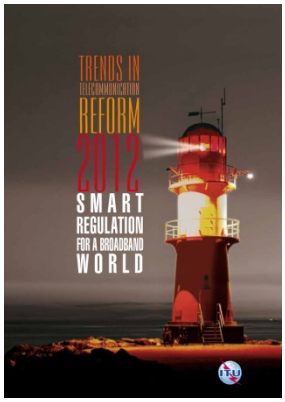
International Telecommunication Union

GSR 2011 Discussion Paper

Open Access Regulation in the Digital Economy



Work in progress, for discussion purposes

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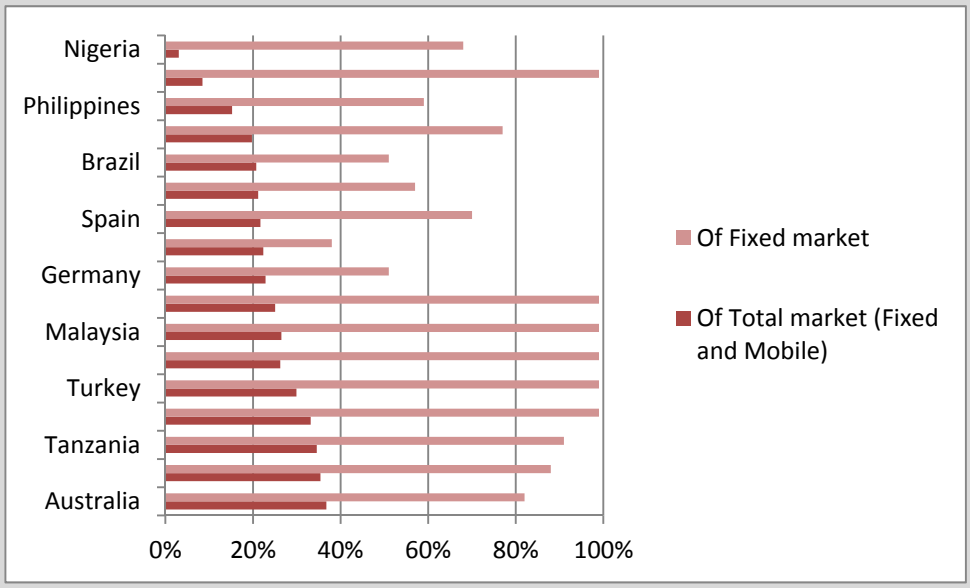
Introduction

The digital economy presents unprecedented challenges for ICT policy makers and regulators alike. Previous periods of major technological change occurred in an era of mostly government-owned monopolies – a regulatory model that lent itself to command and control investments. Indeed, in many countries, public ownership of the telecommunication networks was instigated precisely to enable the large-scale network investment needed to provide affordable, ubiquitous telecommunication services.

The market liberalization that has taken place over the last 20-30 years has been achieved by facilitating open access to the incumbent's network while encouraging the parallel growth of mobile networks. So successful has this strategy been that the former monopolists, now largely privatised, have seen market share eroded well below 50 per cent in many countries as well as traffic growth diverted to mobile and other platforms. The picture is similar in the developed and developing world (see Figure 1).

Now legacy networks are proving incapable of supporting the insatiable growth of bandwidth-hungry applications. New investment is needed, and on a grand scale, but the policy and regulatory emphasis on liberalization and competition has in many countries created a fragmented market lacking the scale economies and the regulatory certainty to underpin such large-scale investments. This is not to deny the evident benefits of competition, but some new regulatory thinking is now required for a successful transition to the digital economy.

Figure 1: Market share by revenue of fixed network incumbent by country



Source: ITU World Telecommunication/ICT indicators database, 2010 (www.itu.int/ITU-D/ict/publications/world/world.html)

A number of countries (e.g. Australia, Qatar, Malaysia and Singapore) have embarked on the creation of entirely new national broadband networks (NBNs), which deploy fibre optic technology throughout the core network and, crucially, in the access networks that reach out to the end customers. Investments in these networks are huge (e.g. Australia's NBN will cost AUD43billion (USD45bn)), and this has led to the re-nationalization of infrastructure so as to obtain economies of scale and preferential Government borrowing rates.

Other countries (e.g. in Europe) are trying to work within the existing regulatory frameworks to find means of improving investment incentives for network operators while maintaining competitive supply. Such a strategy involves lightening the myriad of regulatory requirements that has been imposed on dominant operators (that is, operators with Significant Market Power) as a support or reward for the development of ubiquitous broadband networks.

