United States Government, fiscal year 2000*)⁶. It would be unfair and stupid to ask developing countries to focus on their consumer surplus, while advanced economies have always relied on the telecommunications industry for fiscal resources⁷. As they are not able to tax as efficiently as advanced economies, developing countries need the additional revenues more badly. For instance, over the period

⁶ Similarly in Australia the communication industry has the highest company tax to profit ratio equal to 0.49. In company tax alone each firm in the industry paid on average Australian \$40 millions (2002-03 income year), more than the double of the average of the second largest contributors (i.e., the mining industry). Finally in 2000 the UK mobile sector alone generated £1.3 billion in tax revenue. See:
http://www.intellectuk.org/sectors/sector_telecommunications_1.asp

⁷ Until recently telecommunications companies were public in virtually all countries in the world (with the important exception of the US). The telecom public utility being traditionally profitable, it provided a steady flow of public funds throughout the years.

1990-1995, revenues collected from public firms (among them the telecommunications industry is traditionally a large contributor) amounted to 8% of GDP in Bolivia, 2.2% in Brazil, 5% in Chile, 1% in India, 3% in Mexico, 3% in Peru (World Bank, 1998).

"On the whole this non-tax revenue is more important for developing than opposed to industrial countries, comprising about 21 percent compared to 10 percent of total revenue." (BURGESS & STERN, 1993 p. 782).

Profitable duopoly

When *ex-ante* profitability rises substantially, the market allows for the entry of more than one firm. AURIOL & PICARD (2002) show that the advantage of private unregulated structures disappears. Indeed, when a second firm is introduced, the costs of information and of *ex-post* profitability constraint in regulated firms diminish more than the costs of excessive prices and entry to private oligopolies. In other words, market liberalization, which corresponds to the divestiture of an historical monopoly and the introduction of new entrants, is not equivalent to *laissez-faire*. In the framework of our model the divestiture of the historical monopoly is motivated by smaller fixed costs and/or by larger product demand. The mobile and the internet segment of the telecommunication industry are a good illustration of these changes. Indeed, with wireless technology sunk costs fall. Depending on the size of demand (i.e., country population and wealth) several suppliers can efficiently compete in the same market. Hence in the mobile segment 78% of countries had adopted some degree of competition in 2001 versus 86% in the internet segment.

The paper suggests that privatization and liberalization reforms in these segments of the market cannot succeed without effective regulation of entry and prices. The result is counter intuitive. It would seem more natural to regulate the outcome of the private monopoly (i.e., in the low profitability case) than that of the duopoly (i.e., in the high profitability case). Indeed, with several firms one could expect competitive pressure to push prices down. This is true to some extent: prices decrease when the industry moves from a private monopoly to a private duopoly. However, unregulated competition (e.g. Cournot) is inefficient compared to regulation. The privatization outcome is obviously worse when operators collude or are granted exclusivity periods, as is often the case in developing countries. To avoid the dead-weight loss created by monopoly pricing, it is necessary to regulate the market, especially access to bottleneck facilities (e.g. the fixed

line network). Indeed new entrants need to be able to interconnect with the incumbent telecommunication firm in order to reach their customers. If the latter is privatized, it has every incentive to prevent competition from mobile operators. This is a major concern because recent empirical studies show that the biggest improvements in the telecommunication sector have been driven by competition from mobile telecommunication firms, not by privatization reforms (see LI & XU, 2001; McNARY, 2001; PETRAZZINI, 1996; ROS, 1999; WALLSTEN, 2001). Since the revenues generated by the telecommunication industry represent over 2% of world GDP, inefficient entry and high prices in the mobile segment generate large social costs. FUSS, MESCHI & WAVERMAN (2005), for instance, estimate that in a typical developing country, an increase of ten mobile phones per 100 people boosts growth by 0.6 percentage points. The growth dividend is similar to that of fixed-line telephones in developed countries in the 1970s.

■ Empirical assessment of reforms

To make a general appraisal of the reforms LI & XU (2002) calculate the difference between pre- and post-privatization mean of key performance variables and test whether the difference is zero based on a sub-sample of some 60 countries that experienced full or partial privatization in the telecommunications sector. Based on this simple test privatization is associated with a substantial reduction in employment (nearly 50 percent) and with a sharp increase in investment. Interestingly it is also associated with a 38 percent reduction in real output.

This result is consistent with the finding by BIRDSALL & NELLIS (2002) that the output prices of infrastructure industries increased as a result of privatization. Since the reduction in real output is lower than the reduction in employment, privatization is associated with a significant increase in labour productivity (42 percent). The pre and post-privatization mean testing does not establish causality, it shows correlation. However, the results do help to reconcile the experts' positive evaluation with the unpopularity of the reforms. Indeed, privatized telecommunication firms seem to be more productive and to invest more in network coverage. This is an improvement for the population, which in turn gains access to the service. Yet they also get rid of redundant employees, increase prices and disconnect those who cannot afford their bills. Prices rise decreases the surplus of consumers who

had access to the service before privatization. Disconnections and labour downsizing hurt the poor⁸.

So far the empirical results are consistent with both efficiency and the fiscal theory⁹. This raises the question of what triggers the privatization decision in the first place. The question is empirically relevant because the conduct and performance of the reforms vary with their objectives. The few empirical papers that study this problem do not focus on the telecommunications industry. They suggest that the macro economic rationale put forward in AURIOL & PICARD (2002) plays a significant role in the decision whether to privatize. Based on a data set from privatizations in China, LI, LI, LUI & WANG (2001), for instance, test whether government privatizes in order to enhance production efficiency or to increase its revenue. They conclude:

"Our tests based on the data set from China reject the efficiency theory and yield support for the revenue theory."

Similarly BORTOLOTTI, FANTINI & SINISCALCO (2003) analyze panel data for privatization around the world. They consider all types of industry (competitive and oligopolistic) and all kinds of countries (rich and poor). The authors find that privatization is more likely in wealthy democracies with right wing governments, high debt, liquid stock markets and a legal system that protects shareholders. Finally WARLTERS (2004) studies the determinants of infrastructure privatization using probit regressions with panel data covering 155 developing countries for the years 1984-1998. He shows that the introduction of a VAT system positively influences the probability of infrastructure privatization. This result illuminates the link existing between taxation and privatization reforms. WARLTERS (2004), who interprets the introduction of a VAT system as an improvement in the tax system, concludes that:

"Infrastructure privatization is more likely when the shadow cost of public funds falls."

⁸ As BIRDSALL & NELLIS (2002) put it: "Most privatization programs have done much more to enhance efficiency than equity. At least initially, and on average, privatization has worsened wealth distribution (highly likely) and income distribution (likely)."

⁹ That is, after the privatization firms use more efficiently their inputs. They also pay franchise fees and make more investment than the financially strapped governments. Finally, they increase prices so that output decreases.

The three papers support the idea that macro-economic concerns influence the decision to privatize. However, with the exception of LI, LI, LUI & WANG (2001), they do not control for efficiency. To test which theory prevails requires micro-economic data on public firms on top of the usual macro-economic data. These data are usually not available. A notable exception, which is exploited in AURIOL & TUSKE (2005), is the data on the telecommunications industry.

AURIOL & TUSKE (2005) estimate the probability of telecommunication privatization in developing countries using data from three primary sources. Firstly, the International Telecommunication Union maintains a rich panel data set on the worldwide telecommunication industry. The database contains detailed information for every country in the world on telephone service revenue, quantity, annual telecom investment, infrastructure quality such as teledensity, the number of telephone mainlines etc.. The data are industry based. Since the public firm used to be in a monopoly position, the data provide detailed company information before privatization. Secondly, the World Development Indicators (WDI) maintained by the World Bank provide the matching macro economic panel data required to test the relevance of the fiscal argument. Finally, the dependant variable is constructed by extracting information relative to the telecommunication industry from the World Bank's Private Participation in Infrastructure (PPI) database. The probability of privatization is estimated with random effects probit models. The panel data covers 153 developing or transition countries for the year 1985-2003. It contains privatization data from PPI, industry level information from the ITU, and macro-economic information from the WDI. The theoretical predictions differ depending on which theory prevails. If the efficiency argument is determinant firms with poor economic performances should be privatized first. On the other hand, if AURIOL & PICARD's (2002) fiscal argument is relevant, macro-economic variables measuring the tightness of government budget constraints should significantly influence the probability of privatization. A more subtle implication of AURIOL & PICARD (2002) arises while focusing on the incumbent operator of the telecommunications industry. Indeed the fixed-line and the long distance segment traditionally constitute a profitable monopoly. Depending on the opportunity cost of public funds, privatization of the incumbent operator might be the optimal policy in a rich country, while the same does not necessarily apply to a poor one. AURIOL & PICARD (2002) show that the optimal decision depends on a critical value of the opportunity cost of public funds. Under the paper's assumptions, the critical value lies in the range of the opportunity cost of public funds generally retained for developed

economies (i.e., it varies between 0.35 and 1.10). If the model assumptions are empirically grounded the probability of privatizing the fixed-line and the long distance segment in developing countries should decrease with the opportunity cost of public funds ¹⁰.

AURIOL & TUSKE (2005) found that the probability of privatization of the fixed access and long distance segments decreases with country risk rating, with the level of multilateral debt service, or alternatively, with the level of public and publicly guaranteed debt. As predicted by the theory, the probability of privatization declines when the opportunity cost of public funds, measured by the level of debt service for example, rises. The result is robust when the characteristics of firms are analysed. In this case it is worth noting that the probability of privatization increases with the level of teledensity, the percentage of digital mainlines and the level of annual investment, but decreases with the level of the telephone waiting list. To confirm these results regressions were run with the micro-economic variables alone. They yield the same qualitative results. The probability of privatization increases with teledensity, annual telecommunication investment and the percentage of digital main lines, but decreases with the size of the telephone waiting list. In other words developing countries privatize efficient incumbent telecommunication firms first. It is doubtful that the firms' efficiency is at the heart of the privatization decision. On the other hand, the results are consistent with governments maximizing sale revenues. Developing countries, which are coping with critical financial problems, rationally regard privatization as a fiscal instrument.

Whether governments privatize public assets to unbind their budget constraints or to increase industry performance and consumers' surplus is crucial to the conduct of reforms. For instance, in privatization of public utilities governments have the choice between auctioning off the operator on the basis of the highest royalty payment, or waiving the royalty payment and auctioning off the service to the party who bids the lowest service tariff (see ESTACHE, FOSTER & WODON, 2002). In a survey of 600 concession contracts from around the world, GUASCH (2000) shows that, in most cases, contracts are tendered for the highest transfer or annual fee. In practice, governments in developing countries are more concerned with relieving fiscal constraint than securing tariff reductions. The proceeds of

¹⁰ The prediction is reversed for advanced economies as suggested by BORTOLOTTI, FANTINI & SINISCALCO (2003) where the probability of privatization increases with the level of debt.

privatization in non-OECD countries, which account for over one third of the worldwide proceeds of privatization (MAHBOOBI, 2000; GIBBON, 1998, 2000), have hence been used to alleviate fiscal pressure on the public sector¹¹. Using a panel of 18 developing countries, DAVIS *et al.* (2000) show that the budgetary proceeds of privatization have been used to reduce domestic financing on a roughly one-for-one basis. Since the transfers are higher the greater the expected profitability of the industry, governments committed to privatize choose policies that are likely to increase the firms' profitability.

Privatizations initially often come with exclusivity periods (i.e., temporary monopoly power). To study the impact of the exclusivity period on privatization price, WALLSTEN (2000) focuses on the privatization of twenty telecom firms in fifteen developing countries. In this small sample 2/3 of the countries chose to allocate exclusivity periods for an average of 7.42 years. They apparently had a very good reason for doing so. According to the author's computations, granting a monopoly in fixed local service would more than double the price private investors pay for the firm. Granting an international long distance service monopoly would be even more valuable than a local monopoly. The advantage of exclusivity periods seen in the sale price comes at the cost of reducing network growth relative to privatization without exclusivity periods. A one percent increase in the length of the exclusivity period is associated in the sample with a 0.05 to 0.08 percent decrease in network growth. Doubling the exclusivity period should consequently reduce network growth by five to eight percent. When the sample is broadened to include advanced economies, the proportion of countries that choose to allocate an exclusivity period is lower. For instance in the LI & XU (2002) sample, which covers 116 countries from 1981 to 1998, of all countries that privatized in 1998 one-third offered investors exclusive access to certain segments of the market. Consistently with WALLSTEN (2000), their calculations show that the impact of exclusivity periods on the number of fixed line and mobile telephones per 100 inhabitants is negative and significant.

Secondly governments often restructure public firms in an attempt to increase privatization prices. CHONG & GALDO (2003) analyse the impact of labour policies, such as downsizing, pay cuts, or employment guarantees, on the privatization prices in 84 telecommunications privatizations. The

¹¹ A review by the IMF (2000) of 18 privatizing countries reports that the net receipts from privatization account for 1 percent of GDP.

sample covers 75 percent of the privatizations worldwide that occurred between 1984 and 2000. In their sample 73% of the firms experienced labour downsizing in the three years prior to privatization. When checking for endogeneity, the authors show that restructuring, in the form of specific labour policies before privatization, is not conducive to higher net privatization prices. On the contrary, in the particular case of voluntary downsizing, it significantly decreases prices (by 15 percent). This result is consistent with the lemon problem studied by JEON & LAFFONT (1999) and RAMA (1999): The best employees, who are aware of their productivity, are the first to take severance packages and leave voluntarily. This theory is supported by the fact that many exiting employees were re-hired after the privatizations. The authors also find that, firms' characteristics such as the presence of unions and of negative net liabilities, decrease like expected net privatization prices. More interestingly, the type of method used in the sale seems to matter. Public offerings and direct sale are associated with an increase in the privatization price; shares sold are associated with lower prices. Foreign participation is not significant. The authors conclude that governments eager to privatize their telecommunication industry should concentrate on the privatization process, as the method of sale seems to matter. On the other hand, they should avoid restructuring the public firm. This is a costly process, especially in developing countries where labour downsizing hurts the extended family of those who are fired. Since reforms had either a negative impact or no affect on privatization prices, restructuring prior to privatization has proven bad policy. Yet it occurred in nearly 3/4 of the telecommunication privatizations covered by the authors and its poor results partly explain the unpopularity of reforms.

■ Conclusion

Among network industries, telecommunication has undergone the most dramatic change since the mid-1980s. Major innovations, embodied in the wireless technology or the internet, have pushed costs down and demand up. The new segments of the mobile and the internet markets are hence suitable for (oligopolistic) competition. Network externalities in telecommunications oblige entrants to interconnect with the incumbent operator in order to reach their customers. Major reforms of the former public monopoly have been necessary to accommodate the entry of the new operators. These liberalization reforms, which occurred at an industry level, have been intertwined with structural adjustment programs. Indeed,

international donors and creditors, like the World Bank or the IMF, made privatization programs a condition for economic assistance in the 1980s context of explosive debt crisis. As shown by AURIOL & TUSKE (2005), the macro-economic rationale is at the heart of the decision to privatize in the telecommunication industry. In this context it is hard to disentangle the effect of market liberalization that occurred in response to technological change and demand growth from the effects of privatizations resulting from global government restructuring.

A careful review of existing empirical literature reveals that telecommunication privatization in developing countries came, at least initially, with a substantial employment reduction, price increases and a reduction in real output. Since output decreases were generally lower than job cuts, labour productivity rose as predicted by the efficiency theory. The owners of the firms seem to have been the main beneficiaries of the productivity gains. In line with popular opinion, privatization per se did not seem to benefit consumers much. On the contrary, WALLSTEN (2001) finds it to be negatively correlated with mainlines per capita and connection capacity. Similarly CHONG & GALDO (2003) show that restructuring public firms before privatization, as has often been the case in developing countries, has proved bad policy. Not only is labour downsizing been conducive to higher net privatization prices, but in the particular case of voluntary downsizing, it significantly decreases prices. In the end, the biggest improvements for consumers have been driven by competition from mobile telecommunication firms, not by the privatization of the incumbent firm (see LI & XU, 2001; McNARY, 2001; PETRAZZINI, 1996; ROS, 1999; WALLSTEN, 2001).

To conclude, privatization reforms must take into account the fiscal argument. In profitable, increasing return to scale industries, such as the fixed line telephone or the long distance segment, allocative inefficiency combined with the critical budgetary conditions found in most developing countries favour public ownership. This is an effective way of combining the regulation of the firm with a maximum level of taxation. AURIOL & TUSKE (2005) thus found that the probability of privatization declines in the fixed line segment when the opportunity of public funds rises. Instead of rushing into the privatization of their incumbent telecom operator, governments should concentrate on liberalizing the mobile and internet segments. Indeed, increasing the competitive pressure from mobile operators is the best way to increase consumer surplus and growth. This concretely means avoiding allocating exclusivity periods to private operators in the mobile segment and creating an efficient regulatory authority to avoid overpricing of bottleneck

facilities (such as the fixed line network) and collusive behaviour from mobile operators. China and Viet Nam followed this winning strategy. They chose to keep the fixed line operator public and monopolistic while fostering (regulated) competition in the mobile segment. According to the ITU (2002), these two countries experienced the highest change in ranking for total teledensity (the sum of fixed lines and mobile users per 100 inhabitants) in the world with China moving up from a ranking of 159 in 1990 to 95 in 2000; while Viet Nam jumped up from 189 to 141. They are also countries where the government gains maximum revenues from the telecommunication industry.

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Structural Change in African Mobile Telecommunications

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Abstract: This paper focuses on structural change in the African mobile telecommunications market. After identifying those multinational mobile telecommunication companies with a presence in Africa, attention is drawn to the different types of inward investors that can be observed and where they are investing. The analysis also highlights the lack of competition between the main investors, especially in the large markets outside of South Africa, and the extent to which operators are consolidating with one another.

Key words: mobile, internationalisation, FDI, Africa.

In recent months considerable attention has been paid to the role of mobile telephony as a stimulant to economic progress in Africa. A much quoted public policy paper by Vodafone (Vodafone, 2005) drew attention to the impact of mobile communications in Africa, while *The Economist* argued that encouraging the spread of mobile phones was 'the most sensible and effective response to the digital divide' (*The Economist*, 2005).

It is evident that with market penetration at very high levels, especially relative to incomes, in most of Europe and increasingly in Asia and the Americas, the attention of mobile network operators was bound to be drawn towards the low penetration levels typically found in African countries, especially given the accompanying low levels of fixed-wire penetration. Starting from scratch, a new mobile network will almost certainly be cheaper to roll out than a fixed-wire network in such countries. But which African markets are already well-served, which are now attracting the attention of investors and which operators are involved? This paper sets out to answer these questions.

■ Mobile operators' presence in Africa

Consider first of all the subscriber numbers in the 54 countries and islands that are included in our definition of Africa. Using December 31st 2004 as our point of calculation, and limiting ourselves to round numbers as the subscriber count is less than perfect in most cases, we discover that there are only a handful of countries with large subscriber bases: South Africa (20 million), Nigeria (10 million), Morocco (9 million), Egypt (7.5 million) and Algeria (5 million). Those countries with 1-4 million subscribers include Cameroon, Côte d'Ivoire, DR Congo, Ghana, Sudan, Kenya, Tanzania, Tunisia and Uganda. Most of the rest have less than half a million subscribers. This suggests, inter alia, that there is plenty of potential for subscriber growth, which is nevertheless likely to remain constrained by income levels despite players like Motorola being contracted to produce a new range of very simple and cheap handsets ¹.

Consider secondly which international operators are present in the 54 countries sampled. WHALLEY & CURWEN ² have undertaken an extensive study of internationalisation in the mobile telecommunications industry, and have identified forty companies with a presence in at least three countries. The table below is drawn from this study and identifies those mobile operators with a directly-held investment in Africa at the end of 2003 and 2004 and at the time of writing (June 30th 2005).

It should be noted that there is potentially an element of double-counting involved in the above since it is possible for, say, a European operator to have a stake in an African operator, which in turn has multiple investments in Africa. For this reason, the above table only counts countries if either the investment is direct or the investment in the other operator exceeds 50%. The effect of including countries served via indirect minority investments would be to add as follows: Vodafone and Telekom Malaysia (four additional investments each in 2003 and for Vodafone alone in 2004 via Vodacom), Telefónica (five additional investments in 2003 and four in 2004 via Portugal Telecom), and Vivendi Universal (one additional investment in 2003 and 2004 via Maroc Télécom). The 2004 additions also apply as of June 30th 2005, but in the case of Etisalat the 50% stake in Atlantique Télécom is treated as a majority stake for convenience.

¹ See *Global Mobile*, vol.12, no.4, 1-2.

² For an example of this analysis see WHALLEY & CURWEN, 2005.

Table 1 - Mobile operator presence in Africa

Mobile operator	Home market	Countries			African mobile subscribers (mn) ²
		2003	2004	Mid-2005 ¹	
Celtel International	Netherlands	13	13	13 ³	3.490
France Télécom	France	10	10	10	3.768
Orascom	Egypt	9	8	8	3.777
MTN	South Africa	6	6	6	11.677
Millicom	Luxembourg	5	6	6	0.894
Atlantique Télécom	Côte d'Ivoire	5	6	6	0.600
Investcom	Lebanon	5	5	5	1.230
Vodacom	South Africa	5	5	5	11.149
Portugal Telecom	Portugal	5	4	4	1.036
Vivendi Universal	France	4	3	3	2.330
Vodafone	UK	3	3	3	7.028
Telekom Malaysia	Malaysia	4	3	3	0.137
MTC	Kuwait	2	2	15 ³	0.524
Etisalat	Emirates	2	2	8 ⁴	0.029
TeliaSonera	Sweden	2	1	1	0.205
Telefónica	Spain	1	1	1	0.812
Hutchison Whampoa	Hong Kong	1	1	1	0.032

Notes:

1. This column accounts for all agreed transfers of assets up to the specified date. These had not necessarily taken place in practice by that point due to matters like approvals by the relevant company boards and regulators.
2. By subscribers we refer here not to gross subscriber numbers, but to 'proportionate' or 'equity' subscribers: that is, the gross figure is weighted according to the proportion of the equity held by the company in question. The totals given are for December 31st 2004.
3. In March 2005, MTC made an agreed offer for 85% of Cotel, with the other 15% to follow within two years.
4. The six additional networks were the result of taking a 50% stake in Atlantique Télécom in April 2005.

Source: WHALLEY & CURWEN (2005a) updated to end June 2005

The first observation that can be made is that seventeen of the forty most internationalised mobile operators identified by WHALLEY & CURWEN are present in at least one African country. As the table demonstrates, the number of countries in which these seventeen operators are present varies considerably, ranging from 13 to just one. Those companies with a single African investment have focused their attention on other regions; for example, the limited African presence of Telefónica contrasts with its substantial investments in South America.

A second observation is that the companies are drawn from a wide range of home markets in Europe, the Middle East and Asia, but not the Americas. The European involvement is not unexpected from a historical perspective, and largely explains the specific countries where France Télécom's African investments are to be found (see table 2). Vodafone, however, originally

emerged as a competitor to the incumbent in the UK (BT - which has no investments in Africa) and its direct presence in Africa is limited to just three investments; in South Africa, Kenya and Egypt. As noted, it also has an indirect presence in a further four African markets. The remaining European involvement in Africa is relatively small scale, other than for Celtel International and Millicom International; however as both are based in Europe but operate elsewhere, they are European in name only.

Some additional light can be shed on this matter by comparing the number of African investments with the overall number of international investments. In a large number of cases (for example, Celtel, Orascom, MTN, Atlantique Télécom and now Etisalat) the vast majority of all investments are in Africa, whereas for Vodafone (26 overall in 2004), France Télécom (27 overall in 2004), Millicom (16 overall in 2004) and TeliaSonera (14 overall in 2004), the African section of their portfolios is of much less significance.

The relatively recent appearance of Middle Eastern investors in Africa is of particular interest. Although there are many reasons why African markets could be attractive to these investors, a key factor would appear to be the differential growth rates that exist between their home markets and Africa. Quite simply, Africa is more populous as a region and it is growing faster as a market than the Middle East³.

Etisalat has signalled its intention to expand outside of its home market by establishing a dedicated international subsidiary and stating that it will invest USD 10 billion overseas by 2008 (McSHEEHY, 2005). In April 2005, the company expanded its presence into western Africa by acquiring half of Atlantique Télécom. However, it is somewhat doubtful whether it will now be able to build a successful international business after it paid USD 1 billion more than the next bidder to acquire a 26% stake in the Pakistan Telecommunications Company.

In March 2005, Celtel agreed to a takeover by Kuwait-based Mobile Telecommunications Co. (MTC), which happens to co-brand with Vodafone, even though the latter has no equity stake. In total, this two-stage deal valued Celtel at USD 3.4 billion (ODELL, 2005). The South African based MTN reacted angrily to this deal, and sought to have it overturned in the

³ For details of growth rates across Africa and the Middle East, see *Global Mobile*, vol. 12, no. 8, 7-10.

courts (McLEOD, 2005). The takeover was nevertheless completed in May 2005, with MTC emphasising how the deal contributed to its key strategic objective of becoming a global operator ⁴.

For its part, Orascom is technically African. It is commonly perceived as a Middle Eastern operator although, interestingly, it is not behaving like one, despite increasing its holdings in Algeria and Tunisia during 2005. It currently has a presence in eight African countries, but its status in Chad is dubious and it sold off its assets in the Côte d'Ivoire in April 2004, following on from the sale of stakes in nine other African countries to Atlantique Télécom and the Gloria Trust during 2003. Furthermore, the acquisition of Italy's Wind for EUR 12.1 billion in May 2005 by Weather Investments, which will henceforth also control all Orascom holdings and be 74% owned by Orascom, suggests that its attention is no longer tightly focused upon Africa. This view is fostered by its recent decision to sell two more of its sub-Saharan investments ⁵ and to acquire licenses in Bangladesh and Iraq.

These comings and goings necessarily attract most attention, but it is also important to remind ourselves that with the exception of MTN, Vodacom and Vodafone, the number of subscribers controlled by each of the companies identified in table 1 is, at least for now, comparatively small. In some respects this is only to be expected given that mobile telephones came late to Africa, and the position will undoubtedly change in the future as rapid increases in penetration grow the number of subscribers. In doing so, the dependency of the internationalising mobile operators on their home markets will be lessened. For example, two-thirds of MTN's subscribers were to be found in South Africa at the end of 2004, but as the company is growing relatively rapidly in Nigeria, easily its second-largest market, this dependency on a single market is being reduced. Given that Vodacom obtained 86% of its proportionate subscribers from its home market in 2004, it would also benefit from rapid growth in Tanzania and elsewhere, but it will find it much harder to bring this percentage down unless it makes further acquisitions ⁶.

⁴ The accompanying press release described this strategy as "3X3X3X" (MTC, 2005). Beginning in 2002, MTC has started to move from being a regional to an international and then global operation at three-yearly intervals.

⁵ Orascom is selling its 65% holding on Libertis Telecom in Congo-Brazzaville and its indirect 100% stake in Oasis Telecom of the DR Congo – see *Global Mobile*, vol. 12, no. 10.

⁶ As noted, players like Celtel do not operate in what is technically their domestic market, but Celtel nevertheless has a widely distributed set of investments, with none yielding as many as one million proportionate subscribers at the end of 2004.

If so, Nigeria might be expected to appeal, but no interest is evident. For its part, MTN is likely to continue to enjoy rapid growth in Nigeria due to a combination of a low penetration rate and a large population, but it will face increased competition if Virgin Mobile was to enter the market ⁷. In June 2005, Virgin Mobile and Vodacom bid for a controlling stake in Vmobile, adding another twist to the Vmobile saga which began when Vodacom pulled out its management contract with Vmobile in 2003 (BAKER, 2005).

■ Location of networks

At this point it is accordingly useful to examine where the main African operators had their networks at the end of 2004, as set out in table 2. Given that there are 54 countries/islands in the sample, it is perhaps less than surprising that these operators have largely kept out of each others' way, competing only in Benin, Burkina Faso, Cameroon, Chad, Congo-Brazzaville, Côte d'Ivoire, DR Congo, Egypt, Gabon, Ghana, Kenya, Madagascar, Niger, Sierra Leone, South Africa, Tanzania and Uganda. Arguably, what is most surprising is that there has been so little competition among these companies in the largest African markets outside South Africa, namely Algeria, Egypt, Kenya, Morocco, Nigeria and Tunisia.

Table 2 - Location of networks as of December 31st 2004

<i>Operator</i>	<i>Countries where operational</i>
Atlantique	Benin, Burkina Faso, Côte d'Ivoire, Gabon, Niger, Togo.
Celtel	Burkina Faso, Chad, Congo-Brazzaville, DR Congo, Gabon, Kenya, Malawi, Niger, Sierra Leone, Sudan, Tanzania, Uganda, Zambia.
France Télécom	Botswana, Cameroon, Côte d'Ivoire, Egypt (with Orascom), Equatorial Guinea, Madagascar, Mali, Mauritius, Reunion Island, Senegal.
Orascom	Algeria, Chad, Congo-Brazzaville, DR Congo, Egypt, Madagascar, Tunisia, Zimbabwe.
MTN	Cameroon, Nigeria, Rwanda, South Africa, Swaziland, Uganda.
Investcom	Benin, Burundi, Ghana, Guinea, Liberia.
Millicom	Chad, Ghana, Mauritius, Senegal, Sierra Leone, Tanzania.
Vodacom	DR Congo, Lesotho, Mozambique, South Africa, Tanzania.
Vodafone	Egypt, Kenya, South Africa (via Vodacom).

On the face of it, inspection of the companies in tables 1 and 2 suggests that Africa, other than in South Africa, appears to be a tale of two groupings, one the Africa 'specialists' such as Celtel, MTN and Vodacom, now to be joined by Etisalat and MTC, and the other a heterogeneous group of

⁷ See 'Virgin to increase presence in Africa', *Global Mobile*, vol. 12, no.12, 5.

international telcos such as France Télécom with a limited interest in Africa relative to elsewhere. However, there is, as ever, the exception to the rule as Orascom appears intent upon reducing its reliance upon Africa. In other respects, Africa is a tale of small networks mainly financed by local interests.

■ Conclusions

As we have seen, the situation with regard to mobile telephony in Africa appears to be undergoing a significant process of structural change as certain operators either become, or cease to be, Africa 'specialists'. However, it is frankly rather difficult to understand why some of the non-specialists are in Africa at all, although their original entry may well have had nothing to do with their present strategies, and there is always the 'growth potential' argument to keep them there. One suspects, however, that some of them will offload investments outside the 'big five' markets to the specialists, which would appear to have a clear interest in expansion over the medium term, although financing that expansion will be relatively problematic, especially in the case of the private companies⁸. Nevertheless, as holds true elsewhere in the world, owning stakes in operators that are not numbered among the top two in a given country is unlikely to be an attractive strategy even to Africa specialists.

In short, it can be seen that the African mobile market has attracted considerable FDI from outside the continent. However, the two largest operators in terms of subscribers are both South African, while the company present in the most countries is controlled from Kuwait. So far consolidation has been relatively limited, although the takeover activity of MTC and Etisalat suggests that this may be about to change as scale becomes an important determinant of competitiveness.

⁸ For example, Orascom's offloaded its Telecel subsidiaries to reduce its debt levels.

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Internet as a Critical Infrastructure

Lessons from the Backbone Experience in South America

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Abstract: The radical transformations that have been reshaping the world of telecommunications are uniquely decentralized and, yet, they increasingly provide the lifeblood of our new societies. In this paper we study the internet as a critical infrastructure whose efficiency depends upon the proper and efficient functioning of its market structure. Our objective is not to propose the role governments should play. It is not to suggest regulation. It is exclusively to highlight the vulnerability of the economy to the lack of competition and associated problems due to inefficient market structures. The analysis in this paper is buttressed by the unique in-depth empirical research one of the authors has already carried out on internet in South America, covering many of its national idiosyncrasies, and its various forms of governance. South America is particularly interesting in view of the different ways in which networks came to interconnect with one another and the diversity of governance one finds at points of internet traffic exchange. This subject will form the basis for further work.

Key words: Internet, critical infrastructure, externalities, regulation, NAP (network access point), peering, transit, governance, South America.

Internet is now an essential element of most economic activities around the world. In this paper we contend that it is now a "critical infrastructure". No region, no country and no economy can afford to overlook the internet without finding itself just as isolated from the world economic activities as a region without access to adequate shipping and railroad transportation would have found itself a century ago.

The internet is unique among infrastructures. Apart from its original creation, it has grown largely free from government intervention. Some (ECONOMIDES, 2004) argue that it is competitive and that government intervention would do more harm than good. This analysis, while interesting,

is somewhat self-fulfilling; as Economides tends to see the internet environment as inherently competitive, his conclusion that competition makes regulation and other forms of government intervention unnecessary is largely predictable. Regardless, these conclusions do not seem to conflict significantly with a superficial look at the issue. LAFFONT *et al.*, through a series of papers (especially 2000 and 2003), came to different conclusions. However, both were looking just at a specific problem, namely, whether the merger of MCI with Sprint might harm competition at the backbone level.

Just to explain our argument through an exercise of issue confrontations, we can state that Economides and Laffont *et al.* are looking at a different question from the one we study here. They look at the internet as a common sector in the economy and evaluate its level of competitiveness. They do not take into account the unique role infrastructures continue to play in the proper functioning of the economy, i.e., the kind of policies that might protect the economy from market-based infrastructure crisis.

In this way the object of this work is not to be a generic paper on infrastructure. It is only to establish that the internet is indeed an infrastructure, to identify what are the elements of the internet that together form its infrastructure. Most of the internet has nothing to do with infrastructures. It is a huge bazaar where one can find all kinds of information, from an online video game such as The World of Warcraft to most of the scientific studies that have been produced to evaluate new medications.

This paper aims to provide a better understanding of the nature of internet infrastructure, i.e., what is it that is critical in the internet. We do not expect to reach some simple answer because the internet is (or has become) too complex an entity. It would seem useful to look at the question from both a bottom-up and top-down perspective. In addition, the internet is multidimensional, involving dimensions such as hardware connections, software connections and security. Somewhat like in a human body, these connections coexist and rely on each other's organization or governance. While each relies on the others, each is its own infrastructure in itself.

The *sine qua non* to running an internet is the IP layer and everything below this layer that sustains it. The services above it, including security, are important, but they are value-added services that make the internet more valuable to more stakeholders. The internet could function without them.

Below the IP layers are the telecommunications layers. Since the time of Vail in the early 1900s they have been presented by operators as a non-separable whole and, following the technology choices made by vertically integrated entities, they have become non-separable to some extent (TEMIN, 1987, pp. 18 and 74). There is some truth in the problems faced by incumbents with unbundling, not so much because it is naturally efficient to have all those functions vertically integrated, but rather because, for almost a century, operators did not have to be concerned by the issue and its efficiency. However, it is also clear that lack of separability has everything to do with sustaining a *de facto* monopoly and probably nothing to do with efficiency (FONTENAY, LIEBENAU & SAVIN, 2005). The question becomes whether or not the layers below the IP layer are to be treated as an indivisible whole and the answer is rather trivial, since vertical integration is due to path dependence initiated in the early 1900s by Vail, rather than through efficiency. In addition, a look at sub-elements, such as cables or poles, immediately reveals that there is nothing making integration efficient.

It follows, as shown in FONTENAY *et al.* (2005), that there is no reason to treat the complete set of activities below the IP layer as a monolithic monopoly infrastructure and that doing so is inefficient. If the backbone sector, i.e., everything below the IP layer, was contestable, then vertical integration would not have any effect on competition and governments would have few, if any worries regarding the potential for abuse of market power. We would be in a world not all that different from the ideal world of ECONOMIDES (2004).

To understand the internet as a critical infrastructure we have decided to focus on the South American region¹, a complex environment, as a first step in that direction. It is nothing more than a first step because the critical infrastructure does not seem to have been identified as such in this particular context. It has not received the attention we believe the internet merits and has seen less government involvement to-date than other infrastructures historically². We would like to emphasize that we ignore other dimensions that may also be considered infrastructures such as

¹ Part of our motivation for focusing on a regional issue arises from the unique work prepared for South America through private, informal contacts with stakeholders in a number of countries (see section 2). To the best of our knowledge, a similar data base for other regions of the world does not exist today.

² The internet has been identified as a critical infrastructure in other contexts such as the threat of terrorist attacks (AVIRAM & TOR, 2003).

internet access, a major concern in Latin America, as in other regions around the world.

The choice of Latin America may seem surprising when considered from the perspective of developed countries. In the past five years, significant progress has been made in disseminating information and communication technologies (ICTs) in Latin America and the Caribbean, with a growing impact on the public, social and economic spheres. The Economic Commission for Latin America and the Caribbean (ECLAC, 2005) reports that between 1998 and 2004, the number of fixed telephones almost doubled, rising from 53 million to close to 93 million; the number of cell phones grew 8.5 times, from 20 million to 172 million, and the number of internet users increased twelve-fold, from 6 million to 72 million. However significant gaps remain and are indeed becoming wider at the level of internet access, with only 14% access in Latin America and the Caribbean compared to over 50% in developed countries. Growth in ICTs faces increasing challenges, as these technologies penetrate sectors of the population where purchasing power is lower and lower ³.

Thus the region is coming to the realization that without proactive policies, new approaches to the internet, new technologies can exacerbate existing inequalities, which makes it increasingly important to take public actions that will ensure socially desirable results. As we will see, the analysis of the paper raises the perennial challenge policy makers face in economic development. Should they focus on a few key sectors with the expectation that successful deployment in these sectors will have a knock-on benefit for the whole economy or should they focus instead on uniform deployment of the internet, leaving no one behind. At this stage, the focus appears to be far more on universal service, i.e., an even, geography-free deployment of internet access. India, on the contrary, has resolutely taken a selective approach, with typical penetration even lower than in South America and with a thriving, localized telecom sector (ZAHEER & RAJAN, 2003; KELLY, 2005a, 2005b).

To address the "critical infrastructure", our paper is organized in a bottom-up fashion. The following section describes a historical account of a particular segment of the internet in a region of the world impacted by the

³ It is estimated that the 20% richest members of the population in the region dispose of US\$800 per year for investing in ICTs, while the 50% poorest can only afford to spend US\$100 per year. The poorest 25% of the population have only US\$1 per week with which to connect to ICTs (ECLAC, 2005).

introduction and deployment of internet infrastructure. This is the history and development of the internet traffic exchange infrastructure in South America. Taking into account the lessons from South America, the paper then analyzes the internet backbone as a critical infrastructure. The section after addressed limitations to the positive economic impact of the internet on geographic development. As a preliminary conclusion, the last section underlines that, as an infrastructure, internet development clearly has policy implications.

■ Internet in Latin America, its emergence, development and market structure

In this section we discuss the emergence, development, market structure and governance of a critical part of the internet infrastructure in Latin America. We refer to the history and development of Network Access Points (NAP).

The emergence of the internet in Latin America

During the late 1980s, the internet started out as a university-led venture in several Latin American countries, in some cases with an ad-hoc, non-committed participation of government agencies. In several countries a leading academic institution or a small group of universities forged an alliance with the NSF or with a U.S. university to establish a link to the existing NSF backbone. In the mid-1990s, after the commercial internet growth boom in the U.S., the first commercial internet access providers appeared in the region. Some telephone companies began to service corporate customers and households, but newly formed firms and established data network providers also created Internet Service Providers (ISPs) (HUSSAIN, 2001).

Early provider relied on international carriers for access to Internet Backbone Providers (IBPs). In most cases these providers signed transit agreements, as their size and inexperience did not make them suitable for peering agreements. International traffic became mostly unidirectional, with users of the early ISPs getting access to data bases and early web services, mostly located in the USA. Regional customers' internet traffic was routed through networks in the USA, regardless of the geographical location of

sources and destinations. As domestic traffic increased, ISPs saw no advantage in having their domestic traffic routed through foreign networks when, in fact, the source and destination points of such traffic were located within the country. To the ISPs it was evident that local routing of domestic internet traffic would save them the costs incurred in purchasing channel capacity in carriers' networks.

In the late 1990s, ISPs in Argentina, Chile, Brazil and Colombia chose to negotiate multilateral cooperative agreements among themselves (in each country, all of them or a selected subset of them) to build traffic exchange points. Participating ISPs, also called members, jointly designated a NAP administrative body in charge of the agreement. This body was usually an association of telecommunication-related firms (chambers of commerce), as was the case in Argentina and Colombia. Throughout the region such cooperative agreements became known as NAPs. NAPs allowed ISPs to avoid routing domestic traffic through the large ISPs routers and gateways in the USA. One of the immediate consequences of the creation of NAPs was a reduction in costs for all ISPs. New ISPs saw the benefits of joining the established associations and participating in the exchange. The NAPs saw major growth in the early years of their existence.

Interconnection agreements

The two most significant interconnection agreements between ISPs are peering contracts and customer contracts (HUSTON, 1999). Under a peering arrangement, an ISP accepts traffic destined for its customers and does not accept transit traffic destined for a third ISP's customers. With a customer agreement, an ISP sells transit to another ISP; enabling the latter's customers to communicate with the rest of the internet. A peering agreement usually implies no charges among ISPs, so it is considered a Bill and Keep (B&K) agreement. Under B&K, ISPs do not charge each other for traffic exchanged between their networks. A peering contract involves address advertising, settlements and peer monitoring of interconnection features (NORTON, 2003).

These two types of agreements help to consolidate the hierarchical structure observed in the internet. Less complex routing tables, a limitation on routing arbitrage, the reduction in connection costs and an improvement in the accountability of providers' quality of service are usually listed as the benefits of the hierarchical structure.

However, the internet is not purely hierarchical. The South American internet access markets are examples of regional secondary peering agreements for the exchange of local and regional traffic. Many of the ISPs involved also benefit from the practice of being customers to multiple backbones (multi homing) (HUSSAIN, 2001).

The nature and extent of regulatory intervention

Two cases of regulatory intervention in the internet access market are worth mentioning: Chile and Venezuela.

The Chilean Department of Transportation and Telecommunications, through its Telecommunications Sub Secretariat, regulates ISPs' interconnection in Chile (SUBTEL, 2000). The Secretariat's intervention is aimed at guaranteeing efficient use of resources and the non-discriminatory treatment of users' access to contents, independently from network access providers. Regulatory norms constrain ISPs to establish and accept connections among themselves to send domestic traffic, leading to the set-up of traffic exchange points, called TEPs (Traffic Exchange Point), for domestic traffic⁴.

TEPs must be non-discriminatory and must accept all ISPs' domestic traffic, without restrictions, and exchange routes with ISPs connected to other TEPs. In order to comply with the domestic connection requirement, every ISP must be physically connected to and entitled to route exchange with at least one TEP. In this case, the existing agreement among ISPs connected to TEP should be a peering agreement. They may, however, agree on other connection topologies, provided that national traffic be exchanged by authorized providers.

TEPs manage quality indicators not only of TEP connections with ISPs, but also of connections among TEPs. By mandate of the Telecommunications Authority, there must be full connectivity among TEPs,

⁴ TEPs are actually a regulatory concept and a first step towards understanding what traffic exchange is both from a legal and technical point of view. In short, Chilean-based ISPs are obliged to become TEPs because they are mandated to establish local interconnectivity to other ISPs. On the other hand, NAP is the realization of a TEP in which several ISPs associate to establish a legal entity able whose purpose is the exchange of local traffic under independent governance.

if less than five in number. However, should there be more than five, each TEP has to be connected to another three TEPs.

NAPs in South America

NAP Cabase Argentina

In Argentina NAP Cabase Argentina was founded in April 1998. NAP Cabase was created by the *Cámara Argentina de Bases de Datos y Servicios en Línea* (Argentinian Chamber of Data Base and On-line Services), a lobbying organization, as a non-profit body embracing all 12 Argentinian telecommunications companies, on-line and internet service providers. Cabase contracted Comsat Argentina to operate and maintain the NAP. To qualify as a NAP member, a company must first be a Cabase member, have an added value or telecommunications license, and own an Autonomous System number. In 2003, NAP Cabase's ISPs had about 71,500 dial-up connections - 90% of the country's connections - 120,000 ADSL connections, and over 73 000 cable customers. NAP Cabase handled almost 100% of internet domestic traffic. Other types of traffic are handled by agreements signed by individual ISPs with international carriers (BELLAGAMBA, 2003).

Prior to NAP construction, ISPs had to pay an expensive international access charge to communicate with other ISPs at a local level. Data access and e-mail providers (whose clients are mainly corporate) operated an X.25 network. After the update to IP, Argentine communications authorities allowed Telintar to be the sole provider of international access, but Telintar did not provide local connectivity. The local connectivity issue was first addressed when three Argentine ISPs decided to interconnect themselves. After one year of negotiations the three ISPs decided that they would be bound by a local interconnection neutral agreement. This agreement became NAP Cabase. Original founding members paid no entry fees.

The terms of the agreement are the same for all members. Initially some ISPs raised concerns threatening to refuse acceptance of some contract clauses such as ISPs being contractually obliged to publish their domestic routes. In fact the exchange of domestic traffic must take place at no reciprocal costs for the parties involved; all agreements are peering agreements. The administration believes that their determination to keep the same contract for all members has been crucial to the growth in exchanges.

There are no private agreements between two ISPs at the NAP. Routing addresses are publicly advertised for all members. The NAP Cabase adheres to an open-policy principle. All business affairs are publicly discussed. The NAP's cooperative spirit led the organization to dismiss the issue of Service Level Agreements.

Cabase's approach to decision-making is that decisions are made together, with a technical sub-commission in which every member is represented by a professional technician. On the other hand, financial sustainability rests on the concept of NAP points. The administration introduced this concept to reflect the use that each ISP makes of the common switching resource. The capacity demanded by each ISP determines the amount of NAP points awarded to it. In other words, an ISP's monthly payments depend on the amount of NAP points it has accumulated. One NAP point encompasses not only connection capacity, but also the kind of installation needed by the ISP.

In 2003, four members (Advance Grupo Telefonica, Impsat, Prima-Grupo Clarin and Telecom Argentina) decided to unilaterally reduce their input capacity to the connection (BELLAGAMBA, 2004). When the four members downgraded their connections the NAP administration could not resort to any punishing action against those ISPs. This situation led to chaos in internet traffic interconnection in Argentina. Other members were obliged to advertise routes while the four ISPs reduced their capacity. This effectively produced two networks in Argentina. Due to the reduction in capacity, the subscribers of the remaining ISPs could not "see" addresses belonging to any of the four ISPs. This was, in fact, a strangling of interconnection, which led to the de facto existence of two subnetworks. As a consequence, any connection between these two subnetworks was only possible using international links. Cabase has admitted some responsibility in this affair since it did not foresee the consequences of not having any Service Level Agreements.

The four ISPs have sought economic compensation from the remaining ISPs connected to NAP Cabase. Both sides argued the importance of their own traffic in the Argentine context. If one side demanded compensation, the other side believed that it should also be granted compensation. Eventually the four ISPs decided to disconnect their networks from the NAP.

Ultimately, what the ISPs were pursuing was a change in the nature of the interconnection agreement. The four ISPs sought to enter client-server agreements or perhaps paid peering agreements. However, Cabase's

principle of peering public agreements based on a cooperative infrastructure was to stand.

NAP administrators reckon that the action taken by the four ISPs may have been motivated by growth in VoIP services. In all events, the four ISPs argued that they had made the largest part of the initial investment and demanded compensation in return.

A certain interpretation of the Argentine telecommunications act allowed Cabase to seek the intervention of the Secretaría de Comunicaciones. However the government agency never responded to Cabase's letter.

NAP Chile

NAP Chile was created by six independent ISPs to prevent the international outflow of domestic IP traffic. This association was also the genesis of the Asociación de Proveedores de Internet, IPA (Internet Provider Association).

NAP Chile is one of eight TEPs that existed in 2004. It guarantees a non-discrimination policy by which ISPs must accept and establish connections among themselves to exchange domestic traffic. Chile is the only Latin American country in which regulations have been designed to solve the problem of internet interconnection. Specifically, the Chilean Department of Transportation and Telecommunications, through its Telecommunications Sub Secretariat, has taken steps to regulate ISP interconnection in Chile. According to 1999 and 2000 regulatory guidelines, the Telecommunications Secretariat must guarantee, among other things, the efficient use of resources, and non-discriminatory access to contents for users, regardless of their network access provider. In turn, every content provider must be free to choose its hosting provider, which leads to free competition.

The guidelines mentioned seek to establish a non-discriminatory internet access service, in terms of quality, constraining ISPs to establish and accept connections among themselves to send domestic traffic. Red tape for ISPs includes the submission of a written request, a copy of which must be sent to the Sub Secretariat. Established connections should guarantee quality access to users, equivalent not only to that provided by their own ISP, but also to that of the ISP at which interconnection was requested. Regulation also allows for the establishment of traffic exchange points for domestic traffic (SUBTEL, 1999, 2000).

The Secretariat also controls network functioning by demanding that ISPs keep quality indicators such as the number of users, number of content providers, rate of packets lost, delay levels in data delivery (latency), and links' occupation level, published in a common web page. The rate of packets lost is the percentage of packets sent to a specific destination, but lost and therefore unable to receive an answer during a certain period of time. Latency is the time spent by a packet leaving and going to another specific point of the internet network.

NAP Colombia

An agreement signed by twelve ISPs (founders), led by the Colombian Chamber of Informatics and Telecommunications CCIT, created NAP Colombia in 1998 as a cooperative body. CCIT was donated part of the exchange equipment, outsourcing maintenance, control, and traffic measuring maintenance, control, and traffic measuring. Founding ISPs benefited from the common exchange point. Communication and routing services are rendered under equal conditions and opportunities for all entitled NAP members (NAP Colombia, 2004).

In 2003 it was estimated that Colombian ISPs who are also NAP members save about one million dollar a year, as they are not using international bandwidth to route domestic traffic. Total traffic handled by such providers represents 90% of all domestic traffic.

NAP Colombia provides information about traffic volumes, speed, traffic comparative ratios, time of use and congestion levels. It also updates information on internet development and growth in Colombia, identifying the technical capacities offered, as well as traffic and demand. All information and statistics derived from NAP's operations must be furnished to all parties to the agreement, at the same time and under the same conditions and means, without any discrimination or preference. Peering is the only type of agreement at the NAP.

The NAP Administrative Council acts as decision-making body. If technological changes are implemented by the NAP, the technical subcommittee issues recommendations to be approved by the Administrative Council. Founding members set forth an entrance fee to cover infrastructure expenses. NAP operating costs are financed with a monthly payment set forth by NAP members, whose purpose is to cover projected expenses.

The NAP was originally operated with level 3 technology, which meant that all ISPs were connected under peering agreements (implicit or direct connection to NAP). However, due to a traffic increase through the level 3 router, speed problems appeared as the router was working at full capacity. Consequently, NAP members migrated to level-2 technology, and although this was a technological set back, it allowed each ISP to set up its equipment according to its own traffic requirements. This new scheme may generate interconnection agreements other than peering, but transit agreements have not been signed yet.

The original tariff scheme for each ISP was calculated based on monthly operational costs, and equally divided among all ISPs. However, it did not fairly reflect traffic variations from one ISP to the others. Therefore the NAP had to design new schemes. After a transition period in which 70% of monthly costs were equally divided among all ISPs, with the remaining 30% allocated in proportion to the ISPs' shares of total traffic, NAP Colombia recently moved to a cost allocation scheme similar to that used by NAP Cabase.

NAP Peru

NAP Peru is a non-profit civil association, founded on August 2000 as an independent organization by five founding operators. Key characteristics for internet domestic traffic in Peru improved immediately after NAP Peru began operating. This was due to the fact that international bandwidth was no longer shared with national traffic and costs arising from time of connection, final destination, as well as the network and infrastructure used for the interconnection were reduced. One technical and one administrative committee are in charge of technical and administrative issues, respectively, with the American Chamber of Commerce currently administering the body. As usual, operation, maintenance and traffic measuring are outsourced to a specialized firm.