In developing countries (e.g. Tanzania and Mozambique) that lack the public funds to support a full NBN, but that equally lack existing privately-owned fixed network infrastructure that could form the basis of future digital communications, hybrid solutions are being pursued. These typically involve public investment, typically in the form of low-interest loans, in a fibre backbone network, coupled with various forms of support and encouragement for privately-funded access networks using a range of technologies such as WCDMA, HSPDA and WiMAX.

Whichever strategy is adopted, **Open Access** is the key to success. Open access means that all suppliers, whether in horizontal or vertical markets, are able to obtain access to the new network facilities on fair and equivalent terms. The precise definition of open access may vary depending on the regulatory model adopted, and the terms and conditions of access most certainly will vary. Nevertheless, open access is paramount if the new digital economy is not to rest on network infrastructure provision that has folded back into a purely monopolistic framework.

This paper assesses what open access means and how regulators can apply the concept in different situations. The paper also highlights a number of case studies that illustrate the practicalities involved with open access. The paper is structured as follows:

- Section 1 examines the need for open access, in particular considering the different requirements for access at different levels of the OSI reference model. It identifies the inherent tension between open access and competitive supply of networks and services, and then uses this analysis to draw conclusions on the appropriate scope of open access in the digital economy.
- Section 2 focuses on open access to network infrastructure, including passive and active elements, and discusses why open access is vital if downstream competition in digital applications and services are to be achieved. It examines open access as an *ex ante* regulatory response to the ability of an operator to exercise Significant Market Power in wholesale broadband markets and considers how the transition to digital technologies may impact the approach taken to open access.
- Section 3 focuses on open access to transport. It questions the need for traffic management and outlines the emerging policies on network neutrality.
- Section 4 considers the role of open access at the digital applications and services level, and argues that policies designed to facilitate demand through education, industry co-operation and e-Government initiatives are preferable to open access obligations at this layer.
- Section 5 concludes the paper by identifying best practice arrangements, especially for developing countries.

1.1 The need for open access regulation

1.1.1 Open access applies to physical networks

Open access is a slippery term. Several definitions exist, each implying a different extent of openness. In a paper prepared for the Global Symposium for Regulators (GSR) in 2008[1], the definition for open access was taken from *info*Dev:

> *Open Access means the creation of competition in all layers of the network allowing a wide variety of physical networks and applications to interact in an open architecture. Simply put, anyone can connect to anyone in a technology-neutral framework that encourages innovative, low-cost delivery to users. It encourages market entry from smaller, local companies and seeks to prevent any single entity from becoming dominant.*[2]

This definition, which dates back to2005, emphasises open access to **all** layers of the network, and suggests that vibrant competition can result from the application of open access principles. This utopian vision of access to all layers of the network, including applications and services, has yet to become reality. The emphasis of policy-makers and regulators alike has been focused on open access to physical networks:

- The Best Practice Guidelines on innovative infrastructure sharing strategies that were adopted by the 2008 GSR[3] were seen as "a tool to promote infrastructure deployment, in particular IP backbones and broadband access networks".
- The Best Practice Guidelines for Enabling Open Access that were adopted by the 2010 GSR[4] defined open access as "… the possibility for third parties to use an existing network infrastructure". The guidelines recognised two forms of open access, regulated and commercial, but again did not suggest that open access applied beyond the infrastructure level.
- Regulated open access, with a few exceptions as detailed in Section 4 of this paper, has focused on access to infrastructure, often to purely passive infrastructure (ducts, poles, towers, etc.). A typical example is that of the infrastructure sharing regulations adopted in Mozambique in 2010 (see Box 1).