The main problem faced by this NAP is the result of its original legal framework (a non-profit association instead of an independent, profit-oriented organization), because it does not reflect the existing traffic disparity. Under the original rules all the parties had to connect with the same capacity, and if links were saturated they had to increase their capacity on equal basis. However, this restriction to conform to bandwidth capacity harms small traffic operators. Since NAP Peru is currently saturated, sometimes it is preferable, for the sake of speed, to route traffic to

international links. As a result, it was proposed to update the interconnection links to 30 Mbps, but this move pushed out members with less traffic because of the higher interconnection costs incurred.

ISPs partners at NAP Peru negotiated peer-to-peer exchange agreements. As of early 2004, the two largest ISPs have handled 95% of NAP traffic. For its members, NAP Peru hosts routers and infrastructure for domestic traffic exchange, thus avoiding the use of international links. In case of failure, a report is produced in under five minutes, offering 99.999% availability. Measurements are not, however, classified according traffic type (voice, video, data, etc). The criteria measuring the quality of the services rendered by NAP include bandwidth and latency between the exchange central node and the provider's exchange router. Traffic from each ISP to NAP (outgoing traffic for ISPs) and from the NAP to each ISP (ongoing traffic to ISP) are also considered when evaluating quality of service. Total traffic is also calculated from data levels transiting throughout the two (redundant) switches, which belong to the NAP. Each ISP is connected to each one of these switches (one backs up the other in case of failures).

The entry fee that must be paid by every applicant is USD15,000. Total The NAP's monthly operational cost was about USD3,000 per month in 2003. Such cost is equally divided among its members. If any ISP requests membership to the NAP, it must have an AS number and use BGP, own an international outgoing, and maintain the same transfer speed as the remaining members. The minimum capacity required to interconnect to NAP is 2 Mbps. As a result, smaller Peruvian ISPs usually route their internet traffic through transit nodes in the United States.

Brazilian NAPs

NAP Brazil

NAP Brazil is located in Sao Paulo. It is administered and operated by Terremark Latin America (Brazil) Ltd, together with FAPESP (Fundação de Amparo á Pesquisa do Estado de São Paulo). Terremark also owns and operates NAP de las Americas, Miami, U.S., the world's 5th network access point Tier-1.

NAP Brazil uses FAPESP's facilities, with some of its expenses covered by Terremark. Among the services offered by the NAP are information provision, peering, and data services. Such an offer also includes physical facilities for equipment to its clients. Each client privately signs up peering

agreements and other similar commercial agreements with other member ISPs. NAP acts as a facilitator and operates the peering structure and the meeting points used by its clients for the duration of the agreements. It also sells cross connections at different speed for those clients who may interconnect between themselves. It offers system monitoring, services and other kinds of installations used by four categories of clients: network service transporters or providers, service providers (hosting companies), government commercial and industrial enterprises, and government agencies (CROM *et. al*, 2003).

NAP clients with two simultaneous connections are offered 99.999% availability to connect with other clients having also two connections. Those with one connection may obtain 99.5% availability, although larger percentages may be possible in some cases.

NAP RSIX (Porto Alegre)

NAP RSIX operates in the data processing center of the Universidad Federal de Rio Grande do Sul. It facilitates agreements and network connection at low costs for public and private institutions. This NAP provides a neutral point where different operators may exchange traffic among different backbones, having at least one point of presence in Brazil.

Some of its first members included Brazilian research and academic institutions, as well as commercial ISPs and other academic Autonomous Systems. Multilateral agreements are signed among these members. Members are required to use protocol BGP4 and have at least 2 Mbps of capacity.

NAP ANSP

This network was created on 1988 thanks to a nuclear physics professor, the president of the FAPESP's Conselho Superior. Originally it had connections that allowed universities and research institutions in Sao Paulo to gain access to information in United States universities and research centers. Ten years later the network started to offer traffic exchange services, thus promoting traffic exchange between backbones and content providers. NAP ANSP owns an international connection laid out directly with Global Crossing (GBLX) at 155 Mbps.

DIVEO - NAP

This NAP was created in 2001 and is the only wholly private NAP in Brazil. Its goal is the exchange of internet consumers and companies in Brazil. It was set up to improve network efficiency and performance. Connected to NAP ANSP and to other operators like Embratel and Global One, it aims to diversify network exchange by using the BGP4 protocol.

The cases above presented lead to the following conclusions:

- A key dimension of internet provision is the set-up of backbones that carry traffic between ISPs, but backbones themselves are generally not a source of problems as long as they are properly interconnected.
- The key concern is the interconnection between backbones and this takes place at the level of NAPs.
- NAPs are organizations created by process and characterized by their respective governance. NAPs can and do differ a lot from one another in Latin America in terms of both their organization and governance.

To understand the impact of the differences between distinct models of NAP organization and governance, it is necessary to state the internet as "critical infrastructure", as the next section will demonstrate.

■ An infrastructure with unique economic characteristics

Infrastructure: concept and definitions

What is meant by an infrastructure in a modern, complex system such as the internet is, at best, ambiguous. This is not new but, in the case of the internet, it reaches a point rarely experienced in the past. There is a world of difference between the internet and the infrastructures that have preceded it, including the telegraph, telephony, and cable infrastructures.

Our concern is with the internet as a critical infrastructure, rather than with the internet *per se*. Beyond that, the infrastructure has been selected in a narrow manner. This background information is important in order to understand the specifics of various national internet access infrastructures, but it must also be pointed out that infrastructure exist from the origin of the

facilities. Few innovations almost instantly become infrastructures like that of Claude and Ignace Chappe, whose optical semaphore was adopted by the French Legislature shortly before Valmy in 1792 and is said to have played a significant role in keeping the French army better informed. Similarly, there is probably no existing infrastructure that has been studied over as long a historical period as the Chota Nagpur Plateau's irrigation system, which has been analysed for 4,000 years (SENGUPTA, 2001). Few infrastructures are now being put to the test as harshly as those parts of health infrastructures, regionally, nationally, and globally that have to deal with growing concern over the avian flu.

This was not the situation with the internet. It only gradually became an infrastructure. This was even more true for places outside North America such as Latin American where the internet was totally dependent upon access to North America, the location of most of its content. In turn, access was dependent upon both the local access infrastructure, as well as intercontinental access to the North American internet.

In short, an infrastructure is a concept that is both intuitive and complex. When thinking about infrastructures, one thinks of something like "large capital intensive natural monopolies such as highways, other transportation facilities, water and sewer lines, and communications systems" (GRAMLICH, 1994, p. 1177). The internet is complex because, when we start thinking about the concept more carefully, while many activities are not infrastructures, the boundary can nevertheless be quite ambiguous. We must first understand the definition of infrastructures to understand what the significance of saying that the internet is an infrastructure. To that end we review a number of ways that infrastructures have been defined in order to be able to support our contention that the internet is a critical infrastructure of modern economies.

The ambiguity in the concept led us to turn to the dictionary for a definition. The Webster's New Universal Dictionary defines infrastructures as the "basic underlying framework or features of a system or organization". It also provides a more concrete definition, closer to the intuitive concept of an infrastructure, namely: "the fundamental facilities and systems serving a country, city, or area, as transportation and communication systems, power plants, and school". This definition gives a concrete dimension to what one means by infrastructure and yet it is easy to see that it overly constrains the first definition, leaving no room for "digital" infrastructures. Our objective is not to provide an ultimate solution to the definition problem, but rather to

enhance our understanding of a rich and powerful analytical concept that will help us better understand the infrastructure dimension of the internet.

The term 'infrastructure' is often used to describe some of the physical elements that would be used in a system. Thus, the FCC's overall policy priority is not competition, but the deployment of a broadband infrastructure across the U.S. This is illustrated by ARON & BURNSTEIN (2003) when they argue that:

"Consideration must be given to the obligations of incumbents to unbundle their broadband infrastructure and provide pieces of it" (p. 3) ⁵.

Their interpretation would seem to be supported by the Webster's use of "facilities." ASCHAUER (1989) and a whole body of literature on public infrastructure reviewed by GRAMLICH (1994) takes an even narrower approach to the concept of infrastructure, restricting its attention to public sector ownership of infrastructure capital due to a lack of available data with which to explore any other definitions. Were it not for such data constraints, GRAMLICH (1994, p. 1177) would have liked to define the infrastructure of a regional entity such as a country as possibly including, "human capital investment and/or research and development capital." JUSTMAN (1995, p. 131) takes a broader perspective, including "less tangible" elements such as processing facilities and distribution networks.

AVIRAM & TOR (2003a) take a different view of what an infrastructure could mean, which is closer to the Webster's first and more generic definition. This would seem to be motivated by the post-9/11 context with the emergence of Homeland Security's Critical Infrastructure Protection Program. That program formally integrates in the concept of infrastructure the governance that supports the exchange of critical data between providers in the context the private stakeholders' incentives to manipulate the process to their private benefit. Their usage brings us closer to the definition by FRISCHMANN (2004) that we consider below.

⁵ ARON & BURNSTEIN (2003) effectively consider two infrastructures and two scenarios, namely, whether the presence of duopoly-type competition between cable broadband internet access through cable modem and telephone operators' DSL access reduces the price of broadband access relative to a monopoly infrastructure, either cable-based or DSL-based. They do not study whether or not unbundling the service provision of broadband access under unbundling regulation at either the DSL level or at both the DSL and cable levels, i.e., service level competition would provide an even more efficient solution, with greater service diversity and, for comparable services, lower access prices (BOURDEAU de FONTENAY, CHAVEZ, & SAVIN, 2003; and BOURDEAU de FONTENAY, LIEBENAU & SAVIN, 2005).

For them, the formal and actual governance of the various stakeholders is an integral part of the infrastructure. Furthermore, this implies that the institutions and governance among the stakeholders, including the specific government agency (agencies) involved, are together an integral part of the internet infrastructure and by extension, the multiplayer information systems and their ability to communicate with one another. For AVIRAM (2003), infrastructures have complementary dimensions that tend to make a significant difference between different areas. Thus, an infrastructure tends to develop institutions and private organizations (often informal) that often have the ability to complement the government's role. When considering the Katrina disaster in late August 2005, Aviram's analysis suggests that informal governance failed, among other things, because of the racial divide that is so specific to the USA. The U.S.' racial divide may have contributed to the region's and country's inability to respond to Katrina as efficiently as many other, less developed countries could.

Infrastructure, government and COASE's lighthouse

Infrastructures are typically associated with large, sunk investments and historically there have been debates among economists as to whether these funds could be effectively provided by the private sector without government intervention. Many economists have proposed price-based mechanisms to allocate access to infrastructures, noting that such a system would prevent overinvestment in infrastructures. Firstly, as we saw with Katrina, even if the price system by itself may allocate according to ability to pay, this is hardly an efficient solution in a heterogeneous society, nor is it an efficient approach once one takes the social and political dimensions of the problem into consideration.

The debate around the role of government in the provision of infrastructures appears, at first glance, to have been resolved by COASE's 1974 study of the lighthouse. Few structures have epitomized the role of government in providing for some forms of infrastructures and to that extent Coase's analysis is central to our understanding of the interplay between governments and infrastructures. In practice, the merit of Coase's study was to bring to the forefront, using the powerful image of the lighthouse, the complexity of the problem. A careful reading of Coase shows that he does not provide a solution to the complex problem discussed. His contribution is to outline a range of options among alternative governance, all of which were already widely known and all of which involve substantial government

intervention. None of the solutions discussed involve the free market as conventionally understood (van ZANDT, 1993).

In his study of the provision of lighthouse services in England and Wales, Coase takes to task a large number of economists for rejecting the possibility that lighthouses could be provided by the private sector, independently of government intervention, funding, and management⁶. Yet none of his solutions conflicts with those considered by those economists. Coase correctly asserts that, "A lighthouse service can be provided by private enterprise" (p. 375). Nevertheless, that sentence, if read in isolation, is grossly misleading since the provision of the service he considers, in every case, was carried out under highly regulated conditions, conditions that were designed to protect the interest of the private entrepreneur who built the lighthouse. The principal risk taken by the entrepreneur was that, due to unforeseen conditions, the seafaring traffic might shift in such a way that the entrepreneur's earnings would end up be lower than expected.

Coase tells us that the entrepreneur who took the task of building a lighthouse was effectively granted a government monopoly, as well as rates s/he could charge to operate such lighthouse and maintain it. There were other benefits in kind. In those days, most ships would follow the coast, i.e., that they would stop in most ports along their path. Harbours and ports would typically have a customs house that would charge those ships for the use of the port. Typically, that same customs house would collect the charges that related to the lighthouse(s) that the ship had passed since the last port it stopped at. This meant that, contrary to the belief of most economists, transaction costs were quite low. The arrangement eliminated most free riding.

The rates charged were regulated very early on by the charter the entrepreneur would receive and posted in customhouses. In other words, Coase shows that the arrangement was highly regulated so as to avoid the kind of opportunism Mill, Sidgwick, Samuelson, and Arrow were concerned about. While the lighthouses were typically privately financed in those early days, the licenses granted to private entrepreneurs by the government were so restrictive as to eliminate most of the risks entrepreneurs were taking, while providing them with the proper incentives to build, operate, and

⁶ COASE's challenge focuses largely on Samuelson and yet the only criticism made in his paper was that Samuelson was not informed as to the actual working of the English and Wales' lighthouse arrangements. Samuelson's analysis is far closer to the situation that arose on the European continent as analyzed by van ZANDT (1993).

maintain those lighthouses. In addition, it was typically the entrepreneur who gathered the support of ship-owners for a new lighthouse to then propose to the government that a lighthouse be built and, presumably, suggest the terms and conditions under which it could be built. In other words, the entrepreneur was able to minimize risks in building his/her business case. The scarcity of capital and the political process the entrepreneur had to go through was also such as to minimize, if not proscribe, challenges from a competing entrepreneur. Where the terms of conditions were seen as inadequate, these were improved as noted by COASE (pp. 365-366) in the case of the Eddystone Lighthouse. As one can see, the private provision of lighthouses in England and Wales had little to do with "free markets" as commonly understood today. Coase's 1974 analysis confirms the need for major government involvement in the provision of lighthouses. In fact, if we compare the risks taken by a modern utility as described by Justice Stouter in, say, *Verizon vs. FCC* (2002), we can see that lighthouse entrepreneurs were taking probably less risk than today's utilities.

Evidently, Coase considers numerous examples in which lighthouses were built with private capital under highly regulated conditions. However, his study ends at the point when the system was changed and the provision of lighthouses was centralized and coordinated at a national level. Except for a few superficial comments, he does not carefully study the transformation of the British system, nor some of the potential rationale for the transformation. Had he done so, he would have had to confront the questions raised by economists such as Mill, Sidgwick, Samuelson, and Arrow, questions that he dismisses casually. One of the central questions that those other economists reviewed is how lighthouse owners could be paid by the ship-owners who use the lighthouses.

In the period Coase studies, most ships would coast relatively short distances, going mostly from port to port. There were evidently ships that travelled along international routes, but those ships had to follow relatively standard routes, at least, for safety. It suggests that it was relatively easy, during that period to assess the lighthouse(s) the ships would have benefited from when they arrived in a port where they had to pay their duties for using the harbour. In other words, it suggests that the types of shipping that were the most common could easily be assessed in terms of the use of lighthouses, hence keeping free riding to a minimum. Starting with Mill, it would seem that economists started to look at a broader and more complex problem, one where lighthouses became more common and more powerful, where ships became freer to follow a greater diversity of routes, i.e., when it

was becoming harder and harder to be able to avoid free riding, a question Coase overlooked given his historical coverage ⁷.

Coase's model also makes very strong assumptions about the information requirements for identifying the need for a lighthouse and identifying entrepreneurs with the resources to undertake the task. One of the shortcomings of Coase's analysis is its static nature. Technology was a factor that led to the expansion of seafaring, but lighthouses also contributed to the process, hence to the growth in the extent of the market. He overlooks the dynamic elements of investments such as lighthouses that contributed to an expansion of the division of labour, hence to growth, elements that were at the heart of classical analysis. In this sense, he grossly underestimates the benefits of building new lighthouses, and more generally new infrastructures, that helped augment trade.

WEST (1977) and KEOHN (1997) are among the authors who have looked at the characteristics of English institutions at the end of the XVIIIth and beginning of the XIXth century. This was a period for questioning existing institutions and creating new ones. Transportation constraints meant that the country had remained an aggregation of small largely independent regions until then with a limited scope for interregional commercial exchange. In that period, new projects in the form of turnpikes and canals opened the country and rapidly expended what Adam Smith called "the extent of the market" that led to rapid growth through "the division of labour". In that period, governmental institutions were slowly being developed and private capital was often a much faster way of financing canals and similar public works. While this historical period teaches us a lot about the emergence of modern capitalism, it has little to tell us about complex, modern societies and, for instance, how best to ensure appropriate infrastructures.

Lighthouses and the Elizabethan period are far from the age of the internet and yet the step we have taken is necessary to dispel the view that unregulated markets are the answer to all problems ⁸. Coase's contribution

⁷ One seems to see a repeat of the problem with social cost where there are too many ambiguities on the part of all parties to be able to support COASE's criticism of other economists (KLINK, 1994).

⁸ This view would seem to result from an overly narrow conceptualization of economics as when Knight in *The Economic Organization* (1933), as cited by SWEDBERG (2003), writes that, "Economics deals with the social organization of economic activity" and adds, "[I]n practice its scope is much narrower still; there are many ways in which economic activity may be socially organized, but the predominant method in modern nations is the price system, or free

dispels extreme views about governments, in particular the view that government involvement is, by necessity, inefficient and wasteful. Inefficiencies are found both at the levels of governments as within the private sector and it is the kind of governance that regulates government and private activities that matter. Economics is not an exact science. Rather, as Marshall had stressed, it is more akin to a biological process where optimization is of use, at best, locally.

Some question what Adam Smith meant by the third duty of governments, the productive duty to build infrastructure that contributes to the facilitation and expansion of trade, most of the time by facilitating transport and expanding the extent of the market (WEST, 1977). At the time of Coase's study of lighthouses, the number of goods and services that were produced and their diversities were still limited. The dynamic growth that would emerge from the expansion of the division of labour was in its infancy. Intermediate markets were generally poorly developed and where they were developed, different activities were typically located close to each other⁹.

One of the key dimensions of modern infrastructures is that they support a wide range of activities across the economy to an extent that could not have been imagined in the late XVIIIth century. In a modern economy it is not possible to identify all the activities involved, nor the significance of the impact through which those activities are affected, even less the new activities that are created through division of labour-type innovations (YOUNG, 1928). In his path-breaking study of the lighthouse, Coase considers infrastructures at a point in history when they were barely beginning to emerge and demonstrates the substantial role government was already playing together with the private sector in facilitating the creation of infrastructures¹⁰.

enterprise" pp. 5-6. From such a perspective, transaction costs required for the price system to function are treated like manna from heaven. Infrastructures and their management or regulation by governments are a significant element of those transaction costs that are ignored as being outside the sphere of economics.

⁹ One can think of Birmingham's small arm industry STIGLER (1951) describes so well.

¹⁰ KEOHN (1997) notes that "[I]n the second half of the eighteenth century, Parliament approved hundredth of miles of turnpike construction, much of it initiated and funded regionally by local businessmen... At the same time, Wedgewood and Bentley began recruiting political and financial support for a canal that would link the port cities of Liverpool and Hull..." (p. 34). Note the inconsistency with WEST's (1977) analysis which argues that the third task of the state was to build infrastructures such as roads and canals because it was hard to find private financing.

Infrastructures' economic specificity

Infrastructures are economic sectors that produce somewhat unique intermediate goods. Those intermediate goods are unique because they are not inputs into one or a small number of processes, but rather because they are inputs into a whole gamut of upstream processes. Because infrastructures are inputs in so many economic activities, any disruption in their activities has a profound impact on the general level of economic activities¹¹. Such disruption, if permitted, can have wide and costly repercussions throughout the economy, significantly lowering social welfare.

Economists have focused heavily on three other dimensions of modern infrastructures, namely, their low levels of excludability and of rivalry and their high level of externalities (de FONTENAY, HOGENDORN & LIEBENAU 2005). As we noted, those dimensions were fairly minor in the period studied by Coase (WEST, 1977) to become, as noted by YOUNG (1928), central in modern days.

The change in the relative role of infrastructures, just like the change in the relative scale of government to make capitalistic trade possible, are dimensions that have been largely neglected by economists. This kind of change is somewhat reflected in modern telecommunications. In the 1980s/early 1990s, industries such as the automobile sector built costly, complex, dedicated, private networks based on proprietary networks – a pre-internet infrastructure much like the canal which would help Wedgeworth's Etruria factory on the Trent-Mersey canal to facilitate the distribution of its output (KEOHN, 1997) or the early railroads with their individual gauges. Today's industry networks are centered on a single, universal infrastructure, namely the internet.

ROSE (1986) has focused on the third, specific dimension of infrastructures, a dimension that we have repeatedly described above, but not yet specified, namely externalities. Rose makes the simple, Youngian observation that looking at an infrastructure from a neoclassical perspective, i.e., as an essentially static process, and basing policies such as pricing upon that perspective is harmful to the economy because it undermines the

¹¹ This is why, in modern warfare, so many resources are targeted at destroying the enemy's infrastructures. This is also why, after a war, infrastructure rebuilding becomes the dominant activity, an activity that can never start without significant and durable, direct government intervention. This dimension of infrastructures and of the role governments have to play has rarely been as well demonstrated as by the Marshall Plan after World War II.

benefit infrastructures contribute to, namely, the expansion of trade ¹². Rose's contribution shows that extending Coase's analysis to the stage when the activity becomes an infrastructure is not a neutral step. It is at the heart of the economy's innovative process and the source of economic development.

We have identified up to this stage a number of characteristics that make infrastructures different from conventional economic goods, characteristics such as their impact over a broad range of downstream economic activities, low levels of excludability and rivalry and a high level of externalities.

■ The internet's economic benefits are limited by its impact on geographic development

Each new technological revolution in transportation and/or communications transforms the world we live in and shrinks distances. One will soon be able to work from anywhere and "geography" will become irrelevant, or so we foresee the impact of each new technological advance. KEOHN (1997) reports that when the first locomotive, the 'Rocket' was introduced, it could reach the speed of 25 mph. It could cover in one hour what a loaded horse-drawn wagon could do, at best, in one full day on the new turnpikes. The introduction of the telegraph had an even greater effect on society (STANDAGE, 1998). Events that had been taking days and often months to reach people in major metropolitan centers such as London became available almost instantly. Later, television and satellites brought about the same changes for video images ¹³.

¹² This issue, the role of externality, separated YOUNG more than any other issues from his student, KNIGHT. The externalities are the core of YOUNG's analysis to a much greater extent than to MARSHALL. YOUNG and MARSHALL, notwithstanding WEST's analysis, see those as core to SMITH's growth analysis all centered on the division of labor (theory which YOUNG brilliantly generalized).

KNIGHT was one of the first and one of the most outspoken neoclassicists to reject externalities. Today's conventional economics is in the tradition of KNIGHT rather than YOUNG, because KNIGHT's static approach was amenable to clear solutions that could be established unambiguously given the assumptions the economic analysis was based on.

¹³ In 1954, the Canadian Broadcasting Corporation was the first to present the film of Queen Elizabeth II's coronation on North American television. It did so by using a jet bomber belonging to the Royal Canadian Air Force to bring the films from Europe to North America. The first live video broadcast between Europe and North America did not take place until 1959.

The demise of geography via the internet is yet to be realized. With each transformation throughout history, conditions have changed with some regions benefiting while others lose out, but the process has been slow and the "geography" evolves, changes, but does not disappear. There are many factors that can help us to understand the ever-present geography, the most obvious being the lack of mobility of populations.

MARSHALL (1890) is probably the first to have studied the role of economic geography in the context of the localization of business activities. As a pragmatic man, he could not ignore that economies of scale were a major factor in the economy and that monopolies were nevertheless uncommon. Marshall addressed the conflict by noting that there are substantial externalities between firms within a given industry. They worked in such a way as to dissipate those externalities throughout the sector, resulting in the absence of monopolies. He was aware of the potential dichotomy between economies of scale-based monopolies and their incompatibility with competition, which became the neoclassical dilemma, but he dismissed it for the interaction between externalities and geography, i.e., where firms are located.

Neoclassicists have rejected Marshall's externalities. After all, as SRAFFA (1926) points out, it makes a mess in the formal analysis of the problem. They have effectively marginalized externalities. Assuming away externalities, one is left with the neoclassical dichotomy between monopolies and 'perfect competition,' with nothing in between. At the same time, one also eliminates geography from economic analysis.

The policy issue with economic geography is that, independent of internet's communication capabilities, geography still matters a great deal. KOGUT (2003) edited a number of studies on internet development in a number of countries, including India. The series of papers that he edited is enlightening and provides an insight into the role of geography. LEAMER & SORPER (2001) first addressed the subject from its traditional perspective. Trading is a function of the distance between traders and the further from each other traders are, the less they generally trade with each other. They then turn to complementary factors to evaluate whether there are internet-specific factors that may be changing that historical relationship. They note the fundamental role played by codification, i.e., the extent to which human communications can be codified.

Some communications can be, through experience, highly codified. The easier it is to codify communications the less sophisticated are the

communication needs to achieve an efficient transfer of information. For instance, one of Apple's historical competitive advantages has been its consistent, superior ability to codify the procedure to start using computers and other appliances they sold to the general public. The most codified forms of communications leave few ambiguities and involve few, if any, elements that could lead to different interpretation. The internet tends to reduce not the geography factor, but at least the significance of distance. LEAMER & SORPER (2001) point out that the internet's contribution has to be compared to older technologies such as the telegraph, then the telephone and the fax. Those technologies had already started to impact the role of distance in trade, communications, and distributed work.

LEAMER & SORPER (2001) note that, on the other hand, there are communications that are hard to codify; in these situations, one tends to use case studies to facilitate communication that keeps nevertheless many of its ambiguities. Beyond that, there are human communications that cannot be reduced to codifications as, for instance, most great poetry ¹⁴.