Box 1: Infrastructure sharing regulations in Mozambique

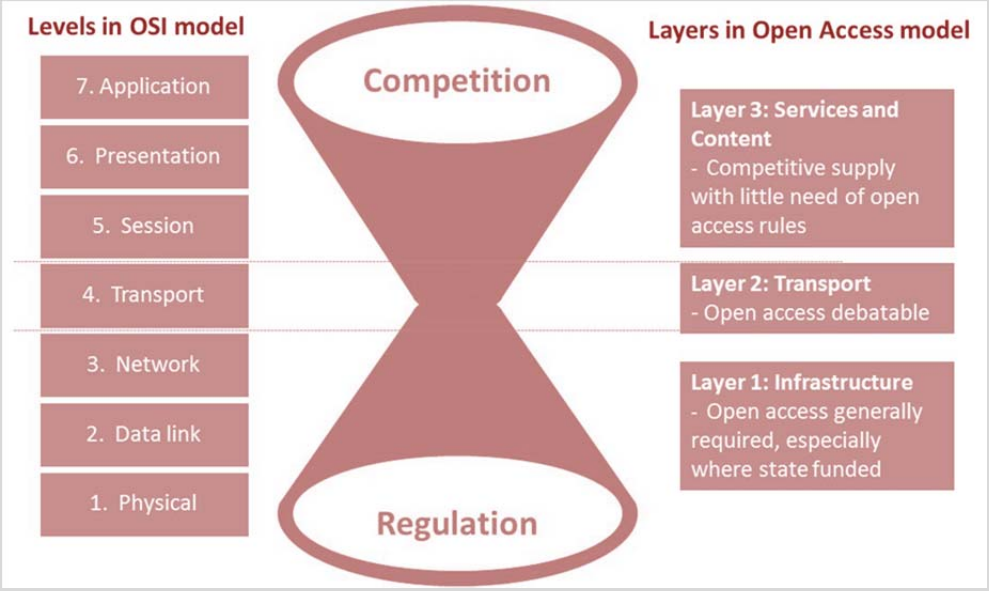
The regulatory authority in Mozambique, INCM, published new infrastructure sharing regulations in December 2010 following a period of public consultation. The rules apply to all network operators and require them to provide access to passive infrastructure elements. The basic requirement is to publish a Reference Sharing Offer and then negotiate individual Sharing Agreements with Requesting Licensees. There are also stipulations concerning capacity and quality of service with the aim of ensuring equal treatment for all operators. Pricing should be fair and reasonable and based on defined costing principles.

The approach adopted by INCM gives network operators the opportunity to negotiate commercially satisfactory sharing agreements subject to regulatory guidelines. The existing operators are required to take into account the needs of new entrants, e.g. by maintaining an inventory of assets and building capacity partly based on commitments from other parties who seek access to their infrastructure.

The final regulation has yet to be published on the INCM website.

Source: INCM (www.inmc.gov.mz). Note: The final regulation has yet to be published on the INCM website

Figure 2: Open access and the OSI model



Source: Author

Given the current emphasis of policy-makers on the digital economy, which spans broadband networks, digital services and applications of many different kinds, two specific questions arise:

- To what extent are open access proposals of the kind foreseen by GSR08 and GSR10 being implemented in practice?
- To what extent should open access rules be applied above the infrastructure level to include access to services and digital content?

From an examination of recent theory and practice, this paper concludes that open access is critical in the case of publicly funded national broadband networks and generally required wherever there are actual or potential economic bottlenecks preventing competitive supply. However, open access is progressively less important moving up the layers (see Figure 2), provided that open access is available at the lower layers and there is sufficient incentive in the regulation of open access to encourage investment in infrastructure. Regulatory and policy objectives for Services and Applications in the digital economy should focus mostly on demand-leadership, the protection of public interests, and curbing abuse of market dominance.

1.1.2 Open access is critical for national broadband networks

The Best Practice Guidelines for Enabling Open Access adopted by the 2010 GSR re-asserted the vision and stressed the pre-requisite principles of transparency, effectiveness and non-discrimination. They also recognised that national broadband networks may present a different regulatory challenge. The Guidelines stated that:

> *…in order to encourage broadband deployment, preserve and promote the open and the interconnected nature of the public internet, regulators may consider mandating dominant providers of national broadband networks, including cable landing stations, to provide open access on a fair and non-discriminatory basis to their network and essential facilities for competitors at different levels of the networks.*

Regulators thus recognised in these guidelines that open access is not a means to establish competition throughout the value chain, but that in some circumstances, national broadband networks being the case in the point, it is necessary to accept the existence of a dominant provider and regulate accordingly. The objective remains the same – ensuring that all users enjoy the full benefits of living in a digital era – but competition is not always the best means of achieving it. Indeed, it is precisely where competition is most limited that open access is most critical, so that competition can flourish in the other layers of network and service provision.