The key dimension of their contribution is that, in spite of the gains we have made in the codification of information that is communicated between humans, there always remain a substantial amount of communications that, at this stage, cannot be codified. One can think of some of the forms of learning, the exchange of personal views on a subject matter, and other forms of communication; especially those that involve the complex transfer of information, much of which is ad hoc and cannot be pre-planned, but still requires direct, live, human interaction. The lesson to be learnt from their work is that the unique characteristics of these communications imply a continued and substantial role for geography. This can be illustrated by internet's inability to eliminate the existence, even in the high tech sector, of phenomena such as Silicon Valley and Route 128 where localization is just as important as the one Marshall was discussing in his time (KENNEY & VON BURG, 1999; SAXENIAN, 1999). The implications of such a geography is that one must expect the poles of internet-based development, especially at the higher levels, where codification is non-existent and at this stage impossible, are almost exclusively located on the West and East coast, with a minimum role played by the central regions of the country. We raised earlier the example of India and Bangalore (see also SAXENIAN, 2000). It is

¹⁴ This is well known in a great number of contexts. One can think, for instance, at the typical impossibility to write complete contracts, problem that has led to a substantial literature on opportunism (WILLIAMSON, 1973) and its challenge (HELPER *et al.*, 2000).

important for countries, such as in South America, to understand the logic behind that kind of development process whereby the internet tends to reallocate tasks and how it can be expected to impact development: Are one or more "Bangalore-type Silicon Valley" important for the future of South America?

While the process is often affected by e-government – after all, governments are generally the largest centers of activities in most countries, it is largely independent of universal service concerns. Universal service is a policy that aims to eliminate geography while the internet's impact on geography is to transform its role and, in many cases, accentuate its significance.

■ Preliminary conclusions

The character of the internet as an infrastructure leads to policy implications for governments. Critical infrastructures are segments of the economy that a large number of other segments depend on to function. One thinks typically of transportation, for instance. Their impact on the rest of the economy, along with the cost and damages that arise from infrastructure failures, have always made them a matter of concern for governments.

As an infrastructure, the internet is a unique kind of good that is an input to a large range of economic activities. Internet disruptions cannot be studied from the same perspective as disruption of average economic processes because their repercussions across the economy would be too serious, costly and politically unacceptable.

Considering the internet as an infrastructure can help Latin American regulators to design their second-generation reform of Universal Access Funds (UAF). Strong mobile penetration in the region helps to achieve universalization goals much more than fixed line penetration, which has stagnated after the post-privatisation boom. The UAF were originally intended to build and support fixed line penetration, but the internet is a serious candidate for receiving assistance from the UAF. Thinking of the internet as an infrastructure can give regulators new criteria in their task of allocating some parts of the UAF to foster internet penetration.

We do not propose a specific infrastructure policy, but we show that governments need to put in place policies that enable them to address

potential disruptions. We do not propose specific policies because at this stage too little is known about internet backbone competition and how networks interact with one another. However, we point to the situation in Latin America that has been studied in great detail by one of the authors and shows the enormous diversity in organization and governance at the level of the points of internet traffic exchange or NAPs (Network Access Points).

Understanding the significance of the internet as an infrastructure and highlighting the diversity of NAP organizations, governance, and organizational routines (NELSON & WINTER, 1982) should greatly help governments to assess and compare the efficiency of the present arrangements, their robustness in terms of anticompetitive activities and their ability to cope with significant market disruptions. This should, in turn, help governments to shape policies to address the infrastructure dimension of internet and protect it against critical changes.

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Broadband Technologies and Services in Sub Saharan Africa

The Case of ADSL, Opportunities for Operators and Challenges for Regulators

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Abstract: Sub Saharan African (SSA) countries generally suffer from a lack of fully rolled out fixed infrastructure to enable the spread of ICT use among the population, especially in remote and/or rural areas. Nevertheless, the rapid development of dial-up internet access out of the existing footprint of the fixed network provides a clear indication of latent demand for internet access. Average annual growth of internet dial-up traffic, approximately around 40%-60%, is currently mainly driven by increases in the number of customers, through both private (residential) and public (cyber café) access. Various broadband initiatives have therefore been launched and the number of African countries offering commercial ADSL services tripled to 15 in 2004 from just 4 (Tunisia, South Africa, Nigeria, Senegal) in March 2003. Achievable penetration rates (typically 3% of fixed lines after 2 years, 5% after 5 years, 10% after 10 years) provide a sound basis for companies, which are fairly concentrated geographically, a basis that has been reinforced by the significant fall DSL equipment costs. In SSA countries, confronted both with the development of broadband internet usage and the liberalisation of fixed telecommunications, the major challenge for regulators is to ensure an appropriate set of options for "DSL Make or Buy" with respect to ALL the various players in the market (non infrastructure-based ISPs, infrastructure based-ISPs, infrastructure-based telcos (voice, data, internet, retail and wholesale etc.) whilst preventing incumbents from abusing their dominant position.

Key words: ADSL, Sub Saharan Africa, business models, regulation.

Faced with the diffusion of new technologies and services such as VoIP, WIFI and WIMAX that bring both services and high-speed internet access to urban and rural areas, as well as the launch of ADSL offerings in urban areas with/out TV or VOD, regulators and policy makers in Sub Saharan African (SSA) countries are encountering major challenges in the design and implementation of a new set of models and tools to reform and regulate broadband.

■ Broadband value chain(s)

Broadband technologies enable triple play services, comprising of internet access, voice and video services. The economic logic behind triple play is quite straightforward, due to the importance of:

- Economies of scale, at a subscriber level: joint fixed costs between services are high, so once the first two services (broadband internet + VoIP, for example) have been sold, a third service (such as TV) can be offered at a very low marginal cost.

- Economies of scope, at a network level: when new services are added, the potential for attracting new clients increases as a higher number of new customers will be interested in the offering; for example, by TV programmes only (sports events etc.) or unlimited calls only (VoIP). The broadband value chain comprises of 4 main components: content, backhaul, delivery and end user terminal (see figure 1 below). When considering SSA countries, the following specificities as compared to Europe have to be taken into account:

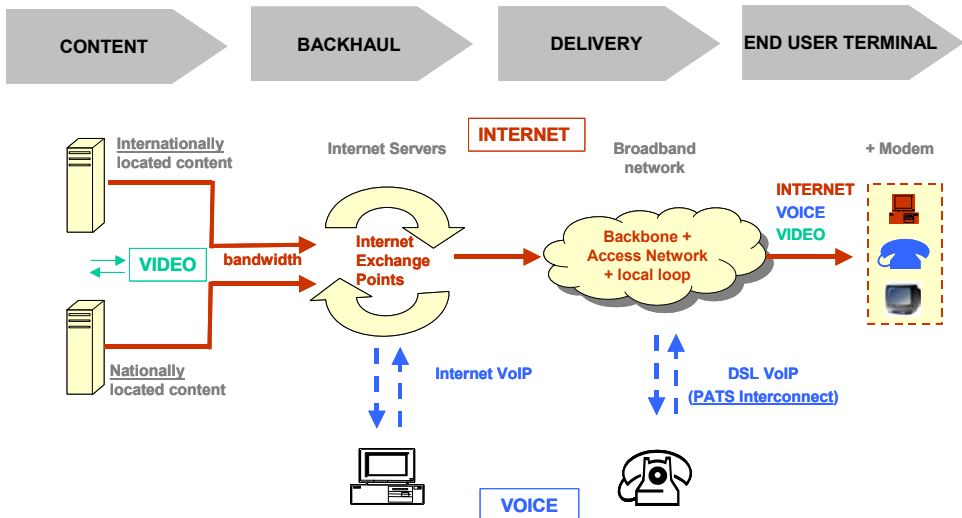
- Content: if content provision by African stakeholders does not increase, most of the traffic flows are likely to be from North to South, which constitutes a major difference between the broadband market and voice telephony.

- Backhaul: issues of international internet bandwidth capacity and pricing, as well as an appropriate number of internet exchange points, are of paramount importance to the development of broadband in Africa. Africa's combined international internet bandwidth capacity is projected to increase tenfold to over 6 GB/s through 2006, although significant differences in availability exist depending on access to deep-sea cable capacity and regional backhauls. Furthermore, insufficient bandwidth availability sometimes leads existing broadband customers (using internet leased lines) of incumbents to switch to a VSAT solution, thus bypassing the incumbent.

- Delivery: most incumbent operators have succeeded in upgrading and modernizing their backbone and access network on the basis of the existing footprint. Investments in new local loops, on the other hand, have been very scarce, and fixed networks basically only cover major urban areas. Although the world's most rapidly growing market for mobile telephony and home to its fastest growing fixed telephony markets, Africa still has the world's lowest penetration rates and basic telephony provision remains a major need in many parts of the continent, particularly in rural areas.

- End user terminal: the availability of computers is still insufficient.

Figure 1: Broadband value chain



Source: Tera Consultants

■ Single play "broadband internet":

DSL offers an interesting solution for incumbent operators in SSA countries

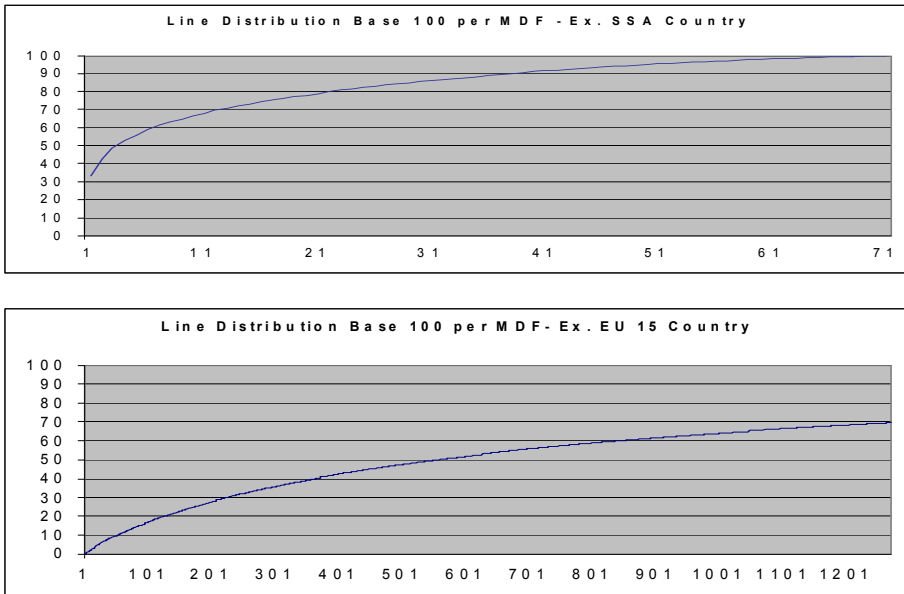
SSA countries generally suffer from a lack of fully rolled out fixed infrastructure to enable the diffusion of ICT use among the population, especially in remote and/or rural areas. The fixed revenues of an incumbent operator in an SSA country can typically be broken down as follows: 75% in the capital city, 20% in major provincial cities and only 5% in remote and/or rural areas.

Nevertheless, the rapid development of the internet dial-up market out of the existing footprint of the fixed network provides a clear indication of a latent demand for internet access. The average annual growth of internet dial-up traffic of approximately 40% - 60% is currently mainly driven by increases in the number of customers, through both private and public (*cyber café*) connections. Not so long ago launching ADSL in SSA countries would have seemed like a crazy commercial strategy, but the following supply- and demand-related factors have improved the business case for such a move in recent years.

Major supply-side related factors include:

- Prices for DSL equipment (DSLAMs in particular) have dropped sharply in recent years (DSLAMs manufactured by Chinese suppliers currently retail at under EUR 10.000 per unit).
- Incumbents' networks are geographically highly concentrated (see figure 2 below). The number of main digital frames to be equipped is relatively small, at least to cover the main areas of demand in the existing footprint, thus making the relevant investment compatible with a typical 5 year business plan of an incumbent telephone operator in SSA countries.

Figure 2: Line distribution per main distribution frame



Source: Tera Consultants

Major demand-side related factors include:

- Narrowband usage of internet via fixed lines is fairly high, so an appropriate pricing policy would definitely encourage migration to ADSL lines.
- Flat rate use of ADSL (as opposed to per minute pricing for narrowband internet access) enables far better control over communication expenditure from the customer's point of view and is therefore more

appropriate for public programmes aimed at supporting the diffusion of ICTs (in schools and universities, for example).

Various broadband initiatives have therefore been launched and the number of African countries offering commercial ADSL services tripled to 15 during 2004 from just 4 (Tunisia, South Africa, Nigeria, and Senegal) in March 2003. The SSA countries that have introduced ADSL include Ghana (in June 2003), Benin (in April 2004) and the Ivory Coast (in August 2005). An analysis of past and future market developments indicates that, given appropriate pricing, ADSL penetration in typical SSA countries could reach 2.5% to 3% of fixed lines within 2 years, around 5% within 5 years and 10% within 10 years, taking into account the existing segmentation of demand (high ARPU), growth in public access (cyber-cafes) and ICT governmental projects.

So even if widespread deployment of ADSL within SSA countries is clearly impracticable (which advocates the simultaneous usage of alternative technologies such as WiFi and WiMAX), deployment where copper infrastructure exists could enable the rapid roll out of broadband services in major areas of demand.

As illustrated by Senegal, demand in the initial phase of market development is predominantly for low bit rates, typically 256 kbit/s or 128 kbits/s (see figure 3 below). Appropriate pricing for the first level of bit rates should not be more than around twice the price of a narrowband internet connection in the SSA country.

Figure 3: Mix in ADSL bit rates in Senegal

Year	Bandwidth			# DSL lines	# Fixed lines	% DSL lines over fixed lines
	256 Kbits/s	512 Kbits/s	1024 Kbits/s			
March 2003	2156	711	133	3000	229,000	1.3%
December 2004	5507	1816	340	7663	229,000	3.3%

Source: Tera consultants

■ Viability of business models for competitors is nevertheless highly dependent on the regulatory environment

In SSA countries, which face both growth in internet usage and the continued liberalisation of fixed telecommunications, the major challenge for regulators is to ensure an appropriate set of options for "DSL Make or Buy" with respect to ALL of the various players in the market (non infrastructure-based ISPs, infrastructure-based ISPs, infrastructure-based telcos (voice, data, internet, retail and wholesale etc.) whilst preventing incumbents from abusing their dominant position.

A review of the current situation in SSA countries that have introduced DSL offers reveals potential regulatory concerns both in terms of operational issues (different levels of quality of service between an incumbent and its competitors' clients, refusal to let competitors offer one-stop shopping for ADSL connections etc.) as well as in terms of pricing issues.

When devising the new regulatory framework for facility-based competition in fixed telecommunications, regulators should therefore:

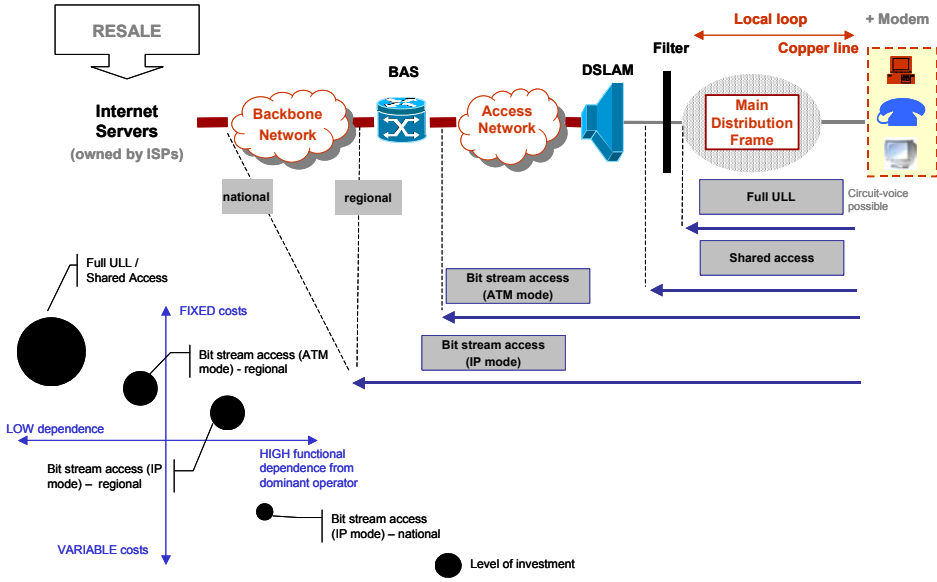
- introduce an appropriate set of options for competitors, including resale, bit stream access and unbundled access
- adopt a clear stance against price squeezes by incumbents at the retail and/or wholesale level

Introduce an appropriate set of options for competitors, including resale, bit stream access and unbundled access

ISP subsidiaries of incumbent telephone operators in SSA countries generally face competition from rival ISPs, despite their retention of a very significant market share. It is therefore important for regulators to prevent incumbents from launching retail DSL products in cases where a wholesale product, enabling rival ISPs to offer their own DSL retail products and compete against the incumbent, does not exist.

Different wholesale DSL products could be made available by incumbents to ensure that rival ISPs are not foreclosed from the ADSL market (see figure 4 below):

Figure 4: Wholesale DSL products



Source: Tera Consultants

Resale

As regulations in most African countries do not allow ISPs to obtain their own international bandwidth capacity, incumbents have to develop a resale offer to rival ISPs, as illustrated by Senegal.

In Senegal, the launch of retail DSL offerings by the incumbent Sonatel / Sonatel Multimedia in March 2003 was accompanied by the launch of a resale offer for ISPs named "Net ISP". Upon intervention by the regulatory authorities, one-stop shopping was imposed, enabling the rival ISP to order DSL access on behalf of its customers (rival ISPs had claimed that the purchase of DSL connections in the incumbent's outlets gave the latter an opportunity to win customers for its own internet subsidiary). However, the issue of "one-stop billing" for rival ISPs is still under discussion.

Bitstream access

Two main technical forms of bitstream access that could be provided with different geographical granularities are possible depending on the nature of

the network (technology, footprint) operated by the new entrant. Based on experiences in Europe, the following bitstream offers could be envisaged in SSA countries:

- An IP bitstream at national level. This option would benefit rival ISPs as soon as competitive provisioning of international bandwidth capacity is allowed.
- An IP bitstream or an ATM bitstream at a regional level, if rival ISPs are facilities-based and operate a long-distance network linking the capital and some of the country's major cities. Compared to IP bitstream, ATM bitstream would offer more scope for differentiation compared to the incumbent, and especially suits those new entrants that operate an ATM network as they offer services to residential and business customers.

By using bitstream access, new entrants will be put in a position to follow a smoother path between non facilities-based competition (simple resale of DSL services offered by the incumbent: small infrastructure investment, small potential for differentiation) and facilities-based competition (Shared Access/Local Loop Unbundling for DSL services by new entrant: high infrastructure investment, high potential for differentiation).

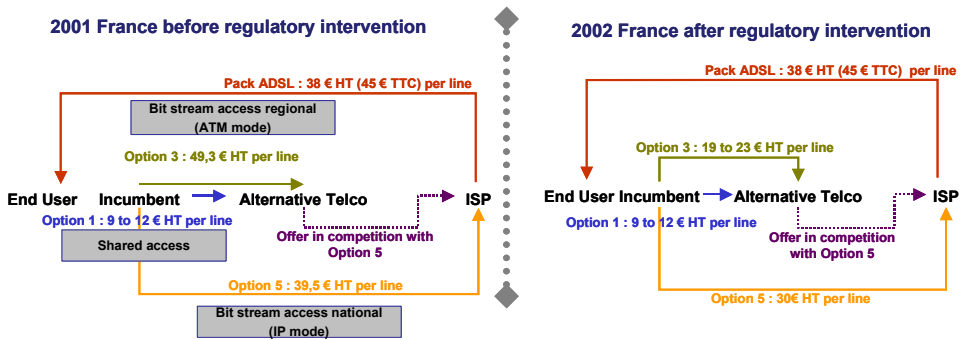
Shared access/Full unbundling of the local loop

These options are associated with a higher amount of investment, as new entrants have to install their DSLAMs in the incumbent's premises in all of the geographical areas that they intend to address. In SSA countries, however, fewer areas are "structurally" interesting for competitors with shared access or full unbundling of the local loop (5 to 15 areas in most of the cases to serve most potential clients). In these areas, the length of lines is generally compatible with DSL, but quality can be an issue (see Ghana). Nevertheless the civil engineering costs of accessing those areas could prove high: compared to shared fiber MAN, costs can multiply be a factor of 3 with leased lines and 5 with proprietary MAN. As a result, shared access or full unbundling of the local loop have more relevance in the context of the licensing of long distance or local operators for voice and ADSL services (second national operator), as these operators will search for local interconnection for voice and ADSL services and can thus share the associated costs.

Regulators need to adopt a clear stance against price squeezes by incumbents at a retail and/or wholesale level

Whenever confronted with a competitive ADSL market, regardless of whether the incumbent and its ISP subsidiary hold a very dominant position, regulators need to monitor the relative pricing of retail and wholesale ADSL products closely. This monitoring may be fairly complex depending on the diversity of products on the market, but it is crucial to ensure that there is appropriate economic space for all players in the ADSL market, as shown by experiences in the UK and France (see figure 5 below).

Figure 5: Economic space between retail and wholesale ADSL



Source: Tera Consultants

■ Clear potential for dual or triple play in SSA countries

Traditional voice telephony (PATS) has been subject to very strong substitution by mobile telephony for almost a decade in Africa. VoIP, which is currently growing rapidly throughout Europe and expanding in SSA countries, poses the threat of large-scale substitution for traditional voice telephony.

- DSL VoIP (also called voice over broadband or managed telephony), offered by telcos or facilities-based ISPs to clients with a DSL connection, targets "heavy" voice telephony and/or internet users. DSL VoIP is fairly easy to use and offers a service close to carrier-call reliability. When priced aggressively, DSL VoIP is a direct substitute for traditional voice telephony, so that only users with low telephone traffic and no desire to use the internet

may eventually remain clients of the incumbent if it does not react to the DSL VoIP offerings of its competitors.

- Internet VoIP is also taking off, although it addresses a nearby market segment: low fare / low cost and "nomads" with no fixed line. Today internet VoIP is still limited to users equipped with PCs, but QoS and reliability are not guaranteed.

As SSA countries are characterized both by the importance of public access (revenues in an SSA country can typically be broken down as follows: 15% public service, 35% business, 20% residential via private access, 30% residential via public access) and by relatively high prices for international calls. Very rapid growth in internet VoIP is to be expected for international telephony, with both competitors and incumbents offering VoIP services (in Algeria, for example, international telephony prices have decreased by almost 40% due to competitive pressure from VoIP services).

Furthermore, incumbent operators in SSA countries will seek to leverage their DSL equipped local loop and enter the media market. This process is well underway in North African countries, offering yet another example of the latent demand for such services, while experiences in Senegal with ADSL2+ technology with both streaming (movie, sport etc.) and broadcasting (6 channels of Canal Horizon etc.) have proven successful to-date. This evolution towards triple play services will very probably confront regulators and competition authorities in SSA countries with the same new challenges as their EU counterparts, with ownership of diffusion rights becoming a major competitive advantage for those operators that have secured them.

■ Conclusion

Although SSA countries are considered the most under-served region in telecommunications infrastructure and network access, and the success of mobile telephony casts even more doubts over the further development of fixed telecommunications, the successful launch of DSL shows a clear potential for this broadband technology to supply internet access, but also voice and TV services.

Even if only limited to the existing footprints of fixed infrastructures, DSL offers to bring customers in SSA countries higher quality internet access and better value for money, and thus to contribute to lasting ICT diffusion.

Furthermore, DSL is particularly suitable for cyber cafés, whose successful development plays a vital role in increasing the demand for broadband access and bandwidth capacity. Failure to deploy ADSL technologies may therefore deny SSA countries an opportunity to participate fully in the knowledge economy of the 21st century.

Local Software and Local Content Production Challenge in Developing Countries

Lessons from Open Source and Creative Commons Paradigms?

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Abstract: The G8 Digital Opportunity Task Force qualifies the digital divide as follows: "digital divide" is, in effect, a reflection of existing broader socio-economic inequalities and can be characterized by insufficient infrastructure, the high cost of access, inappropriate or weak policy regimes, inefficiencies in the provision of telecommunication networks and services, as well as lack of locally created content. The goal of our article is to study how the open source and creative commons paradigms could give policymakers tools with which to achieve the production of content and interface at a local state. The first part of this article presents the role of local software and local content in the policy agenda of developing countries to bridge the digital divide and challenges the choice of IPR as the main policy tool. The second and third sections introduce the open source paradigm and the creative commons paradigm respectively.

Key words: Digital Divide, IPR, Copyright, Open Source, Creative Commons

The G8 Digital Opportunity Task Force qualifies the digital divide as it follows: "[The] digital divide is, in effect, a reflection of existing broader socioeconomic inequalities and can be characterized by insufficient infrastructure, high cost of access, inappropriate or weak policy regimes, inefficiencies in the provision of telecommunication networks and services, [and the] lack of locally created content". Progress has been made both at an academic and a policy level in order to address infrastructure and access issues in developing countries. Several analysts point out that to bridge the digital divide more attention and effort should be focused on addressing issues related to the production of local software and local content that can fit developing countries' needs. This statement has been assessed at an academic level and is gaining ground at a policy level. Nevertheless the policy agenda and the policy actions to be implemented remain unclear. From a policy perspective, the underlying question is: which framework can

create the incentives to foster the production of local software and local content. Economists have long shown that intellectual property right systems are the main tool for creating these incentives. The WTO and WIPO are supporting the implementation of an IPR system in developing countries ¹. Nevertheless, the radical transition towards a western style intellectual property rights system in developing countries raises several problems (CIPR, 2002). In particular, financial and human resources constraints are an impediment to the quick implementation of such a rights system. Furthermore, a straightforward implementation of a western style intellectual property rights system in developing countries could provoke a shift from a "digital divide" to a "knowledge divide" (ORBICOM, 2003).

These constraints and risks should not prevent developing countries from move on and experimenting with pragmatic alternative approaches which could foster the production of local software and content. In western countries, the information revolution gave birth to two paradigms, which have proven their efficiency in order to produce software and content: the open source and the creative commons paradigms.

The goal of this article is to suggest how the open source and the creative commons paradigms could offer pragmatic and transitory tools for policymakers in developing countries. The first part of this article presents the role of local software and local content in the policy agenda of developing countries to bridge the digital divide and challenges the choice of IPR as the main policy tool. The second and third sections introduce the open source paradigm and the creative commons paradigm respectively.

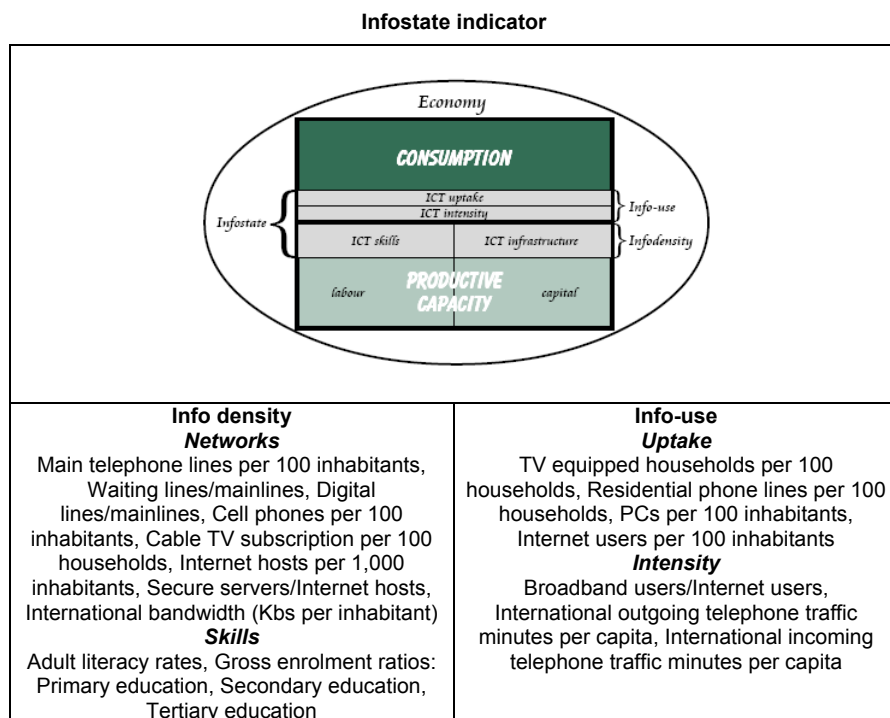
■ What is the framework for the development of local software and local content in developing countries?

New critical domain of action: local content and local software

In order to provide a comprehensive view of the determinants of the digital divide, the 2003 Orbicom Report on Digital Divide embedded in its monitoring methodology the long-debated relationship between information

¹ TRIPS – Trade Related Aspects of Intellectual Property

access and information use. In this report the Infostate for a given country is defined both by an Infodensity indicator, which includes the level of ICT skills and ICT infrastructures, and an Info-use indicator, which includes both the adoption of ICT devices and their effective use. Despite the data limitations related to the creation of such an Info-use indicator, this methodology gives analysts and policymakers a clear view of the role of ICT adoption and use for a given country.



Source: Orbicom, 2003

Nevertheless, despite the major step this study represents for policymakers in terms of helping them to design their policy priorities to reduce their digital divide, it fails to take into account three access issues which have been identified as critical by Ernest J. WILSON (2004): the design access issue, the content access issue and the production access issue.

Negotiating the Digital Divide

<i>Access</i>	<i>Policy actions</i>	<i>InfoState Index</i>
Physical Access	Provide Infrastructure Expand Applications	X
Financial Access	Suppliers (enhance competition, promote investment) Customers (Grameen, targeted subsidiaries)	X
Cognitive Access	Teach teachers Teach students Science and technology policies Continuous learning and training	X
Design Access	Improve hardware and software for popular applications	
Content Access	Support local content industries Permit imports Minimize content restrictions	
Production Access	Capacity building Pairing Innovations, reform Incentives for local production	
Institutional Access	Expand ICT sites (home, municipal kiosks, post office, etc.)	X

Source: adapted from WILSON (2004)

Design access

The inadequacy of human-to-machine interfaces both at a hardware and software level can constitute an impediment to access to ICTs. It constitutes a design access issue. In order to reduce the digital divide for a targeted population, policymakers need to support the production of tailored human-to-machine interfaces. In western countries, this issue is addressed by several organizations², which provide hardware and software solutions to specific groups of users such as the visually impaired or hard-of-hearing, who face difficulties connecting to standardized technology tools. In developing countries this issue is critical. Firstly, at a hardware level, western technology tools and devices cannot stand physical constraints of these countries (lack of electricity supply, heat, humidity...). Secondly, at a software level, the cognitive architecture and functionalities of western human-to-machine interfaces often do not satisfy the needs of users in developing countries.

² For example: <http://www.ataccess.org/>

Content and production access

The content access issue is related to the fact that a potential user of ICTs in a developing country may not find any interest in the content provided by information and communication technology. This can either be because this content is not in his/her language but also because this content is not relevant to his/her needs. WILSON (2004) quotes a Mozambique senior official whom once told him:

"I feel very sad about the internet because there is not a single page on the world wide web with anything in my maternal language".

Hence, developing countries also face a production access issue. Developing countries need to create the framework that could foster the production of local content to fit local needs.

At a policy level, these three access issues point to the need to set up a framework that could create incentives for individual, communities and firms to develop local software and local content tailored for the specific needs of their population or for targeted groups that remain excluded from ICT diffusion. At an international level, the WTO and WIPO advocate that the adoption of a western style intellectual property rights system is the most efficient way for developing countries to create this framework.

**Is WSIPR the most appropriate framework for developing countries?
The political economy debate**

The role of IPR in economic growth has been closely scrutinized in recent years. In industrialized countries, it has even become a major concern. In the past few months, public discussions have flowed on this topic ³ and a lot of academic contributions ⁴ have examined the role of intellectual property right on economic growth and economic development. Certainly, these investigations have contributed to enriching debate. Notably, some analysts have challenged one prevailing interpretation of the idea that property systems create the greatest value (PARKER & van ALSTYNE, 2005). For

³ See for example, the European debate on the patentability of software, the discussion surrounding the quality of the patent issued by the UPSTO or the controversy regarding digital rights management for cultural goods.

⁴ For a discussion on patent policy on software industry, see BESEN (2003), HAHN & WALLSTEIN (2003), BESEN & HUNT (2003, 2004).

instance, academic research has highlighted the negative impact of regulatory reform on licensing policy⁵. In industrialized nations, these debates help us to understand the recent shift towards a systematic use of patents. They also improve our knowledge in the context of the strategic use of patents by firms for anticompetitive purposes. At the normative level, these studies help governments and international institutions to reshape policies on IPR design. However, for developing countries, this debate around intellectual property rights addresses a deeper issue. This is not a question of more or less competition but a question of sustainable growth. As the rich world benefits embraced new computing and communication technologies, the situation of developing countries in terms of technology, digital content and information remains unchanged. This situation has led to frontal oppositions during past international conferences. For example, at the World Trade Organization (WTO) in Cancun in September 2003 or in the World Summit on the Information Society (WSIS) in Geneva in December 2003, a divide grounded in the design of IPR clearly appeared (BAMBAUER, 2004) raising outstanding questions: how the implementation of western style intellectual property rights system is an attractive tool for a developing country? How IPR interacts with the digital divide issue? Is it possible to evaluate the impact of WSIPR on the pace of innovation for developing countries?

For opponents of the IPR, the implementation of western style intellectual property rights system in developing countries represents a major threat because it favours lock-in strategies. More specifically, because developing countries can't spend money on patent litigation and, at the same time, the implementation of a western style intellectual property rights system enables the enforcement of IP and lawsuits against developing countries, the bargaining power of the industrialized countries is strongly reinforced. Indeed, given the fear of patent litigation, this phenomenon contributes to creating strong barriers that prevent fresh initiatives in developing countries and the creation of a critical mass of knowledge. Finally, the consequences for developing countries are very serious because the implementation of WSIPR enables industrialized countries to control the innovation rate in their developing counterparts.

⁵ In a recent book, JAFFE & LERNER (2004) strongly criticize the patent policy reform in the USA. For them, by facilitating patenting, the regulatory changes have broad consequences on competition.

On the contrary, the advocates of WSIPR maintain that the implementation of WSIPR strongly encourages local innovation. They claim that the implementation of a WSIPR: (a) creates strong incentives and business opportunities for developing countries at a microeconomic level; (b) facilitates foreign direct investments that complement local initiatives; (c) improves the ability of developing countries to deal with IP Policy. These considerations make us sceptical with regard to the ability of the parties to reach a compromise acceptable to both sides. Sometimes, these cheap talks contribute to entirely occulting the digital divide itself, notably because several arguments used in this debate are political.

Nevertheless, we need a rigorous approach⁶ to foster the creation of local software and content. Firstly, we need to encourage the creation of strong intellectual property rights in developing countries. Unfortunately, the postures presented above instead contribute to favouring strong contentions between developing and industrialized countries in terms of the design of intellectual property rights. With the implementation of the intellectual property rights system, we need to enact practical tools to enhance local content. In developed countries, two mechanisms dedicated to fostering collaborative and creative works have appeared in recent years. These mechanisms are built on an intellectual property rights system and they have already gained a large audience. In the rest of this paper we propose to evaluate these tools, namely the free open source software and creative commons paradigms.

■ Free open source software paradigm

By Free Open Source Software (FOSS)⁷, we refer to computer software and the availability of its source code as open source under an open source license to study, change, and improve its design. Thereby, the availability allows users to modify, share and redistribute the source code of the software. To exclude the problem of personal benefits and free-riding, the

⁶ WEBER (2003) argues (that this is essential for developing countries) because: "It is a question of what regime for the ownership and distribution of tools, the essential infrastructure for the next generation of economic growth, best serves the interests of emerging economies and of the global economy as a whole".

⁷ see www.opensource.org (Open Source Initiative) for a precise definition of open source. In this text, we use the term free open source software (FOSS) to embrace the terms free software, open source software or libre software.

contributors to FOSS have constructed a set of well-established social norms. At the same time, the FOSS uses various tools to legitimate free open source software. Among them, we should emphasize peer review, restricted licenses or specific governance structure.

The FOSS paradigm was initiated by a software engineer, in MIT's laboratories during the 1970s in reaction to the growing privatization of information. The success of the FOSS paradigm has grown with the diffusion of Internet. Nowadays, the success of several FOSS projects such as Linux or Apache is acknowledged. FOSS projects are attracting a growing numbers of developers and the number of FOSS projects is surging. Today, Sourceforge⁸ lists more than 100,000 open source projects with 1,100,000 users registered. Furthermore, this emerging success is also attracting commercial interests. A growing number of firms would now like to invest in FOSS projects. In order to take advantage of FOSS, firms like IBM or Redhat have developed business models around this collective method of programming. At an academic level, a lot of scholars have drawn attention to FOSS. Among the bulk of studies, those by legal scholars and economists⁹ have opened up fields of research on FOSS to understand the motivation of developers, the organization and the dynamic of this model.

Public policy and FOSS

FOSS has also attracted audience at a regulatory level. In fact, governments have a wide range of reasons for using and promoting FOSS. Firstly, the adoption of FOSS in the public sector can be motivated by a desire to minimize IT investments and operational costs. Moreover it allows public sector actors to reduce their dependency to software suppliers. Given the fact that the software industry is characterised by an oligopolistic market structure this constitutes a critical issue. In addition, the control over FOSS code is a benefit when e-security concerns are raised. For all these reasons, policymakers in several industrialized countries have integrated FOSS in their IT policy. In order to design their FOSS support policy, many governments have established working groups in recent years. Most of

⁸ The universal repository of FOSS projects

⁹ See for example, LESSIG (2002 a, b) and BENKLER (2002 a, b) for legal scholars and LERNER & TIROLE (2001, 2002) for economists' point of view on open source.

these working groups have acknowledged the potential of FOSS both at a technical level and an economic level ¹⁰.

Open source software in industrialized countries

<i>Country</i>	<i>Policy action</i>	<i>Description</i>
France	Parliamentary Bill	Forbid government-related institutions to use anything but OSS.
Spain	Bill	Parliamentary Bill mandating an open source software preference in all governmental offices.
Germany	Local Initiative	The City of Munich announced its plan to migrate 14,000 computers in its public administration to Linux and other open source office applications.
Spain	Parliamentary Bill	Bill requiring regional governments to prefer and promote open source products.
Spain	Local Initiative	Bill submitted to the Catalan parliament mandating an open source preference in all regional administrative bodies.
Australia	Government Bill	This amendment Bill states that: "A public authority must, in making a decision about the procurement of computer software of its operations, have regard to the principle that, wherever practicable, a public authority should use open source software in preference to proprietary software".
China, Japan and South Korea	Multinational	In September 2003 these countries announced that they will work with the private sector to develop new operating system software for IT devices.
USA	Recommending Policy	The PITAC recommends that "a level playing field" must be created within the government procurement process to facilitate Open Source.
United Kingdom	Governmental Plan	The Office of Government Commerce announced plans to test OSS in nine different areas of government.

Source: adapted from DAVIS (2003) and WEERAWARANA et al. (2004)

In many countries, politicians have also introduced legislation to support open source. Some have acted on their explicit preference for open source software. However only a small number of public projects have been developed to-date. In fact, industrialized governments have shown little interest in creating public open source projects. Two factors may explain such a low level of involvement. Firstly, FOSS has a strong ideological history. The major proponents of open source software have traditionally rejected public or private support to protect the integrity of open source. This rejection may have discouraged broad public support for open source. In addition, the FOSS is still a recent phenomenon that is far from being mature. Rooted in the hacker culture, the open source software has been restricted to a high specialized audience for 20 years. Furthermore, powerful

¹⁰ See the different tables adapted from DRAVIS (2003) and WEERAWARANA *et al.* (2004)

lobbying by proprietary software companies, conceptual redundancy about public support and academic doubts about the sustainability of this programming method could explain the lack of public support for FOSS.

Although some of these barriers still exist, the number of projects funded by public agencies has soared recently. In many countries, governments have tried to level the playing field by developing open source software with the private sector. Undoubtedly, the novel strategy pursued by the FOSS community has played a major role in this shift.

Free open source software paradigm in the digital divide

As in the industrialized countries, the OSS represents a key part of IT policy aimed at reducing the cost of IT investments and increasing productivity. FOSS, for example, could improve the ability of the developing countries to bargain with software editors and reduce the cost of developing an information society for everybody. In addition to cost reductions for IT infrastructure, promoting FOSS could also help governments to compensate for their lack of resources.

In this latter respect, FOSS can fulfil three functions. Firstly, FOSS has a positive impact on personal skills. At an individual level, it requires people to learn English and to improve their skills by using the IT devices of others. This increases the speed of IT diffusion within society as a whole. Furthermore, in the computer era, the availability and diffusion of source code allows everybody to learn programming languages in a learning-by-doing process. At a community level, where network externalities apply, FOSS forges a network of developers, beta-testers and end-users, especially when initiatives target schools, small businesses or special interest groups.

The promotion of FOSS also has a positive impact on work efficiency. Here again, FOSS plays an important role at different levels. Firstly, FOSS is well-known for its modularity and the interoperability. So, at a project level, this collaborative method of programming could reduce duplicated efforts (forking) when modularity operates. Next, FOSS projects are characterised by self-determination. Certainly, FOSS could reduce resource wastage by partitioning tasks between people more efficiently. At the same time, this environment creates strong incentives for working and even if the motivation of developers may be far from altruistic, the possibility to choose the level and intensity of their contribution, as well as the project itself, creates better

learning environments than those that exist in proprietary software. Moreover, FOSS can spur innovation and expand business opportunities in developing countries by democratising the innovation process. It reveals the business models behind open source software to developers more clearly. Paradoxically, it is also conceivable that the creation of a FOSS ecosystem could stimulate a nascent local proprietary software sector.

Can we strive for an explosion of FOSS in developing countries?

To estimate the potential of FOSS in the developing country, we must highlight the scarcity of the resource pool in those countries. In most developed countries, open source software and proprietary software industry coexist and the FOSS's contributors often work in the IT industry.

Open source software in developing countries

<i>Country</i>	<i>Policy action</i>	<i>Identifying characteristics</i>
South Africa	Government Report	This report recognized the educational and commercial benefits of Open Source Development and recommends that partnerships between academic, industry and government institutions be implemented.
Argentina	Bill	Bill mandating use of OSS by all provincial administrations in the Buenos Aires Provinces.
Brazil	Recommending Policy	This policy recommends that federal ministries, agencies and state enterprises install OSS instead of proprietary software on new computer systems.
Peru	Legislative Proposals	This proposals mandates preference for OSS in all governmental offices.
Thailand	Recommending Policy	The government is targeting to have 5% of government agencies use Linux.
Pakistan	Governmental Initiative	The government has created a task force it calls "Linux Force" to review the value these offerings can provide to their computing needs.
Philippines	Government Initiative	The government has initiated an effort to develop a package of OSS products as well as a support mechanism for government agencies, schools and small businesses.
India	Government Initiative	The government has launched the Linux India Initiative that focuses on developing resource centers, special interest groups, pilot projects, assisting in the localization of OSS and to support the development of research studies.
Singapore	Recommending Policy	Government Agency charged with planning and executing strategies to boost the Singapore economy offered temporary tax reductions and financial grants to fund Linux-related projects.

Source: adapted from DAVIS (2003) and WEERAWARANA et al. (2004)

In the developing countries, there is no broad software industry, nor open source initiatives to ensure a choice between proprietary and open source solution. On the same vein, the different surveys on Free Open Source Software have also emphasized that a only few contributors based in the developing countries participate actively in projects ¹¹. We also meet the same chicken & egg's problem for end-users, still like beta-testers or developers, the end-users have an important role in the FOSS process. Nevertheless several developing countries have taken policy measures in order to foster the use of FOSS.

An agenda for developing countries

While we have already highlighted the current lack of debate on IPR, the question on how to use open source in developing countries has often given rise to misleading debates. Firstly, the creation and enforcement of the intellectual property right system are prerequisites for the emergence of open source software.

Secondly, the promotion of FOSS by governments can't be an all-or-nothing strategy. In fact, open source software doesn't replace or dominate the intellectual property right system. Similarly, FOSS doesn't automatically replace or dominate proprietary software. For example, BESEN (2002) argues that FOSS: "Extends the market for software because open source software meets specialized needs not met by either packaged or customized proprietary software."

Even if the creation of IP laws is a necessary condition, it does not go far enough. In building strong intellectual property right systems, governments must enforce these laws. Clearly, if the software piracy rate in developing countries remains unchanged, the benefits of FOSS will be reduced, weakening incentives to participate in a FOSS project. On the contrary, some researchers have stressed the complementary nature of the FOSS and the proprietary approach.

If we transpose this concern to developing countries, local government and international institutions must act carefully when they decide to promote FOSS locally. Firstly, the specific needs of a given country must be clearly

¹¹ See among them, the Free/Libre Open Source Software Survey (FLOSSUS) (2003) or Free/Libre Open Source Software Survey & Study (2002).

identified. The term "developing countries" covers a vast majority of countries. In this heterogeneous class, we have a majority of poor countries. For them, FOSS could be a useful tool for reducing the digital divide. On the other hand, a minority of countries are at the frontier between developing and developed countries. In these countries, strong support for open source could be counterproductive in the presence of a nascent software industry. Therefore, the various initiatives must strike a balance between microeconomic concerns (such as the protection of a nascent software industry) and macroeconomic concerns (such as reducing the digital divide). In this fine-tuning, specific components are essential for creating a successful FOSS ecosystem ¹² including:

- a clear definition of open source software (by producing precise definition of open source and issuing a limited number of open source licenses),
- a critical mass of contributors (charismatic leaders are highly recommended),
- a property rights system that ensures the circulation of the code source, mitigates the free-riding problem, reduces private appropriation and opportunism,
- a realistic government sponsorship.

■ The creative commons paradigm

The creative commons fundamentals

As Lawrence LESSIG claims, digital technologies have reduced access to creative works. In a recent paper, he argues that:

"...for most of our history, the burdens imposed by copyright on other creators, and upon culture generally, have been slight. And there was a great deal of creative work that could happen free of the regulation of the law.(...) All that began to change with the birth of digital technologies, and for a reason that no one ever fully thought through" ¹³.

¹² Recent studies strongly emphasize the need to promote FOSS in developing countries. See, for example, DRAHOS (2003) or WEERAWARANA & WEERATUNGA (2005).

¹³ <http://creativecommons.org/weblog/entry/5668>

In general terms the creative commons project is a response to the privatisation of creative works symbolized by the term 'all rights reserved.' Thus, advocates of creative commons argue that creators have been deprived of their liberty to share their creative works via intermediaries (such as the media industries). In addition, this phenomenon has been facilitated by digital technologies and a defensive interpretation of copyright laws by the courts.

Like FOSS, creative commons aims to create a public domain of creative works in order to favour the circulation, sharing and reusing of the latter and to reduce dispossession. To achieve its goals, creative commons has opted for a "best-of-both-worlds" strategy by using the existing licensing scheme to protect creators' works from any limitation of their rights. At the same time, creative commons rejects the current restrictive interpretation of copyright in order to facilitate the sharing of creative works.

In fact, the creative commons project is a mix of legal and technical approaches. Firstly, it is a licensing scheme. To build "a layer of reasonable, flexible copyright in the face of increasingly restrictive default rules", creative commons has developed a user-friendly licensing scheme that helps "people dedicate their creative works to the public domain- or retain their copyright while licensing them as free for certain uses, on certain conditions"¹⁴. Even if there is now a real spectrum of rights¹⁵, four basic licenses have historically prevailed:

- *Attribution*. The creator lets others copy, distribute, display, and perform the copyrighted work-and derivative works based upon it, but only if they give credit to the original author.
- *Non-commercial*. The creator lets others copy, distribute, display, and perform his/her work, and derivative works based upon it, but for non-commercial purposes only.
- *No derivative works*. The creator lets others copy, distribute, display, and perform copies of his/her former work verbatim only, and not derivative works based upon it.
- *Share alike*. The creator allows others to distribute derivative works only under a license identical to the license that governs the original work.

¹⁴ In "CC in Review: Lawrence LESSIG on How it Began" available at: <http://creativecommons.org/about/history>.

¹⁵ See: <http://creativecommons.org/about/licenses/>

So, even if the scope covered by creative commons is far greater (websites, scholarships, music, film, photography, literature, courseware, etc.) than FOSS, this project embraces the latter's principles. Like a software developer who chooses between GPL (General Public License), BSD (Berkeley Software Distribution) or LGPL (Lesser General Public License) to protect his works, licensors control access to their works thanks to the addition of various options to the basic license. To favour the reuse of creative work, the founders of creative commons have added a technical mechanism to the legal one. To make access to the raw material cheaper and easier, the community has incorporated a metadata 'that can be used to associate creative works with their public domain or licence status in a machine-readable way'.

The future of creative commons: a short discussion

Created in 2001, the Creative Commons project has rapidly gained popularity outside the academic world. Creative Commons is expanding its scope to new territories but still needs to address issues related to its expansion and adoption.

Today, project leaders are working to implement creative commons in a growing number of countries by translating and adjusting licenses to local contexts ¹⁶. Creative commons has already been adapted in over 20 countries to-date (essentially in developed countries) and there are plans to implement creative commons in 16 new countries. This agenda particularly targets developing countries.

Nevertheless, there is still a long way to go towards achieving the initiatives presented above. Firstly, the endowment of creative commons is currently relatively sparse. In fact, creative commons has relied upon the substantial support of major foundations. To reach new financial contributors, the creative commons movement recently launched a fund raising campaign to raise USD 225,000. With these funds, the project leaders hope to diffuse creative commons in a larger number of countries. Beyond financial concerns, this mediated campaign could also be interpreted as a way of attracting sympathy in order to build a core community.

¹⁶ By local context, we refer to the local copyright laws that govern creative activity.

In addition, as the creative commons changes to a social movement characterized by heterogeneous concerns, there is a risk that the message conveyed by creative commons may become less clear. Historically, the creative commons has relied heavily on LESSIG. In the past LESSIG has probably contributed to enlarging the Creative Commons and disseminating the message: his academic background has fostered the strategy adopted by creative commons. For ELKIN-KOREN (2005), heterogeneous concerns could lead to ideological fuzziness in the creative commons. In a recent paper, she argues that:

"LESSIG's trilogy: Code and Others Laws of Cyberspace. The Future of Ideas, and Free Culture set the ideological foundation of Creative Commons, and Free Culture could be thought of as its manifesto. But Creative Commons as a social movement has now gained a life of own. It is a dynamic movement, consisting of many distinct players, motivated by different goals, but still in the process of defining its political agenda. This makes it difficult to accurately define the core principles of creative commons ideology and the tenets of its reform plan."

While the ideological melting-pot could weaken the message conveyed by creative commons, another element could also reduce the strength of its message, namely the number of licenses, which could throw creative commons into confusion. Intrinsic to creative commons, four constraints contribute to increasing the number of licenses: (a) the multiplicity of the activity, (b) the diversity of support, (c) the necessity of creating specific copyright to respect local laws and (d) the degree of liberty granted by the licensor. Here, we would like to stress that increasing the number of licenses could slow down the adoption of creative commons by target groups. More specifically, the number of licensing alternatives provided by the licensing platform could increase the cost of using this licensing scheme, notably for early adopters. Although its creators often report that the strategic minimalist approach taken by creative commons helps people to select the right licensing scheme for them, multiplying the licensing options could lead to greater uncertainty and lower adoption. The transaction cost approach best explains this potential peril¹⁷. At first glance, the creative commons approach seems to significantly reduce the *ex-ante* costs of transaction.

¹⁷ If we typify the creative commons project as a contract scheme, the theory developed by WILLIAMSON (1983) is helpful in understanding the rejection process. For WILLIAMSON, these are two types of transaction cost. The first class deals with the cost of drafting the contract and negotiations regarding the terms of the contract. WILLIAMSON has called this item *ex-ante* cost. The second class, the "*ex-ante*" costs reflect implementation and enforcement related to the contract.

With creative commons, you don't have to write a contract or negotiate the terms with a counterpart: creative commons is an automated and highly standardised package. However, while working towards standardization, the cost of information could be high for users because they must understand the features of each licence to safeguard their creations appropriately. As far as the *ex-post* cost of transaction is concerned, the uncertainty surrounding this license is perhaps greater. Notably the question of enforceability¹⁸ could reduce the adoption process.