Recent work on open access in the European Union[5] has also focused on the need to ensure fair and transparent access to broadband network infrastructure. The European Regulators Group (BEREC)[6] has made the following observation:

> *The term "open access" has arisen in recent discussions at national and at European level on facilitating broadband roll-out, particularly in relation to the roll-out of next-generation access (NGA) networks, in order to provide European consumers with the range of innovative services that NG technology can offer. "Open access" is generally referenced in the context of competitive drivers of NGA roll-out; however, it is also often discussed in relation to the provision of additional current-generation broadband services in under-served areas.*

These different sources illustrate that there is an emerging regulatory consensus on the requirement for open access to national broadband infrastructure. Even in the most developed markets, the scale and scope of investment required for broadband networks tend to limit the market to one dominant provider. Except in the most densely populated geographic markets, the fibre access pipes represent an essential facility or bottleneck for which duplication is neither commercially nor economically viable. Together these characteristics strongly support a thesis of a natural monopoly, and this thesis is immeasurably stronger in rural areas and developing countries[7]. Consequently, regulatory action for broadband networks should be tilted towards ensuring access on fair, reasonable and non-discriminatory terms, rather than towards encouraging infrastructure competition.

1.1.3 Open access needs to retain investment incentives

Open access is especially critical where broadband and NGA roll-out is supported, at least in part, by public

funding. In such circumstances, mandated open access can play a pivotal role in promoting network investment, in preventing uneconomic duplication of resources, and in strengthening competition. European State Aid rules[8] (see Box 2) make this particularly clear, so that the provision of public funding to broadband infrastructure projects is dependent on a commitment to open access. Although the term is never defined in European law or regulations, the State Aid Guidelines specify that open access means effective, transparent and non-discriminatory wholesale access to the subsidised network.

Where public funds are involved, open access matters because it provides the means to achieve public and not purely private benefits. Open access advances public interests by enabling maximum service competition per unit of infrastructure investment. Substantial regulatory effort is now being made to mandate open access to passive infrastructure (towers, masts, ducts, etc.) as shown in Figure 3. Infrastructure sharing can create the foundations for competitive supply of services and applications in vertically-related markets. Such competition is achieved through an equivalence of inputs, whereby any rival service provider is able to obtain access to broadband infrastructure on terms and conditions that are materially no different from those enjoyed by any of its rivals, including (if it exists) the downstream arm of the network operator itself.

However, it is equally important that open access is established in a manner that retains incentives for infrastructure investment. Care must be taken, for example, when open access is mandated as a condition of receiving state subsidies for infrastructure investment. The EU Recommendations are particularly concerned with this matter, as strict EU State Aid rules prohibit subsidy of any infrastructure that could (absent the subsidy) be provided under competitive supply conditions. In other words, State Aid must not distort the markets. This means that subsidy should be provided up to, but not beyond, the point at which the broadband investment becomes commercially viable. The means of identifying this tipping point will typically be through an auction, the successful bidder being the company that requires the lowest subsidy to public benefit ratio.

Box 2: European State Aid Rules for Next Generation Access networks

In 2009, the European Commission adopted guidelines to ensure coherent and consistent practice concerning government support of national broadband networks. The Rules describe how public funds can be channelled into broadband investments in areas where private funding is hard to obtain. Distinction is made between competitive areas ("black areas"), where no public funding is required, and unprofitable "grey areas" (where only one broadband operator may exist) or underserved "white areas" (where there is no broadband infrastructure), in which State Aid may be justified under certain conditions.

In order to prove the need for State Aid in the case of next generation access networks whose deployment is still at an early stage, governments and regulators need to take into account both existing infrastructures and concrete investment plans by telecom operators. The conditions for receiving State Aid include detailed mapping of private infrastructure, open tender processes, open access obligations, technological neutrality and claw-back mechanisms. These safeguards are specified in order to promote competition and avoid crowding out private investment, while at the same time fostering a wide and rapid roll-out of broadband networks.

Figure 3: Regulatory efforts towards infrastructure sharing

Question	Answer	Africa	Arab states	Asia & Pacific	CIS	Europe	The Americas	Total
Is infrastructure sharing mandated?	Yes	18	12	8	1	24	17	80
	No	13	2	14	5	11	13	58
Is co-location/ site sharing mandated?	Yes	14	12	9	2	26	20	83
	No	14	2	11	2	5	9	43
Region size		43	21	38	12	43	35	192

Source: ITU World Telecommunications Regulatory Database (www.itu.int/icteye)

Regulators need to be wary of imposing terms for open access that are overly onerous, such as low access prices that squeeze the potential return on investment. Such onerous terms are a disincentive for potential investors in infrastructure. Moreover, to the extent that these terms reduce the return on investment, they increase the costs of the network infrastructure for private investors; this, in turn, ultimately increases the amount of public funds that are necessary to subsidize the national broadband network. In this regard, onerous terms also reduce expected payback on the public investment. Given the proven economic benefits of broadband penetration (see the World Bank research[9] in Figure 4 and the ITU GSR 10 discussion paper on the impact of broadband on the economy[10]), the policy prerogative should be to maximize investment in order to gain the economic multiplier effects. In such circumstances it is likely to be counter-productive for the regulator to drive too hard a bargain on the terms of open access.