A brief comparison with FOSS

At this point it is useful to compare the creative commons project with FOSS. Both share the same foundations:

- a "public domain/copyright" dichotomy,
- a particular idea of creative activity. Both FOSS and the creative commons project see creative activity as a community-based activity where individuals exchange information and knowledge,
- a free copyright license.

At the same time, these two projects are about to diverge, as shown in the table. Firstly, although the enforceability of both licensing schemes has yet to be tested, it is interesting to note that there are plans to lower the number of FOSS licenses in order to reduce uncertainty. In the creative commons project, we see an opposite movement, with the creation of a spectrum of licensing schemes. However, the most striking difference between these projects lies in the ideological component. Even if creative commons supporters reject an extreme position, they nevertheless claim a strong libertarian approach. In FOSS the libertarian element is also present, but not so significantly. Moreover, the ideological aspect of the FOSS paradigm is probably less evident today than it was 20 years ago.

As McGOWAN (2004) states:

"If we shave off a couple of the beginning years, when the free software movement was learning to crawl, then the movement is a teenager. We might even say it is just learning to drive, an event filled with great and terrible prospects. Like many teenagers, it has had an identity crisis and resolved it with a deft change of name. It is now the

¹⁸ ELKIN-KOREN (2005) points out this problem in the face of the multiplication of derivative works.

free/open-source software movement. (Reluctantly, I bow to convention here and refer to my subject as F/OSS, an ugly abbreviation whose only virtue is to keep the peace.) Like many teenagers, F/OSS production demands attention. Like some, it is worth attending to".

Dynamics of the free open source software and creative commons

<i>Tool</i>	<i>Ideological aspect</i>	<i>Number of licences</i>	<i>Enforcement</i>
FOSS	Decreasing	Decreasing	Not Tested Yet
CC	Unsettled Ideology	Increasing	Not Tested Yet

To end this brief comparison, even if FOSS or creative commons are young projects with unpredictable trajectories, we are more confident about the future of FOSS than that of the creative commons project. Today, FOSS seems mature, unlike the creative commons project. The maturity of any project is a very important factor in convincing people to participate and, above all, influences public support.

Creative commons and the digital divide

While FOSS facilitates the adaptation of software to local needs, we must also recognize that FOSS is a powerful tool in fostering computing skills, spurring innovation and creating business opportunities. To foster the creation of local content, creative commons is probably a better tool because it can help developing countries to (re)build an identity in a context of globalization. By creating a public domain of creative works, creative commons offered developing countries significant raw material with which to build local content. Currently, two specific projects developed in the creative commons scheme directly address developing countries.

The first project, ICommons, is an internationalization of the creative commons idea. Even if there is nothing specific in this mechanism for developing countries, these countries are highly targeted by the promoters of ICommons.

On the contrary, a second project tries to respond to the specific needs of developing countries by creating a particular license called "developing nations copyright license" ¹⁹. With regards to the lack of creative work freely available to the developing countries and because "most of the world's

¹⁹ <http://creativecommons.org/license/devnations>

population is simply priced out of developed nations' publishing output", this free license allows the creator (based in a developed country) to freely grant access to his/her creative work to developing countries. More specifically, this license promotes different copyrights for different countries: in developing countries, licensors allow royalty-free use of their work, while retaining full copyright in the developed world.

Both Commons and the Developing Nations Copyright License are clearly taking interesting initiatives to reduce the digital divide by facilitating free access to a huge stock of knowledge. Even if we have expressed strong doubts about the sustainability of the creative commons project, we must acknowledge that these projects illustrate a preliminary form of action to bridge the digital divide. Unfortunately, at this time, the capacity of creative commons to favour the creation of local content is difficult to predict.

■ Conclusion

In this paper, we have illustrated the role of local content and local software in the digital divide. Our approach outlines two main ideas. The first idea is that the WSIPR system is not sufficient to create proper incentives to foster the creation of local software and local content in developing countries. Hence if it is impossible to achieve a critical mass of cultural content in developing countries, alternative paradigms such as creative commons and open source could provide a transitory framework for policy initiatives.

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Offshore Outsourcing

Global Trends and Opportunities for North African Countries (*)

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Abstract: The rise of the global offshoring business, a high-growth, technologically-advanced, and sometimes labour intensive market, holds major opportunities for North African and European countries. It presents a match between developed countries' demand for services and developing markets' desire to improve their trade balance (by increasing exports), boost economic growth (by generating wealth and reducing unemployment) and intensify technological transfer (by enhancing specialized skills and growing the number of different types of services supplied). An even more important effect is that the activities developed through offshoring will be ready to serve domestic North African markets as soon as they have reached greater economic maturity. This will benefit additionally the balance of trade by reducing the need to import services. Algeria, Egypt, Morocco and Tunisia have already begun to reap the benefits of the current offshoring trend of companies in large European economies and could further develop related business activities by introducing key reforms. In response to existing challenges and to enhance the attractiveness of FDI and offshore investment, the paper identifies four determinants of offshoring and indicates short-term, highly-targeted initiatives that should enable North African countries to attracting the offshoring wave to their shores.

Key words: Information Technology, North Africa, Offshoring, FDI, Business environment.

■ Offshoring: a growth opportunity for developing countries

No commonly accepted definition of offshoring currently exists, and the term has been used in the literature on the subject to cover a wide range of business activities. Generally, offshoring is used to describe the decision by a business (or a government) to replace domestically supplied service

(*) The opinions expressed in this paper are the sole responsibility of the authors, in no way can they be attributed to the World Bank, its Board of Directors or any of its member countries.

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functions with imported services produced offshore. This definition focuses on a company's sourcing decision - should it produce the services internally, source them domestically, or source them offshore? Imported services can include a wide range of functions, such as computer programming, payroll and accounting, and customer call centers. When a business replaces services it had produced internally (or had sourced from a domestic supplier) with imported services, those services and the domestic jobs associated with them are said to have been "offshored" (GAO, 2004). Offshoring differs from outsourcing in that it implies the transfer of operations to another country by hiring local subcontractors (offshore outsourcing) or building a facility (offshoring) in an area offering greater advantages. Rapid advances in ICTs and the accompanying drop in the cost of communications have enabled many new inputs, particularly services, to be traded across borders.

Three factors have been central to off shoring. Firstly, technology advances such as mobile telephony, the internet, customer relationship management (CRM), portable computing and many other developments have enabled cross-border trade in a number of services (financial, customer care, accounting, administrative) that were previously only tradable through the movement of providers. Secondly, investments in education in a number of developing countries created a relative abundance of skilled labour available at a relatively low wage. Finally, business innovations such as just-in-time inventory management, supply chain integration, and customer-supplier partnerships¹ led manufacturing and services multinationals to outsource activities to offshore operational units or to foreign third-party service suppliers.

Three business models are usually followed by offshored operations: the most common is offshore outsourcing (through a subsidiary or a joint-venture), while turnkey operation and indirect offshoring are less frequent.

Offshore outsourcing implies creating or purchasing a firm to become a wholly-owned subsidiary in another country, or partnering in a joint venture with a local company. This allows a company to retain ownership and control and to set up operations rapidly, but limits its long-term flexibility by requiring more time, expertise and up-front investment.

¹ Business innovations also include the use of portfolio management and stage gates in product development, vendor-managed inventories and collaborative planning and forecasting, competency profiling in human resources and business process reengineering.

A *turnkey operation* is a hybrid approach whereby a company hires an outside firm to establish and run the off-shore operation, while the client company retains full ownership.

Indirect off-shoring is a stealthy approach used by companies that are prohibited from working off-shore – generally due to legislation or public pressure- who resort to hiring another firm with access to off-shore resources.

Figure 1: Offshoring versus outsourcing: a company's sourcing options

Offshore Sourcing (Offshoring)—includes BOTH:

1. services supplied by a company's overseas operations ("in-house" or "affiliated"), and
2. services supplied by a third party ("outsourced")

		Domestic	Offshore
In-house	Domestic in-house production		<p>Offshore in-house sourcing</p> <p>Example: Company uses services supplied by its own foreign-based affiliate (subsidiary)</p>
	<p>Example: Company produces its products domestically without any outside contracts</p>	Domestic outsourcing	
Outsourced	<p>Example: Company uses services supplied by another domestically-based company</p>	Offshore outsourcing	
		<p>Example: Company uses services supplied by an unaffiliated foreign-based company</p>	

Source: GAO 2004

The benefits and challenges represented by offshoring are determined by a number of factors. Some of the benefits of outsourcing to firms are determined by the cost advantages from low-cost skilled or unskilled labour; by the tax breaks that come either due to tax incentives from foreign countries or tax savings in home countries, by gaining access to large untapped foreign markets such as China or India; as well as access to

cheaper raw materials and production inputs used in manufacturing. The challenges of outsourcing lie on the side of the offshoring firm and on that of the recipient country.

For firms offshoring their business abroad, a lack of control over the production chain and product quality, together with the change in the nature of costs (increased coordination and management costs versus production costs) might lead to an over-estimation? of the net offshoring benefits for the firm. The labour redistribution, potential structural unemployment and related social issues generated in its home country may weaken the firm's commercial image. The destination country's unknown business environment might require new skills to handle issues such as red-tape, corruption or political risk. Other offshoring risks include the quality and availability of infrastructures, staff, the potential of the domestic market to absorb offshored services and the economic and fiscal characteristics that determine the business and investment climate. For countries receiving offshoring business, risks include a reliance on the economic performance of foreign countries, as well as the volatility of foreign firms' business cycles ².

A tentative breakdown of the segments of entrepreneurial activity most affected by offshoring identifies the following four areas: information technology, contact functions, business and manufacturing operations.

Table 1: Offshoring segments and functions

<i>Offshored operations</i>	<i>Typical functions</i>	<i>Outlook</i>
Information technology operations	Application development, programming, testing, and network support	Initial focus for most early adopters and remains the most common function outsourced off-shore
Contact functions	Call centers, customer support, telemarketing and sales	Second in popularity and are expected to be the next major focus, particularly through call centers
Business operations	Finance and accounting, data processing and administration, operations and project management	Trail the others, but significant growth is expected in this area as well, conditional on workforce skills' upgrade
Manufacturing operations	Clothing and textiles, toys, woodworks, consumer electronics and microelectronics, automotive	Largely diffused thanks to low production costs (even after factoring in the logistic and tariff costs) and privileged access to emerging market

² This was the case in India in 2001 when it was hit economically by the slowdown in U.S. technology markets.

Identifying the main offshoring players can be misleading if the revenue total for each segment is taken as an absolute value. Since offshoring implies a change from domestic production to importing services from another country, the value of the offshored operations (imported services) can be related to GDP (see table 2). Looking only at the business operations segment of offshoring, for instance, the United States is the largest importer³; nonetheless, as a proportion of GDP, this figure is still low compared with the rest of the world⁴. In the United Kingdom, the share of imported business services is about 1% of GDP. India, reported to be the recipient of significant offshoring, itself imported business services worth up to 2.5% of GDP in 2003 (versus 0.5% of GDP in 1983). The trends observed indicate that developing countries remain the main importers of services, expressed as a proportion of GDP (and rely on foreign firms for business services, for example). Nonetheless, they are progressively becoming offshoring destinations, increasing their market share of global exports (source: IMF, 2004).

Table 2: Top importers of services as% of GDP

<i>Top offshorers</i>			
<i>Business services</i>		<i>Computer and information services</i>	
<i>Country</i>	<i>Share of GDP(%)</i>	<i>Country</i>	<i>Share of GDP(%)</i>
Angola	44.5	Luxembourg	1.06
Mozambique	34.74	Guyana	0.91
Mali	21.55	Belgium	0.43
Congo, Republic of	21.35	Croatia	0.43
Vanuatu	17.32	Sweden	0.42
Ireland	13.9	Ireland	0.39
Seychelles	11.78	Slovenia	0.36
Singapore	10.68	Cape Verde	0.34
Azerbaijan	8.57	Namibia	0.32
Luxembourg	8.03	Hungary	0.29

Source: IMF, Balance of Payment Statistics Yearbook, 2003.

Parallel to the impact on increasing exports, offshoring creates employment and fosters technological transfer. In the period 2003-2008, the

³ In its balance of payments statistics, the IMF reports imports of services, which include the categories that are most closely related to offshoring –other business services and computing and information services. Other business services include accounting, management consulting, call centers, and other back-office operations; computing and information comprise hardware consultancy, software implementation and data processing.

⁴ U.S. service imports as a percentage of GDP remain low compared to developing countries, despite the fact that this figure has doubled in recent decades, increasing from 0.1% in 1983 to 0.2% in 1993 and 0.4% in 2003.

global number of call center agent positions in the contact functions segment is expected to grow by 19.9% (or 3.7% annually) to reach 6 million. On an annual basis, European multinationals create about 20,000 new jobs in offshored contact functions in Europe, and about 1,000 in the Middle-East. (ANIMA-AFII, 2004).

The particular benefits of offshoring will vary from company to company and will frequently only be realized after a number of "trials and errors." For instance, the most recent PWC Management Barometer Survey (PWC 2004) indicates that less than half of the European companies that have outsourced their financial functions have so far actually realized large savings, yet two-thirds of the same companies see offshored and offshore outsourced functions as crucial to their profitable growth in the next two years. That so many companies see offshoring and offshore outsourcing as important for future profits, despite their initially disappointing savings, indicates that companies foresee a steep learning curve and expect to realize potential savings in the long-term (KIRKEGAARD, 2005). In selecting suitable locations for offshoring activities, companies take into account several factors, which can be classified in four groups: the cost and quality of infrastructure, the workforce, the business environment, the country and political risk.

Competitive, reliable infrastructure

As service offshoring relies on information and communication technologies, the availability of high-quality, competitively priced telecommunication is essential, as is international bandwidth, the reliability of local and international networks and low cost access to broadband and leased lines. Voice over Internet Protocol (VoIP) is rapidly becoming a mainstream technology for service centers as it enhances customer service, while reducing costs. Constant electricity supply, transportation and the availability of real estate at competitive prices are also central factors in determining the attractiveness of the offshoring location.

Skilled, low cost workforce

A high-quality, multilingual, low-cost workforce is essential. Training programs rich in technology transfer are often sponsored by both governments and corporations to create domestic opportunities and mitigate the outward migration of skilled workers to developed countries. Developing countries have a natural cost advantage (see table below), however, wage inflation is driving costs up – reducing the spreads between wage levels. In

2004, while 50% of India's IT employees received at least a 10% salary increase (with the top 10% receiving increases of over 40%), most IT employees in the United States received an increase of less than 5%, with U.S. salaries nearly ten times higher, on average, than those in India (USD 80,286 versus USD 8,593) (Deloitte Research, 2004).

Table 3: Type of agent cost analysis

<i>Agent cost analysis. Type of agent and cost per hour, 2004</i>							
	<i>India</i>	<i>Egypt</i>	<i>Hungary</i>	<i>Mexico</i>	<i>Poland</i>	<i>Canada</i>	<i>USA</i>
US\$ (*)							
Collections (outbound)	14.6	15.3	16.2	16.5	16.4	25.7	29.7
Direct response (inbound)	14.35	14.9	15.9	16.5	16.1	25.3	29.2
Telemarketing/telesales (outbound)	14.6	15.1	16.2	16.5	16.4	25.7	29.7
Voice-based customer care (in/outbound)	13.3	14.5	14.7	16.2	16.4	24	27
Multimedia customer care (in/outbound)	13.3	14.7	14.7	17.4	16.4	24	27
Technical support/help desk (inbound)	14.85	15.5	16.5	17.4	16.6	26.2	30
% US price for voice-based customer care agent	49%	54%	54%	60%	61%	89%	100%

(*) the total price includes the price paid for and the wage earned by the particular customer care

Source: Datamonitor, 2004

Flexible labour market regulations

Flexible contracts (apprenticeship, traineeship), minimal differences between regular and overtime salary and flexible time schedules to accommodate demand fluctuations are highly valued elements of the offshoring business. Offshoring is volatile, with service centers often migrating to lower cost locations. The ability of offshore customer care facilities to provide services at awkward times is also a requirement for many investors, particularly North American businesses ⁵.

Favorable business and investment climate

The potential for the absorption of offshored goods and services in developing countries that are coming up on the economic growth curve is an

⁵ In many cases, firms will look for a location in the same time-zone, to save on overtime and security provisions.

important determinant of a favorable business environment. Tax incentives, red tape removal and capital market development, including access to venture capital, contribute to a favorable investment climate (CASERO & VAROUDAKIS, 2004). Over the past decade, governments in prospective offshoring markets provided customer care specialists with financial support, generally as agent training, administrative facilities and tax breaks. The simplification of administrative procedures for business registration and the presence of one-stop-shop agencies are often called for in locations with a high offshoring presence.

Countries often position themselves in certain offshoring segments that match their capabilities, resources and skills. Most are not able to cater for all offshoring segments. Common examples of this are:

- India, a leader in the IT services and development sector due to its tech-savvy, English-speaking work force and abundance of IT universities;
- China, leader in hardware and production thanks to its low labour costs, abundant labour supply and proximity to production facilities in Taiwan;
- Mexico, which has developed its auto manufacturing industry by attracting General Motors;
- Costa Rica, which has developed semiconductor manufacturing by attracting Intel.

■ Enhancing offshoring opportunities for North African markets

North African countries are not yet on the map of global offshoring. Yet, the rapidly growing offshoring market may contribute to reduce certain economic weaknesses of North African economies. None of the countries of North Africa was in the top 25 most attractive locations for offshoring, according to A.T. Kearney's Offshore Location Attractiveness Index 2004 (KEARNEY, 2004). In the absence of swift reform measures, French and German companies increasingly following the offshoring trend (BLANCO, FARRELL & LABAYE, 2005; FARRELL, 2004). are likely to migrate their activities towards more established offshoring locations (India and China), or

emerging European locations (such as Hungary, the Czech Republic and Poland ⁶) rather than North Africa.

North African economies grew by only 1.3 percent in the 1990s, a figure considerably lower than the 4 percent average for all developing countries (ABED & DAVOODI, 2003). The combined Arab gross domestic product (GDP) of USD 604 billion is modest ⁷ and remains affected by persistent high unemployment and high population growth rates (per capita GDP). FDI flows to the Arab region dropped from almost USD 3 billion in 2002 to USD 2 billion in 2003, only 1.5% of total FDI flows to developing countries ⁸ and only one-third of the FDI expected for a developing country of a comparable size ⁹. The region's share in world trade declined from 9.6% in 1981 to 3.2% by 2002. Excluding oil exports, this share dropped even further, to only 2.1% in 2002, from 4.2% in 1981 (AL-HERBISH, 2005). During the 1990s, while Eastern Europe, Central and East Asia and the Pacific region doubled their share of world trade in services, the Middle East and North African regions lost market share (IQBAL & NABLI, 2004).

To attract the global offshoring market in its boom phase, North African countries need to accelerate their improvement of four identified drivers: infrastructure, workforce, regulation and business climate. Decisions regarding where to locate offshore activities are becoming increasingly common, but we can envisage this stabilizing in the next 3 to 5 years, with firms having set up their offshoring locations focused on improving their business models. Compared to other regions of the world, North Africa lacks competitiveness both in terms of its infrastructures, regulations and business climate.

⁶ KEARNEY ranks the Czech Republic as the fourth most attractive location for outsourcing in the world, after India, China and Malaysia. Poland is ranked 10th and Hungary 11th.

⁷ Arab GDP remains little higher than Spain's GDP (USD 599 billion), and only a quarter of that of Germany.

⁸ An important distinction must be made between offshoring and foreign direct investment, depending on the difference between final and intermediary good or service, and on where this good or service is sold. Offshoring in fact refers to the acquisition of intermediate inputs by companies (or governments) from locations outside the consuming country. If the final product is sold in the country where the production facility has been moved, then it must be considered FDI to the country.

⁹ FDI flows to the Arab region was mostly targeted to a handful countries (Saudi Arabia, Egypt, Tunisia, Bahrain, and Morocco).

Infrastructure

Telecommunications and real estate still represent a negative factor in the choice of North Africa as an offshoring location. The telecom reforms undertaken in the last five years by the region have increased competition in the sector, implying greater availability, quality and reliability of communications at a lower cost. The North African region now offers mobile communication at competitive rates, but serious restrictions in the data and international communications market, often still under a monopoly, affect the sector's fixed line telephony, broadband and internet connectivity. In addition, the region still lags behind in key indicators such as air connectivity, quality of fixed lines, available bandwidth and PC diffusion. Real estate availability is another deterrent (scarcity of land with access to adequate infrastructure) and property registration is often complicated by the heritage of centralized, state-run real estate systems, reducing availability, transparency and increasing ownership or leasing costs. These elements affect the firms' ability and costs of doing business significantly and do represent a deterrent to offshore their activities to North African countries.

2005 Infrastructure outlook

Competition in the various telecommunication markets has increased significantly since 2000, Morocco and Algeria have recently awarded new full fledged operators licenses, in competition with the incumbent operator. However, no country in North Africa has full competition in international communication. Several internet restrictions, versus the regulatory framework of the EU, or of India, for example, stifle the local North African software and IT industry, and limit the offshoring opportunities in this area. The region is weakly integrated into the global economy, with information technology links among the weakest in the world . The number of internet users was the fastest growing between 2000 and 2005 (311% in North Africa and Middle East versus an average global 160%); however, it started from a very low base and remains low by international standards (8.3% of the population uses the internet versus 8.9% in Asia, 12.5% in Latin America, 36.8% in Europe and 68% in North America).

Workforce

Human capital in North Africa is a large pool of unexploited resources still at competitive cost, but although the supply is vast (high unemployment rates), improvements in the quality of human capital are required to make these countries attractive destinations. North African workforce's training needs to be complemented by information skills and multilanguage training. Governments need to increase education expenditure as a percentage of GDP to match the international education indexes' criteria, adjust national educational programs to international standards and increase the share of

higher education achievers, reducing the duration of the education cycle. A pool of unskilled resources requires specialized training which entails a cost for the enterprise. Some North African governments have addressed this issue by partially or fully subsidizing the cost of training for firms entering the country.

2005 workforce outlook

North African countries can rely on a bilingual, young population as a potential workforce for the emerging market of offshoring of activities of French companies; Egypt has a bilingual population, and sound links with U.S. and UK IT firms. However, the educational systems in North Africa rarely offer the marketable skills needed in this industry . Marketing, IT, management, and customer support skills are often left to the initiative of the investors, which increases their costs. The level of post-graduate engineers in North African schools is high. However, there is a lack of middle and low level technicians to fill positions in the offshoring business.

Regulation

Greater flexibility in labour regulations is an effective tool to attract offshoring, as demonstrated by the performance of countries that have introduced flexible social legislation (such as three weeks annual vacation, night or weekend work without overtime, non-limitation of overtime and total flexibility to meet high-demand periods). Minimum wages and legal weekly work durations still afflict all labour markets in the region, which share very high rates of unemployment. In some cases, the labour laws are avoided in specific export zones. Labour contract flexibility introduced for offshoring businesses (Morocco, Tunisia) increases the attractiveness of the location.

2005 regulation outlook

Unemployment in North Africa stands at between 25 and 60 percent of the workforce, with a large majority of the unemployed having secondary or post-secondary degrees. Part of this unemployment is "wait" unemployment, resulting from the explicit or implicit guarantees of employment (minimum wage legislation and layoff restrictions) common in the region's public and private sectors, but enforced mostly in the public sector . Restrictions on layoffs in the formal sector (and often generous severance payments) make firing redundant workers difficult and restrict the incentives for firms to hire.

Business environment

Evaluating the business environment involves an assessment of rule of law and whether business contracts are enforceable. In the North African region the business environment is not yet as favorable as in other regions

of the world. Issues such as time, costs and difficulties faced by firms in starting and closing a business, hiring and firing workers, registering a property, getting credit, the extent to which investments are protected and contracts enforced are key elements in determining the attractiveness of a location to a foreign firm wishing to offshore. The determinants of the business environment translate in the business model of the firm aiming to offshore as risk factors and their unpredictability is accounted for as a high cost (worse-case scenario) for the firm, deterring its entrance to highly unpredictable markets.

2005 business environment outlook

The business climate is a challenge in all four North African countries. Tunisia, Morocco, Algeria and Egypt ranked respectively 58, 102, 128 and 141 out of 155 countries surveyed in terms of Ease of Doing Business . For example, access to industrial land, a key determinant in offshoring location decisions is quoted as a major impediment in Algeria , while bureaucracy and red tape are acknowledged as a comparative disadvantage in Morocco.

For North Africa to become an attractive offshoring location, and offshoring to contribute to developing and sustaining higher economic growth, several structural challenges need to be addressed. The analysis of the key enabling factors for offshoring shows that countries in North Africa have made some progress. The table in annex compares the attractiveness of four North African countries (Algeria, Egypt, Morocco, Tunisia) as offshoring destinations, in terms of the four factors identified above.

■ Conclusions: reforms needed to transform North Africa into a key offshoring destination

The economies of North Africa have been afflicted by slow economic growth, high unemployment and loss of market shares in the global (non-oil) export markets.

The rise of the global offshoring business, a high-growth, technologically-advanced, often labour intensive market, holds major opportunities for North African countries. In particular, these countries could develop vibrant business activities, reaping the benefits of the current trend towards offshoring of companies in large European economies like France and

Germany¹⁰. This business will not migrate to North Africa by itself in the absence of key reforms.

Offshored activities have a double importance for the development of North African and European countries. Initially, they present a match between developed countries' demand for services and developing markets' desire to improve their trade balance (by increasing exports), boost economic growth (by generating wealth and reducing unemployment) and intensify technological transfer (by enhancing specialized skills and growing the number of different types of services supplied). An even more important effect is that the activities developed through offshoring will be ready to serve domestic North African markets as soon as they have reached greater economic maturity. This should also benefit the balance of trade by reducing the need to import services.