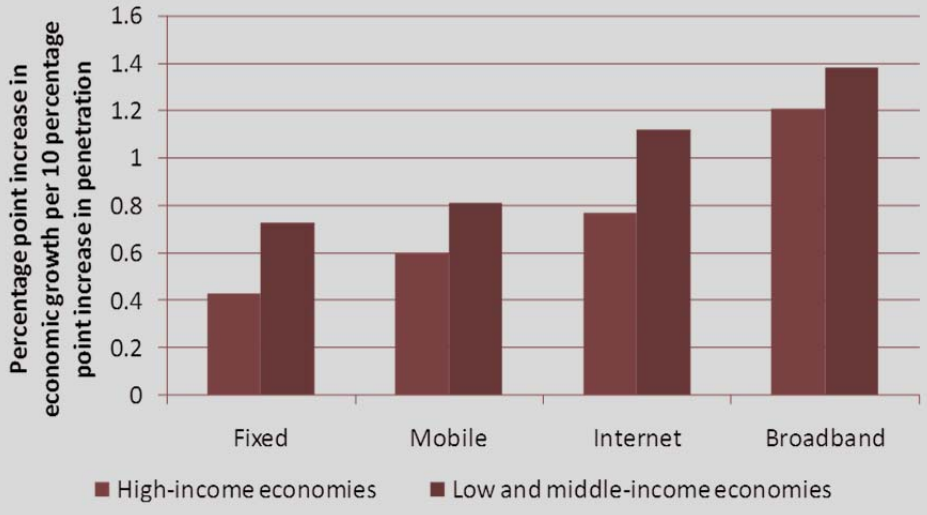
1.1.4 Open access is not always the right regulatory tool

If the goal of open access regulation is maximizing competition at all layers of the network, then regulatory authorities need to realize that open access itself may not always be the right solution. As described above, where network investment requirements are beyond the capabilities of the private capital, the desire for open access has to be tempered by the need to support investors (including the State). At the other end of the spectrum, where a fully and effectively competitive market develops, there is no need for regulatory intervention to enforce open access rules. The only regulatory intervention that is required in such circumstances may occur ex-post using competition law principles, e.g. to prevent anti-competitive mergers or acquisitions or to prevent collusion.

In between these two extremes, the need for regulatory intervention requires careful analysis and judgement. This is particularly true in a complex value chain, as in the case of broadband service delivery, because competition might be facilitated at higher levels by a single provider being subjected to open access arrangements at lower levels. Regulators ought therefore to start their analysis at the lowest network layer, implement open access remedies as required, and then work up the layers, taking into account the likely impact of the remedies introduced in the lower layers.

This paper approaches open access on a network layer by layer basis. It does not anticipate open access at all levels. Each layer is analysed separately, with the merits of open access assessed in light of available regulated solutions at lower layers.

Figure 4: Growth effects of ICT infrastructure



Source: Information and Communications for Development, World Bank, 2009

1.2 Open access to network infrastructure

Open access to infrastructure concerns levels 1-3 of the OSI model (physical, data link and network) and layer 1 of the open access model presented in Figure 2. This is the area in which open access is best developed and also most critical. Markets naturally comprise a value-chain, in which infrastructure facilities are provided on a wholesale basis to service providers that market them at a retail level. The process of assessing market power, described in Section 2.2 below, is based on the premise that the greatest threat of market failure is at the wholesale level and, if adequate regulatory measures are implemented at this level, then effective competition can materialize at the retail level. In other words, effective solutions at the wholesale layer can obviate the need for open access regulation at higher layers. As the European Commission puts it:

> *Regulatory controls on retail services should only be imposed … where relevant wholesale measures … would fail to achieve the objective of effective competition. By intervening at the wholesale level, including with remedies that may affect retail market, Member States can ensure that as much of the value chain is open to competition processes as possible, thereby delivering the best outcome for end-users.*[11]