To respond to the existing challenges and enhance the attractiveness for FDI and offshore investment, countries in the North Africa region need to identify short-term, highly-focused initiatives aimed at attracting the offshoring wave which will predictably disappear within the next five years. The recommendations that emerge from this research are to:

Identify and position in specific offshoring segments where the country has the best resources and capabilities

An assessment of North African countries along the lines identified by numerous international consulting firms can help to bring them into the international businesses market and enables them to choose from manufacturing, IT services, IT development, BPO, etc. and learn from the examples of other countries. Participating in exercises such as the Global Offshoring Index¹¹, AT Kearney' offshoring report, McKinsey emerging global market report¹², Economic Freedom of the World¹³ report or the

¹⁰ The Mediterranean space, including the EU Mediterranean countries, has a population of 380 million inhabitants (7% of the world's population) subdivided between Europe (42%) and the southern shores of the Mediterranean sea (36%). It produces around 15% of total annual global resources and realizes 16% of international trade. With the future set-up of the free-trade zone and growth much higher than that of the EU economies, as well as a large pool of young, skilled and multilingual workforce (while in the EU the population is rapidly aging), the MENA region is a promising destination for investors seeking alternatives to saturated markets.

¹¹ <http://www.joneslanglasalle.com.br/NR/rdonlyres/37B595AA-DB5C-4339-9575-A715404AAC2C/1287/OffshoringIndex.pdf>

¹² <http://www.mckinsey.com/mgi/publications/emerginggloballabourmarket/index.asp>

Global Competitiveness Report¹⁴ is a useful step in assessing domestic resources while marketing the country's assets internationally. From these reports and from an internal consultation process, a country can identify its advantage in a specific segment, capable of attracting offshore investment by international firms.

Create an enabling environment for the specific segment where the country manifests its comparative advantage by:

Providing competitive access to improved infrastructures

The steps that need to be taken embrace national and international bandwidth market liberalization through licensing new telecommunication operators for the fixed segments, enabling full competition in the mobile and VSAT segments and promoting broadband fixed and air connectivity. The North African region still affords new entrants the opportunity to benefit from high subscriber growth rates, given its low teledensity levels. Aggressive, pre-paid focused new entrants, such as Orascom Telecom Algeria and Orascom Telecom Tunisia have also enjoyed healthy market shares. Other markets in the region, especially Morocco and Egypt, are following their footsteps.

Increasing the quality and competitiveness of the workforce

Complementing traditional education cycles with short, targeted training in specific market-economy skills, including commercial, marketing and customer service skills is a priority. Since educational reforms to enable their provision through local graduate or post-graduate education are long-term, supporting firms in the provision of short-term training modules can be more effective. The reform of the school curricula should aim at an internationally recognized system of academic grades to facilitate academic and professional recognition of qualifications and mobility¹⁵. Shortening the education cycles and targeting the skills to meet the needs of the employment market should be a top priority for North African countries.

¹³ http://psdblog.worldbank.org/psdblog/2005/09/economic_freedo.html

¹⁴ <http://rru.worldbank.org/PapersLinks/Open.aspx?id=4668>

¹⁵ These principles are the priorities sought by the Bologna process, for instance.

Improving the flexibility of the labour market

North Africa will need to deregulate its labour market as to reduce existing rigidities through structural reform (AGÉNOR, NABLI *et al.*, World Bank, 2003). But this process will require a long, concerted action between social, political and economic players. In the meantime, some countries initiated reform in specific areas deemed prioritarian for attracting businesses and their examples could be replicated by neighboring countries. Morocco has allowed private employers some flexibility in hiring workers on a temporary and apprenticeship basis at wages below the minimum rate. In Tunisia, only 11 percent of the labour force is subject to the minimum wage. Moreover, allowing market-clearing mechanisms to determine the wage-level (removing minimum wage restrictions, for instance), introducing private social security schemes and improving working time flexibility are other priority actions that should be introduced.

Improving the business environment

Streamlining and informatizing administrative procedures, such as setting up a one-stop shop office for registering and closing a business, obtaining licenses, taxation forms, hiring and firing workers, registering a property, getting credit information, is a key step in improving the business environment's transparency for foreign investors. Investment climate reforms are key to expanding trade in services in the Middle East and North Africa (IQBAL & NABLI, 2004). Other long-term reforms for improving the business environment include reducing the public sector's predominance in the economy and the extensiveness of regulations, simplifying taxes, preventing corruption, facilitating real estate availability through land titling and the enforcement of property rights. Long-term reforms should be started in parallel to immediate ones, as they are essential to retain the service industry in North Africa.

**Adopt policies that strengthen the country's position
(such as specific ICT legislation)**

Specific ICT-related legislation protecting copyright, facilitating data transmission and protection, simplifying or enabling e-commerce (e-signature), regulating internet service providers and information technology, defending customers from computer misuse and cybercrime and enforcing Data Protection are some of the measures that contributed to improving and

foster the development of a technology-based service industry in other countries. Their example should be followed by North Africa.

Take an active role in the promotion of the country as an offshoring location

Attending world business summits¹⁶ and expressing commitment to reform to international business leaders allows North African countries to approach potential business partners looking for offshoring destinations and to build a network of contacts¹⁷. Morocco is very active in this field; while Tunisia and Egypt are following its example. Information flows are increasingly facilitated by multilingual press coverage of the northern and southern Mediterranean shores¹⁸.

¹⁶ Examples of summits are SICCAM, the International Call Center Salon in Morocco; the Global Call center outsourcing summit in Dallas, Texas; the Call Center Summit in Miami, Florida.

¹⁷ Direct contacts with business leaders has proven a key way of attracting businesses to the country as mentioned above in the examples of Mexico and Costa Rica.

¹⁸ www.ansamed.info, a division of the Italian press agency ANSA, is an example of press coverage for the whole Mediterranean region in Italian, French and Arabic.

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Annex: Determinants of offshoring in four North African countries

	<i>Algeria</i>	<i>Egypt</i>	<i>Morocco</i>	<i>Tunisia</i>
Competitive Telecommunication Infrastructure	Sector liberalization started in 2000.	Sector liberalization started in 1999.	Sector liberalization started in 1996.	Sector liberalization started in 1997 with signature of the WTO service agreement.
	The PSTN segment is a duopoly (a second license awarded in 2005) with household mainline penetration of 49% (2005).		The PSTN segment was a monopoly with a household mainline penetration of 16% until 2005, when two new telecommunications licenses changed made it to fully competitive.	The PSTN segment is a monopoly with a household mainline penetration of 38% (2005).
	The cellular segment is fully competitive, with three operators and a mobile penetration of 15% (2005).		The cellular segment is a duopoly, with a mobile penetration of 31% (2005)	The cellular segment is a duopoly, with a mobile penetration of 37% (2005)
	The internet segment is fully competitive with a density of 1.5% (2004). Internet bandwidth grew from 2 Mbps in 2000, to 189 Mbps by the end of 2003. It is projected to reach 877 Mbps by 2008.		The Internet segment is fully competitive with a density of 1.7%. International bandwidth was 712 Mbps in 2004.	The internet segment is fully competitive with a density of 4.4% (2005). International bandwidth grew from 8 Mbps in 1998 to 110 Mbps in 2002 and is expected to reach 726 Mbps by 2007.
	The Datacomm segment is fully competitive.	The PSTN segment is a monopoly with a household mainline penetration of 58% (2005).	The Datacomm segment is fully competitive.	The Datacomm segment was opened to competition beginning of 2004, with a duopoly guaranteed till 2005.
	In 2005 a broadband initiative was launched offering competitively priced packages of PCs and broadband connections for households and small businesses.	The cellular segment is a duopoly, with a mobile penetration of 11% (2005)		The telecommunications network is modern and shows falling communications costs: 2003 saw a 50% decrease in prices of data transmission services, leased lines, numeric network and of the asymmetric termination.
	Real Estate is scarce and prices are high.	The internet segment is fully competitive with a density of 3.4% (2005). International bandwidth has grown from 20 Mbps in 1999 to 1,148 Mbps by end of 2003 and is projected to reach 3,744 Mbps in 2008.		Local real estate prices are low.
	IT facilities are under construction (Sidi Abdhallah Cyber park) on the outskirts of Algiers.	IT facilities and tax free zones (Smart Village) are established for IT and communications firms.	IT infrastructure with wired buildings (Casa Technopark), is available for the private sector.	IT facilities exist (Technopole Ariana and the Technological City) in the outskirts of Tunis.

	<i>Algeria</i>	<i>Egypt</i>	<i>Morocco</i>	<i>Tunisia</i>
Skilled low-cost Workforce	Algeria has a large pool of bilingual (Arabic, French) technical graduates (especially engineering and chemistry related to the hydrocarbon industry's importance).	With a population of more than 70 million, 20% of which is attending different stages of Education, Egypt produces over 265,000 university graduates of which 16,000 graduate from technical universities each year. 30,000 of the graduates each year are either bilingual or multilingual (English, Arabic, German, French, Spanish, and Italian), at 54% of the cost of a US inbound voice-based customer care agent.		Multilingual (Arabic, French, English, Italian) graduate availability and motivation (approximately 5%"turn over").
			The national agency for employment promotion (ANAPEC) facilitates employment searches for service centers through access to human resources database, candidates' pre-selection, etc.) and support measures (apprenticeship contracts).	A system facilitating graduate employment has been set up through a network of employment agencies and a web site. The national employment and independent work agency (ANEPI) support service centers entrepreneurs in their employment and training process
				100% exemption for 5 years from social contributions when employing newly graduated (bac+2) staff and of 50% for employment of a second and third team of employees for firms' production cycles.
		Subsidies are available to customer care specialists such as contact center agent training at recognized educational institutes throughout Egypt.		Subsidies are available (FIAP, PROFANOC) for setting up training programmes. The national office for professional training and employment promotion (OFPPT) adopted training policies focused on tele-services and partial reimbursement (up to 90%) of training
Flexible Labour Market Regulations	The Algerian Labour market is regulated by the decree no 96-21 of July 1996 completing the Law 90-11 of April 21st, 1990 on general working conditions.	The Egyptian labour market is regulated by the new unified Labour Law No. 12 for 2003. The new law aims at increasing the private sector involvement and at the same time achieving a balance between employees' and employers' rights.	Labour market regulations allow night shifts and week-end employment without significant salary premiums and grant large flexibility to work shifts.	Salaries are lower than main competitors and social legislation flexible with three weeks annual vacation, night or weekend work without overtime, non-limitation of overtime and total flexibility to meet high-demand periods.
	The unemployment rate is estimated at 25.4% (down from 30% in 2000), the monthly national minimum wage of 105\$ (2003) and the legal weekly work duration is 38 hours.	The unemployment rate is estimated at 11% (2004), the monthly national minimum wage at 81\$ (2003) and the legal weekly work duration is 35 hours.	The unemployment rate, estimated at 20% in 2001, decreased to 11.3% in 2005, the monthly national minimum wage for the industrial sector is USD 180 (2003) and the legal weekly work duration is 48 hours.	The unemployment rate was estimated at 13.8% in 2004, the monthly national minimum wage for the industrial sector at USD 147.43 and USD 4.45 daily for agricultural sector (2003) and the legal weekly work duration is 48 hours.

	<i>Algeria</i>	<i>Egypt</i>	<i>Morocco</i>	<i>Tunisia</i>
Business & Investment Climate	Full tax exemption for specific sectors and equipments for new enterprises. Additional tax breaks are granted to newly installed companies for the first 5 years of operation.	Tax breaks for 5 to 10 years from the existing 40% current corporate levy for set up of contact centers.	Full tax exemption for the first five years on export revenues and 50% exemption beyond that.	Full tax exemption for export revenues for 10 years and 50% as of the 11th year. Investment is tax free for nationals and foreigners in all fully exporting activities and quasi-fully free for partially exporting activities.
	Custom duties have decreased since 2002 and are differentiated on a 4-level scale (0, 5, 15 et 30%), depending on the degree of transformation of imported products.	Free trade zones for companies to establish operations, which guarantee a tax-free period as mentioned above.	VAT exemption on real estate goods and export services, free capital transfer, custom exemptions for some equipment coming from the EU, while the custom tax on IT goods is reduced to 2,5%.	Income and custom tax exemptions for equipment purchase and supplies targeted to export.
	All foreign investors can hold up to 100% of total project capital without authorizations required and can repatriate benefits and revenues from transfer of invested capital including the value-added generated by the investment.	The government is working on customizing incentive packages to cater for call center investor requirements. Incentives include reduced infrastructure costs that reach 50% of the original price, subsidized training, heavily discounted facilities at the Smart Village; and constant logistical and political support.	One stop-shop investment facilitation agencies connected to regional investment centers facilitate the administrative procedures for enterprises creation and operation. Support to start-up is supported by programs in partnership with EU countries.	All foreign investor can hold up to 100% of total project capital without authorizations required and can repatriate benefits and revenues from transfer of invested capital including the value-added generated by the investment.
	ANDI promotes and supports national and international investors, facilitating administrative procedures and granting fiscal and quasi-fiscal exemptions and tax reductions. One-stop-shops facilitating enterprise set up are being currently set up in each region.		A government observatory is responsible for identifying and correcting sector weaknesses in human resources availability, reception and telecom infrastructures, to improve the competitive environment of the service center industry.	The national investment promotion agency (FIPA) simplifies administrative procedures for new business creation and the Agency for Industrial promotion facilitates enterprise registration process with a one-stop shop procedure.
				Start-up companies have the possibility to raise capital through a newborn venture-capital market (Tuninvest- Siparex).

Note: Household mainlines penetration is measured by dividing the residential mainlines by the number of households in each country

Sources: World Bank Investment Climate Assessments, Banque Libano-française database, International Labour Organization, Arab Advisors Reports, ANIMA- Réseau Euro-Méditerranéen des Agences de promotion des Investissements.

Through the Looking Glass: Civil Society Participation in the WSIS and the Dynamics between Online/Offline Interaction

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Abstract: Struggles for social change have become much more complex and need to be fought on several fronts at the same time, on a local, a national, as well as on an international stage. In this paper the focus will be the international level and, more specifically, the tensions and lessons that can be learned from civil society involvement in (formal) multi-stakeholder processes. The case concerned here is the UN World Summit on the Information Society (WSIS) and its preparatory process. The paper will critically assess the summit in terms of outcomes and process from a civil society perspective and the role of the internet in that process. To do this, some of the results of a worldwide survey on civil society participation will be considered and will provide an indicative picture of the way in which civil society players perceive the implementation of participatory discourses within a context that goes beyond the nation state and the use of the internet in that respect. Furthermore, this will be complemented by an in-depth analysis of the internet governance caucus and their mailing list. The survey reveals that some believe the glass to be half-full, others half-empty, while some even think that it is totally empty. In many ways this debate can be related to the difference between 'what ought to be', paraphrasing Gramsci, and 'what is possible'. This tension between utopia and realism also exists within civil society. A continuum can be observed, going from those that think a lot has already been achieved to those that feel (much) more needs to be done.

Key words: WSIS, Civil Society, multi-stakeholderism, Internet, Internet governance

Processes of social and political change have become as complex and dynamic as our mosaic societies themselves. Current movements towards social change, such as the alternative globalisation movement, gathering at the World Social Forum, or civil society networks trying to influence the World Summit on the Information Society (WSIS), are highly diverse and embrace local grass-root organisations from all over the world, as well as regional umbrella organisations and transnational networks of organisations. Although the internet has increased the connectedness and networking-capacities of these movements, the question of impact remains problematic. The broad diversity of civil society organisations, activists, and sometimes even political parties adopt a wide variety of strategies. Some

prefer strategies of direct action and do not see any benefit in a dialogue with the formal political world, focusing instead on changing values, behaviours and attitudes. Others focus on lobbying, doing the 'dirty' work of actually negotiating and voice the aspirations, and sometimes utopian goals, from the bottom-up to the formal political level of governance. Finally there are those who combine both strategies by taking direct action while also mediating in translating sentiments and passions from an informal political sphere to a formal one. (CAMMAERTS, 2005)

Governance is increasingly no longer solely the prerogative of Nation States. Although they remain powerful players, international organisations and institutions, treaties, the increased globalisation of the economy and of communication have slowly eroded the sovereignty of States (ROSENAU, 1990; HELD *et al.*, 1999). States have, to a large extent lost or given away - depending on the way you look at it - their grip and control over the economy, especially over trade and global finance, but also over telecommunication. Communication is now firmly a commodity, almost totally stripped from its public good heritage. This is most felt by developing countries, but due to the multiplication of channels; the internet, fixed telephony, mobile telephones, cable subscription, and despite the promises that accompanied privatisation, communication and media costs have increased considerably for average families in the developed world as well. Hence, the increasing discourses regarding the digital divide, both from a global perspective and a national one (NULENS *et al.*, 2001; CAMMAERTS *et al.*, 2003).

There is an inherent inconsistency when governments and international organisations on the one hand allow a very oligopolistic market to rule communication and, on the other hand, adopt a discourse that the digital divide has to be bridged, without having the means to actually do something about it. Social and development policy often has many other more important priorities. The WSIS is no exception in this regard. There is much talk about a digital divide fund, but no funds to back it up (ITU, 2003a, 2003b).

In a bid to strengthen the legitimacy of policy initiatives beyond the nation state the WSIS was presented as an experiment in multi-stakeholderism, where the participation of civil society would be promoted, taking into account the views of those organisations that mediate between the 'bottoms' and the 'ups'. As was to be expected, many were left frustrated and felt betrayed after WSIS1 in Geneva. The discourses of 'full' participation and involvement created high expectations amongst many CS-players on which

the ITU and powerful Nation States could, or would not deliver. Some States were seen to bend the rules (KLEINWÄCHTER, 2004), but in terms of real impact of civil society discourses on the declaration and especially on the action-plan the assessment was very bleak (see FÜCKS, 2003; DANY, 2004; Ó'SIOCHRÚ, 2004). From these latter perspectives the glass was half empty or even downright empty.

In this primarily empirical paper, it will be argued that this metaphor has to be diversified into different glasses, some of which are empty - no compromise, others half empty - bad compromise, and again others half full-symbolising a 'good' compromise. Some players will only be satisfied with a full glass, of which there are very few, others smell victory with a good compromise and there are also CS-players who spin a bad compromise into a big step for mankind.

A worldwide survey assessing civil society participation in the WSIS maps these different positions, especially in the open questions, which allow for a qualitative analysis of the polarisation within civil society when evaluating the WSIS1. The survey also shows the increasing importance of the internet for intra-movement networking, gaining access to documents and information. From the qualitative analysis the issue of time, and thus resources, also emerges. Involvement in multi-stakeholder policy-processes requires commitment of funds for travelling, attending meetings, time to be active on mailing lists, consult local or transnational constituencies, write resolutions, and the nitty gritty of lobbying and bargaining. This also partly explains the disappointment of many in the process. Many of the aims and goals of civil society did not make it to the final declaration in Geneva, which prompted the civil society caucus to write an alternative declaration, stating its position and thereby criticising the official declaration deemed overly geared towards solving social problems through facilitating the market and trade (WSIS Civil Society Plenary, 2003).

If we, however, consider the specific issue of internet governance, a contentious issue that was postponed at WSIS1, a more shaded picture emerges regarding multi-stakeholderism and the impact or influence of civil society. The mailing list of the civil society IG-caucus was analysed, allowing us to determine where participants are located, who is active within this debate and how active the mailing list was. A number of questions were sent to the most active participants in the mailing list to evaluate the use of the internet in this process, as well as the process itself and their impact on it.

This sub-case will allow us to depict a more complex interplay between the different players in multi-stakeholder processes and go beyond the polarisation of utopian and realist dispositions. Firstly, a short overview of the WSIS-discourses regarding participation of civil society will be given.

■ WSIS, multi-stakeholderism and civil society 'participation'

In view of its longstanding partnership with NGOs, the UN considered the involvement and participation of civil society in the World Summit on the Information Society (WSIS) to be paramount. UN Resolution 56/183 encouraged:

"intergovernmental organisations, including international and regional institutions, non-governmental organisations, civil society and the private sector to contribute to, and actively participate in the intergovernmental preparatory process of the Summit and the Summit itself". (UN, 2001, p. 2)

In this regard, the Executive Secretariat of the WSIS created a Civil Society Division team that was told "to facilitate the full participation of civil society in the preparatory process leading up to the Summit" (emphasis added). The WSIS is also one of the first summits where ICTs are being used extensively to facilitate the interaction between the UN-institutions and civil society players. It is also the first world summit where civil society has been involved in the preparatory process from the very beginning and as such, a first step in putting the more participatory policy discourses into practice. In many ways the WSIS was presented as a model for the multi-stakeholder approach adopted by the UN.

International institutions are faced with a double challenge. On the one hand their own legitimacy is increasingly being questioned by large-scale protests and a lack of trust by citizens. On the other hand, the legitimacy of state players and their, often, representative democratic regimes, from which international organisations derive their legitimacy, is also in crisis, which is revealed by a number of phenomena including low voter turn-outs, declining interest in politics, and the rise of anti-democratic, populist and even post-fascist movements. Institutions such as the EU and the UN are increasingly looking to civil society and business players in a bid to legitimise policies that can build on the broadest support possible from the different players involved in the complex game of multi-stakeholder governance.

HEMMATI (2002, p. 2) defines ideal-type multi-stakeholder processes as "Processes which aim to bring together all major stakeholders in a new form of communication, decision-finding (and possibly decision-making) on a particular issue". He also points to the importance of equity and accountability, as well as the need for the presence of democratic principles such as transparency and participation.

By putting an emphasis on equity, transparency and participation Hemmati links up with democratic theory where 'real' or 'full' participation is defined as a process where there is equity between all players involved and equal power to influence outcomes (PATEMAN, 1970, p. 70). Reality is, however, much messier, which explains why many theorists dealing with participation have introduced notions such as partial participation (PATEMAN, 1970, p. 71), manipulative participation (STRAUSS, 1998, p. 18), pseudo participation (VERBA, 1961, pp. 220-221) or fake participation. These gradations indicate the many subtle differences between enabling a player to potentially influence, but not to decide upon things - as Pateman conveys with partial participation, and giving a player the impression or feeling that s/he can influence and participate, without actually delivering - as Verba and Strauss capture with their respective notions.

Elsewhere the notion of participation and power relating to civil society involvement in the WSIS was already explored (CAMMAERTS & CARPENTIER, 2005). From that analysis it emerged that introducing the notion of (full) participation in the context of the WSIS and civil society involvement in the preparatory process was a bit over-optimistic. However, it was also concluded that power is a dynamic notion and is distributed amongst all players, albeit in an unequal way.

A complex interplay between generative and productive power mechanisms on the one hand, and repressive or restrictive power mechanisms on the other hand, could be observed, situated at both a micro- as well as macro level of analysis. Moreover, acts of resistance by the different players to both generative power and to repressive power were put to bear. Civil society 'participation' in policy processes beyond the nation state is flawed and – as the results of the survey explored below show - contagious. However, this does not mean that the multi-stakeholder discourse should be reduced to mere rhetoric, as will, amongst others be shown by the internet governance case.

The first part of this paper explores the empirical results of a worldwide survey assessing the WSIS1 from a civil society perspective, as well as the

use of the internet. The second empirical part will analyse the mailing list of the internet governance caucus and present the view of the more active participants in that mailing list regarding their impact on the process.

■ WSIS-phase1 evaluated

In order to assess the WSIS multi-stakeholder process, the nature of civil society involvement, as well as to get to grips with the role of ICTs in that process, we can draw upon a survey that was conducted in May 2004. With regard to the results of the survey, a number of biases need to be taken into account. The response rate was rather low. Of those organisations that actually received the request to fill in the survey (N=522), 54 responded, representing a response-rate of 10.34%. Other biases relate to the regions where the civil society organisations (CSOs) are active, the type of organisation, and the degree of involvement within the WSIS-process. However, when these are taken into account, the sample of 54 organisations can be regarded as reasonably indicative (not statistically representative) of those civil society players that were fairly active within the WSIS-process.

In this section, the assessment of respondents regarding the outcome and the process as such will be considered. Moreover, attention will also go to the importance of civil society networking, use of the internet, intra-movement tensions and the lack of resources experienced by some respondents.

Civil society assessment

Respondents were asked to evaluate the WSIS consultation process and the involvement of their organisation in that process. This resulted in very conflicting comments that represent the different positions outlined in the introduction. One respondent remarked:

"I am very happy with the outcomes we succeeded in obtaining (...) Without our efforts, we faced the risk that youth would not have been mentioned in the documents" (R-3a, m).

Another stated that the consultation process was a "very good approach" (R-12a, f). Such comments represent the full glass perspective and can often be linked to whether the issue the respondent wanted to address has

been taken into account or not. Others were positive, but also realistic as to the outcomes: "Very significant effort leading to modest outcomes which we were content, although not ecstatic about" (R-48a, m), which can be related to the glass half full position.

However, not all respondents were so positive about the WSIS consultation process. Many were critical of the rhetoric regarding the so-called multi-stakeholder process:

"[The process] remained far behind the expressed innovative approach to the summit (process tri-partite); Civil Society in various regards was treated as a fig leaf" (R-26a, m)

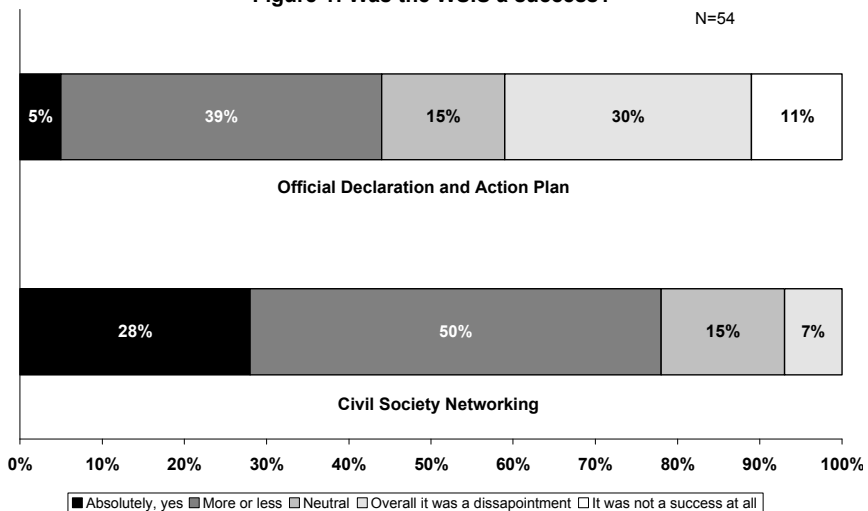
or "The consultation process itself was largely a disaster, and Civil Society was not brought in as a "partner" in the way described by the ITU" (R-49a, f).

In line with these remarks, another respondent dismissed the dominance of states within the process, especially during the final stage of negotiations when finalising the declaration and action plan:

"Closed government working groups excluded us from what we had been informed would be open meetings for us to take part." (R-36a, m).

These statements indicate very much an empty glass or half-empty perspective being adopted by respondents.

Figure 1: Was the WSIS a success?



Asked if the WSIS was a success in terms of the declaration and action plan, about 45% (N=24) of respondents answered "absolutely" or "more or less". About 40% (N=22) disagreed with that, which shows the disappointment amongst many CS-representatives, as well as a polarisation within civil society (see figure 1).

Intra-networking

Many more respondents are convinced that the real outcome of the WSIS was not so much the formal declaration, but the networking-efforts within the civil society caucus, as illustrated by this respondent noting that:

"Through meetings and the opportunity to engage in face to face discussions, as well as agree on a lot of points, we developed our contacts and had a more insightful view into the international politics and networks of civil society organisations' (R-3a, m).

Over 75% (N=42) of respondents agree (absolutely/more or less) with this statement (see figure 1).

For many CS-organisations WSIS also represented a learning experience, as this respondent pointed out:

"Being involved in the process, the way official documents stated, offered a fruitful occasion to discuss both issues of content (the issues at stakes) and procedure (civil society participation). Therefore a growing awareness of this aspect paralleled involvement in the process." (R-51a, f).

Other respondents referred to the alternative civil society declaration as the more important outcome of the Summit, not the official declaration:

"It was about as successful as we expected - not much in it. The real focus was the Civil Society Declaration."(R-16a, m).

The internet

The internet is becoming increasingly crucial to penetration of civil society networks and access to documents, to voting procedures and information. The internet was deemed particularly important in view of intra-movement networking. When asked about the nature of their networking practices with other organisations during the WSIS process, there was a considerable

difference between organisations that responded 'Yes' to internet contact as one means of networking and those who responded 'No' to this question (see table 1).

Organisations that do not network through the internet are (only) dependent on physical meetings and thus miss out on those networking opportunities for which internet access and capabilities are crucial. They are also often uninformed of the location and dates of those meetings. Organisations claiming not to use the internet for networking-purposes were not active in co-organising events with other organisations, nor did they (with one exception) co-sign or co-write documents with other organisations.

Table 1: Ways in which civil society organisations network

		<i>Co-signing document</i>	<i>Co-organising events</i>	<i>Joint meetings</i>
Internet contact Yes (N=41)	Yes	61% (N=25)	54% (N=22)	85% (N=35)
	No	39% (N=16)	46% (N=19)	15% (N=6)
Internet contact No (N=13)	Yes	8% (N=1)	0%	46% (N=6)
	No	92% (N=12)	100% (N=13)	54% (N=7)

That a large majority of organisations using the internet to network were also active in (offline) joint meetings shows the real and persistent importance of face-to-face interaction in combination with electronic communication. About a third of respondents claim that the internet is crucial and only a very limited number of respondents suggested that face-to-face meetings are more important for networking than the internet.

Table 2: Importance of the internet in terms of networking?

	<i>% (N)</i>
It is essential, everything is done through the Internet	33% (N=18)
The internet is very important, but so are face2face meetings	61% (N=33)
The face2face is much more important then the internet	6% (N=3)
Everything is done through face2face contacts	0%

Moreover, a majority of respondents value the internet as much as face-to-face contacts. This confirms other research focusing on the interplay between online and offline (DIANI, 2001).

Intra-movement tensions and differences

Civil society is not a singular player, nor is it conflict-free. The following quote illustrates this:

"[The WSIS] has already allowed organised groups to strengthen their links, as well as those who are new to familiarise themselves with these kinds of activities. However, we also think that a large part of civil society has disengaged from the process, specifically the most militant groups, as well as the new ones, leaving the 'professionals' of civil society to claim a central place in the movement." (R-50a, m - translation by the author).

Another respondent made a similar remark relating to the power mechanisms within civil society and the pressure to strive for consensus and thus speak with one voice in an international setting, which tends to silence radical views:

"The mode of networking, which was guided largely by the more prominent NGOs, strove for consensus in a way that buried what may be considered productive dissent and disagreement within Civil Society." (R-49a, f).

Table 3: Average # of participants per CSO for WSIS-03 in Geneva

	Total	West-Europe	East-Europe	North-America	Latin America	Southern-SSAfrica	Arab World	Asia	Oceania	Unknown
# of CSO-participants	3205 (100%)	1977 (62%)	26 (1%)	599 (19%)	86 (3%)	204 (6%)	165 (5%)	138 (4%)	4 (<1%)	6 (<1%)
#of CSO	462 (100%)	208 (45%)	8 (2%)	85 (18%)	32 (7%)	54 (6%)	35 (5%)	33 (4%)	3 (<1%)	4 (<1%)
Average # Participants/CSO	6,9	9,5/7,1 (*)	3,3	7,0	2,8	3,7/3 (**)	4,7	4,1	1,0	-
Median # Participant/CSO	2	3	3	2	2	1	3	2	1	-

*) World Electronic Media Forum, based in Switzerland, does skew the results for Europe considerably, as it had 507 participants at the WSIS2003. For the average number of participants we made the calculations with WEMF included and excluded.

(**) APC, transnational but officially based in South Africa, does skew the results of Africa as it had 47 participants to WSIS-1. For the average number of participants calculations with and without APC were made.

Source: CAMMAERTS & CARPENTIER, 2005

This dominance of organisations from the Northern hemisphere showing in a quantitative analysis of the ITU attendance-lists, is also problematic in

this regard (see table 3). Some 80% (N=2602) of participants to the WSIS–Phase1 and about 65% (N=301) of organisations present in Geneva, resided in Europe and/or North America. CSO from developed countries are also able to send larger delegations as the average number of participants per CSO indicates.

Time and resources

Finally a number of respondents complained about a lack of resources to attend and to follow up a time and money consuming processes such as the WSIS:

"We shall continue to monitor WSIS and take action as appropriate, but as an organisation with limited resources, we will measure our participation against how much impact we feel we can make, and/or what contribution it will bring to the WSIS." (R-32a, f)

and also: "We joined the process late as we did not have the resources to join in earlier." (R-41a, m).

If we consider the results from the quantitative analysis of the ITU attendance-lists (cf. table 3), it becomes apparent that organisations from the Northern Hemisphere dominate, especially in view of the average number of participants per organisation. The fact that Geneva is one of the most expensive cities in Europe in terms of accommodation and cost of living, and that travel-costs from poorer regions in the world are generally speaking considerably higher, might also explain why participants and organisations from these regions are substantially under-represented, despite (minor) efforts to alleviate this.

■ Internet governance and civil society internet-use

The results of the assessment above indicate that the participatory discourses adopted by the UN and ITU are flawed. Firstly, many respondents feel disappointed with the end-result and the limited impact they had on it. Secondly, there are also issues of exclusion relating to the resources needed to be involved and the dominance of professional NGOs. The use of the internet in policy-processes has to be analysed on two levels: the formal level, where it facilitates access to the process, but not

participation and the informal level of networking within civil society, which was extensive and deemed by many to be the real success of civil society.

From this perspective the evaluation of the 'participation' of civil society in the WSIS is quite bleak. However, a more in-depth analysis of the case of internet governance points to a much more complex and differentiated image. Moreover, the internet governance case confirms the dynamics between online and offline in terms of networking and policy processes.

During the final negotiations at the WSIS1 the sensitive issue of internet governance was postponed to the WSIS2, to be held in Tunis on November 16-18th 2005. The WSIS1 did give the UN secretary general Kofi Annan the mandate to set up a Working Group on Internet Governance (WGIG) with 'active and full participation' of all stakeholders and charged 'to investigate and make proposals for action, as appropriate, on the governance of the internet' (ITU, 2003a: paragraph 50). The WGIG consisted of 40 members, representing the different stakeholders and "who all participated on an equal footing and in their personal capacity" (WGIG, 2005: 3). Four physical meetings were held in Geneva (23-25/10/2004, 14-18/02/2005, 18-20/04/2005 & 14-17/06/2005), but besides that the internet itself was also a much-used tool, especially in terms of civil society interaction and debate.

At the moment of writing the WSIS2 had not yet taken place, it remains thus pre-mature to make definite conclusions as to the impact of the very balanced final report of the WGIG and the extensive and productive involvement of civil society on the final decision, but some trends are emerging. These can be deduced from the replies from a set of questions that were sent to the most active participants of the IG-mailing list meaning those who have posted 20 or more messages during the 2 and a half years that the mailing list has been operating now (N = 26). Nine key-participants responded and this resulted in a distinctly different – more positive and even at times enthusiastic – assessment of multi-stakeholderism and on the impact of civil society than in the more conflict-ridden assessment of the WSIS1 as a whole, presented above. Notwithstanding, several respondents also voice their criticisms, concerns or reservations.

A quantitative analysis of the mailing list of the internet governance caucus will allow us to assess the transnational character of the IG-caucus, the gender balance, and the number of postings per month or per participants. This will be complemented by a qualitative assessment by respondents of the functions, opportunities, as well as constraints of the

mailing list and the use of the internet in terms of networking and multi-stakeholderism.

Impact of civil society players on the process

Almost all respondents feel that the impact of civil society in terms of the debates on internet governance within the WSIS-process has been substantial and the input it provided serious and considerable. One respondent asserted:

"CS-actors [...] played a major role in setting the agenda, providing commentary on WGIG drafts that corrected or identified problems, and injecting specific ideas and proposals into that process." (R-2b, m).

It also emerges that civil society representatives active within the internet governance debate have a high degree of expertise regarding the issues being debated and, as one respondent put it, the ability:

"[...] to translate the technical into political issues and the other way round, while still having in mind the broader vision of global CS for a human-centred Information Society". (R-4b, m).

This also shows in the final report of the WGIG, where civil society discourses relating to unilateral control of the root by the USA, development issues, freedom of expression, intellectual property rights, consumer rights and 'meaningful' participation of CS in policy processes are present in strong language at times, and balanced with other views on other occasions (see WGIG, 2005).

Most respondents therefore feel that they have made a fair to major difference in the process. A respondent phrased it this way:

"The Caucus produced concrete language for the final document and pushed for a 'multi-stakeholder composition' of any IG follow-up mechanism", which shows according to him "the recognition of CS and an 'important player'." (R-3b, m).

The case of internet governance, as well as the continuing involvement of CS in the proposed forum that will institutionalise dialogue, shows that CS-representatives have been taken more seriously as the process evolved.

There were, however, also some critical perspectives. Two areas of concern can be identified. First of all, some respondents have reservations regarding the final political negotiations and whether the CS-discourses in

the WGIG-report will survive the expected wheeling and dealing during WSIS2 in Tunis. A respondent refers to this with an open question:

"When the WSIS process goes back to traditional diplomacy mode [...], will the outcomes of CS involvement stay in or be forgotten and dropped out in the struggle between few governments over control of the root zone file?" (R-4b, m).

In many ways, it is, as one respondent states: "too early to tell" (R-7b, m) when it comes to the question of whether CS has been able to transform input into real impact. The second concern relates to the representativeness of the players active within the IG-process. One respondent expresses the criticism that the mailing list seemed:

"[...] a vehicle of a few people who want to keep in contact before and after meetings and to present some document (in the name of a larger group than they are) into the WSIS process." (R-5b, f).

From this perspective, those actively involved in the IG-process are just another elite acting in the name of a larger constituency. This perception is re-enforced in another comment by the same respondent, voicing disappointment at the absence of the citizen, opposed to the user, in the process. This respondent noted that it was:

"[...] sad that this whole process left out the netizen, the net.citizens" (R-5b, f).

Another respondent also acknowledges that gaps:

"[...] between 'insiders' who are active on the ground and people who've simply joined a listserv can occur, but under the circumstances it's not that bad". (R-6b, m).

This latter observation regarding the circumstances can be linked to a realist perspective that CS-involvement within formal policy processes requires a number of (semi-)professionals' ready and able to perform a difficult balancing act of, on the one hand, getting the alternative discourses through and, on the other hand, seeking consensus within the CS-caucus.

Multi-stakeholder practices

Finally, regarding the praxis of multi-stakeholder, most respondents refer to their positive experience with, extensive involvement in and considerable impact on the WGIG and its final report, as the prime example that the multi-

stakeholder discourse is proving to be more than mere rhetoric, especially after WSIS1. One respondent claims:

"In other WSIS issues, [...] it has been mostly rhetoric, however in the case of IG it has been different." (R-7b, m).

In many ways, the IG-governance process is presented as a best-practice case regarding multi-stakeholderism, as suggested by this comment:

"I think we have been successful and hopefully have set some precedent (small steps perhaps) for WSIS and also perhaps for future UN processes." (R-8b, m).

As the careful phrasing in the last quote already indicates (cf. hopefully, perhaps), most respondents make reservations and are careful to stress that the relatively positive outcome is a temporary 'ceasefire' in an ongoing struggle. The following comments are examples of this:

"Let's see as we move to a more formal, nation state part of the negotiation" (R-7b, m);

or "Let's see what eventuates, but the process to-date has been multi-stakeholder" (R-1b, m).

Indeed, there are grounds for serious concern and scepticism in this regard, as illustrated by the absence of the most powerful nation state, as well as corporate players in the WGIG and the recent strong statements coming out of the U.S.-administration. One respondent echoes this fear: "The U.S. is not giving up its existing role" (R-7b, m). This 'reality' has prompted others to adopt a realistic stance:

"Taking into account that the U.S. was not a member of the WGIG, but delivered a strong and clear statement recently [...], it is rather unrealistic to expect a solution for 'oversight'." (R-3b, m).

It is clear that, at the end of the day when it comes to vested interests, power and control, participatory discourses of equity, transparency and accountability often lose out or are reduced to possible commitments to improved consultation through the proposed Forum.

"I think there will be some kind of forum or mechanism, it will be 'lite'. But most likely there will be no agreement on the key issue of the role of the U.S. [...] So I suspect Tunis will be seen as something of a failure in that it won't bring consensus." (R-8b, m).

But again, given the "contradicting positions" (R-4b, m) and interests, this is hardly surprising to many respondents.

Although for most respondents the glass is definitely half-full, that might change after the WSIS2 where the really tough decisions will have to be taken, not by civil society, but by nation states. For some, adopting a realist position, the outcome of the Tunis-summit is secondary to what has already been achieved, while others, adopting a more ethical view, will be disappointed and are likely to change their assessment from half-full to half-empty.

Assessment of the internet governance caucus mailing list

With about 3,000 messages in a period of over 2 years, it is fair to say that the mailing list of the civil society WSIS-Internet Governance Caucus was very active and vibrant. The mailing list had some 100 active participants, but besides those posting messages, many more subscribe and receive the postings. The mailing list can also be consulted on the world wide web, hosted by the Computer Professionals for Social Responsibility. The period of analysis ran from 30/03/2003, the start of the mailing list, to 03/07/2005 or roughly 2.5 years.

Transnational character of the mailing list

According to many respondents, the e-mail based list allowed for a broader and more global constituency to be involved, to engage and to be informed than was the case for the face-to-face engagement. In the words of one respondent, the mailing list had:

"[...] the capacity to involve people who could not attend and the capacity to get a wider range of viewpoints" (R-1b, m).

This is partly confirmed by the quantitative analysis of the mailing list. As the internet is a global medium, it is only logical that participants in this mailing list are scattered around the world and that all regions of the world are represented. However, as with internet access, there is a clear dominance on the part of participants from the Western hemisphere, where about 65% of participants reside. Following behind Europe and North America are Latin-America (including Brazil), Asia and Africa. If the number of postings are taken into consideration, the under-representation of participants from developing countries is even more striking. Participants

from Europe and North-America account for about 75% of all postings, whilst for example participants from Africa and the Arab world only posted 3% of all messages. Asia, on the other hand, has relatively speaking few participants, but very active ones.

Table 4: Distribution of participation according to region

	<i>Participants (N)</i>	<i>Participants (%)</i>	<i>Postings (N)</i>	<i>Postings (%)</i>
Western-Europe	36	34%	1192	40%
Eastern-Europe	1	1%	163	5%
North-America	29	28%	831	28%
Latin-America & Brazil	10	10%	143	5%
Caribbean	2	2%	44	1%
Asia	9	8%	471	16%
Australia & New Zealand	5	5%	66	2%
Southern & SS-Africa	8	8%	56	2%
Arab Countries	4	4%	17	1%
TOTAL	104	100%	2983	100%

While participants who have posted 20 or more messages are isolated (N = 26) the dominance of European, North American and to a lesser extent Asian participants increases even further. Within the population of most active participants, those residing in Europe, Asia or North America account for almost 85% of participants and a staggering 95% of postings.

Gender-balance

Although gender balance is considered to be "a fundamental principle" by the WGIG (2005: 11), the gender balance within the internet governance mailing list itself is very skewed. Over 75% (N = 80) of participants are male. This dominance is also reflected in the number of postings, where male participants account for more than 80% (N = 2462) of messages.

Table 5: Gender of participants

	<i>#Participants</i>	<i>%</i>	<i>#Postings</i>	<i>%</i>
Organisation	1	1%	5	1%
Female	23	22%	516	17%
Male	80	77%	2462	82%
TOTAL	104	100%	2983	100%

When only the most active participants are taken into account (N = 26), the lack of gender balance becomes even more apparent as only 25% (N = 4) participants are female and only 15% (N = 852) of messages originate from female participants.

Expertise versus elitism

Several respondents stated that the online forum allows for more reflection on complex issues, as well as debate on these issues to be aired. This can be related to the need for expertise, both in the issues that are being debated as well as in political skills. The qualitative analysis of CS-involvement in the IG-process also indicated the importance of expertise in order to be taken seriously by other players and to be able to make a difference.

This need for 'expert-isation' also shows in the affiliation of participants of the mailing list. Although the affiliations of participants of the WSIS internet governance mailing list reflects the different stakeholders within the IG-debate, when analysing the number of postings it is clear that academics in particular have been most active (about 50% of messages). Individual activists, on the contrary, were not so active. This again reflects issues of time and resources, as well as the fact that involvement in policy processes is on a voluntary basis.

Table 6: Affiliation of participants

	#Participants	%	#Postings	%
Activist	13	12%	104	3%
(Transnational) CSO	19	18%	669	22%
Academics	38	36%	1402	47%
Independent Researcher	5	5%	27	1%
Consultants/Software Developers	9	9%	116	4%
Internet Regulatory Agencies (*)	11	11%	627	21%
Government-Linked Agencies	6	6%	8	0.5%
International Organisation	2	2%	10	0.5%
Unknown	1	1%	20	1%
TOTAL	104	100%	2983	100%

(*) Internet Society, Internet Address Registry, ICANN, RIPE

Most respondents are aware of the danger of elitism and this awareness causes a feeling of unease among some, as illustrated by this comment:

"We should not be too quick to assume that silence means agreement." (R-8b, m).

However, as many also recognise, if a controversial issue emerges more people will respond and give their view. As such, the 'silent majority' on the list also fulfils a control function vis-à-vis those who are very active on the list and in the process. One respondent, who was not able to go to the meetings, refers to this 'watchdog' function of the mailing list:

"The global governance mailing list hasn't really given much way to participate in what is happening, but rather the chance to watch those who seem to be able to go to the meetings." (R-5b, f).

Online versus offline

This also refers inexplicitly to the importance of face-to-face encounters to reach agreement or organise concrete actions. As one respondent noted:

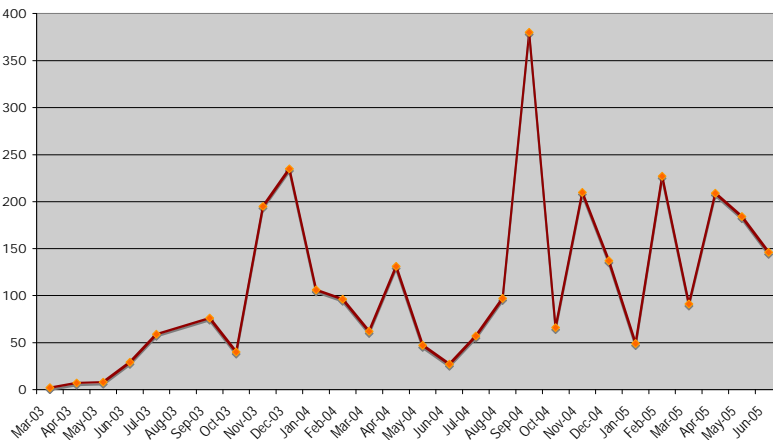
"Actual statements and agreements on particular courses of action tended to come from f2f meetings." (R-2b, m).

Another respondent referred to the importance of social interaction between activists during face-to-face encounters:

"As usual, the active people had beers together f2f many times, that is why the online collaboration goes so smoothly. It's not either-or." (R-4b, m).

Indeed many respondents stress the dynamic relationship between online and the offline interaction. This also shows in the quantitative data where the cyclical character of listserv-use can be observed. This confirms other analyses of mailing lists (HILL & HUGHES, 1998; WILHELM, 2000; CAMMAERTS, 2005).

Figure 2 : # Postings per month



As can be expected, the summer months were less active. Furthermore, the mailing list had to establish itself in the beginning and a surge in the number of mails can also be observed in the run-up to the Geneva Summit

(December 2003). It is fair to state that the mailing list became more active after the WSIS-phase 1, but ups and downs can also be observed in the post WSIS1 period.

Surges in communication via the mailing list can be attributed to the preparation for physical meetings. The big surge in messages in September 2004 relates to a deliberative voting procedure to nominate CS-representatives in the UN Working Group on Internet Governance (WGIG), as well as drafting and agreeing upon CS recommendations on structure and modalities of WGIG. In the period following there were several WGIG meetings, as well as the prepcom2 meeting (17-25/02/2005) for Tunis, which explains the many ups and downs.

In that sense the online list assured "the continuity of work in between f2f meetings" (R-4b, m), but this necessary dynamic between online and offline interaction also creates new barriers for those who are not able to attend the meetings or those who do not have the time and resources to be heavily involved. This can potentially lead to frustration, intra-movement tensions and the marginalisation of minority or more radical positions.

■ Conclusions

These results show that civil society is deeply divided over the WSIS-process; some fiercely critical, describing the WSIS participatory rhetoric as window-dressing, a 'fig-leaf' to legitimise a process that did not have the citizens in mind for whom it is intended; others hopeful, proud of what has already been achieved, with a realist and reformist attitude to social change. A variety of positions going from an empty glass to a full glass emerge. While most respondents acknowledge that on some issues advances have been made, there is no consensus on how to qualify these 'small steps'. A large group accepts this as part of the 'compromising' game and an equally large group aims for more advances, and feels betrayed by the participatory discourses of multi-stakeholderism. It is clear that participation is an essentially contested notion and that serious questions can and should be asked as to the degree and nature of civil society involvement. Many respondents instead focused on civil society networking and dynamics as the real and important outcome of its 'participation' in the WSIS.

The use of the internet in the WSIS-process is extensive and access to the internet, as well as the capabilities to use these tools, are increasingly

becoming crucial to participation in such complex policy-processes. This opens-up many opportunities, the most important of which include a potential for greater transparency, more access to documents, to network more efficiently and to debate issues amongst civil society. However, obstacles to participation also emerge at the same time. Players who do not have easy access to the internet and/or the skills or time to manage the vast amount of information may feel excluded or do not engage. In a policy context the use of the internet also creates a symbolic, as well as physical or real distance, which can easily be (ab)used by those who hold the power to give participants the illusion of participation. When it comes to the actual decision-making process, the internet may provide access to the process at a formal level, but does not facilitate participation as is often claimed in policy discourses.

This also points to an increasing perception amongst some grass-root activists and organisation that those representing civil society are part of a professionalised elite too. Equally true in this regard is the observation that active involvement in a complex policy process such as a World Summit requires time, resources and a level of expertise and lobby-power, which in-turn necessitates that other players, especially State-players, take you seriously. For a variety of sometimes conflicting reasons, some States within the UN, of which not surprisingly the current and emerging super-powers the U.S. and China are the most important, were not ready to do this (yet?). This leaves many civil society players frustrated with the process and makes that the glass definitely half-empty or even downright empty for them.

Assessing the case of internet governance brings us to shade this fairly negative perspective and argue for 'looking' at the WSIS through different 'glasses'. Within the WGIG the civil society caucus was treated and accepted as an equal partner, introducing a social and democratic discourse into the debate. This is also reflected in the final report of the WGIG. It remains to be seen, however, to what extent these social and democratic discourses will survive the inter-state negotiations that are expected to be difficult during WSIS2 in Tunis. In any case, for most respondents the WGIG-process was a best practice case regarding multi-stakeholderism. From their perspective the 'IG-glass' is half-full or even full, although many remain cautious as to the definite outcome.

Our analysis of the IG-caucus mailing list confirms the increasing importance of the internet in terms of intra-movement networking and access to policy processes, documents and drafts. However, it also reveals constraints, such as the dominance of participants from the Northern

hemisphere and of experts and CS-professionals. This is difficult to overcome, as a complex issue such as IG requires experts and a high degree of knowledge and skills to be taken seriously and to be able to play the wheeling and dealing political game that is typical of (global) policy processes. Moreover, analysis of the IG-caucus mailing list also allows us to deepen our understanding of the dynamics between online and offline processes. While the internet serves many functions relating to the diffusion of information beyond those that are directly involved, circulating draft-proposals and even choosing representatives and thus providing some degree of legitimisation, it is during face-to-face meetings and interactions that the real decisions are made. This, in combination with expertisation, raises issues of representation and exclusion, which need to be addressed, not only by international organisations such as the UN, but also within civil society itself.

Finally, this analysis also concurs with results published elsewhere (CAMMAERTS & CARPENTIER, 2005) that social change and power is a dynamic and dialectic process, where outcomes are always temporal and have to be seen in the context of an ongoing struggle between conflicting interests and goals. Furthermore, participation and participatory discourses have to be critically assessed and cannot be reduced to access and making policy processes more transparent. If during final negotiations civil society input does not result into some form of impact, the opposite of what was intended by involving CS will be achieved, namely more frustration and disengagement and the end-verdict will be a variation of the French proverb:

"Je participe, tu participes, elle/il participe, nous participons, vous participez, ils profitent".

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