1.2.1 Policy and regulatory tools

Many of the policy and regulatory tools required to achieve open access already exist and are well deployed in both developed and developing countries. A range of principles and practices exist to curb anti-competitive behaviour, typified by the EU regulatory framework[12] that has been copied and modified in many other countries. These principles and practices include:

- Transparency, including the provision of a Reference Offer;
- Non-discrimination, requiring the use of equivalent conditions in equivalent circumstances;
- Obligations to provide access, specifically applied to unbundled facilities including the local loop, and the requirement to offer co-location;
- Price controls, which may include limits to cost recovery based on specific costing methodologies such as long run incremental costs (LRIC); and
- Cost accounting obligations, including the requirement for external audits and the submission of separated accounts on an annual basis.

These regulatory obligations can be very successful in achieving open access and facilitating service competition. This is especially important in developing countries where the need for open access may be exacerbated by low demand (creating economy of scale barriers to competition) and limited supply options (creating economic bottlenecks). Infrastructure sharing regulations in Mozambique (see Box 1) provide one example of effective regulation, based on these regulatory requirements.

Regulators seeking to apply such requirements face two specific challenges:

- Typically, regulators may only impose the aforementioned obligations where there has been a determination of market dominance. Moreover, the requirements imposed on dominant operators must be proportionate to the degree of market failure that has been identified. In other words, the regulator must impose the least onerous requirement that is capable of ensuring open access.
- Many existing regulatory tools were developed during the narrow-band era and may therefore require recalibration for use in a convergent broadband environment. It is important to ensure that the open access requirements do not act as a barrier to introducing new technologies, nor act to deter future network investment.

1.2.2 Open access and market dominance

Significant Market Power (SMP) describes the power that enables a service provider to make decisions and to act independently of its competitors and customers. Typically this means the ability to raise prices or to reduce output without being concerned that a material number of customers will exercise the choice to obtain services elsewhere or that competitors will gain a material advantage in revenue and market share by winning over disaffected customers.

In such markets, there is a justification for regulators to take *ex ante* action to address or to limit the potentially harmful effects of the exercise of SMP on consumers. Waiting until after anti-competitive behaviour has become apparent may result in lasting damage to competition. In some cases, there is thus an imperative to adopt *ex ante* measures rather than to

rely on *ex post* remedies. In some markets, *ex ante* intervention may take the form of regulated open access.

Before the regulator implements open access, three steps need to be taken:

1. The relevant market must be defined. Best practices in market definition are set out in the European Commission's *Market Analysis and SMP Guidelines*[13]. The market must be defined in product and geographical terms. The hypothetical monopolist test is a common and widely accepted approach to assessing the relevant product and geographical market. This test identifies the scope of a market by including only those products and services that may be an effective substitute either for suppliers or for consumers in the event that a hypothetical monopolist raises its prices by a small but significant and non-transitory amount.
2. SMP status must be established. Since SMP is concerned with the ability of a service provider to raise prices or restrict output without incurring a significant loss of sales or revenues, the assessment of dominance centres on a forward-looking market analysis based on existing market conditions.[14] Market share, frequently measured by revenues, is often a proxy for market power, although this factor may not be determinative. Generally, undertakings that enjoy a large market share (normally, at least 40 per cent) will be presumed to enjoy market dominance so long as this market share has remained stable over time.[15] This presumption can be rebutted, however. Other relevant factors in the assessment of SMP include barriers to market entry, market concentration, market share evolution, tariff evolution, access to funding, technological advantages, vertical integration, product/services diversification, economies of scale, economies of scope, and countervailing buyer power.[16]
3. Open access must be a proportionate response to the identified market failure. Regulatory obligations imposed on operators and services providers in response to SMP must match the risk of harm and must be the least burdensome obligation possible that will achieve the end of protecting competition in the market. Proportionality implies that it may be appropriate to impose different regulatory obligations on different operators that enjoy SMP since each of the operator's circumstances may require varying levels of regulatory intervention. It is also important to consider what, if any, action to take in downstream retail markets where there is SMP, having regard to the actual or likely effectiveness of the regulatory obligations applied or proposed for related upstream wholesale markets

1.2.3 Adapting policy and regulatory tools for the digital era

The major difficulty facing alternative suppliers of retail broadband services is the "last mile" -- access to the customer. The standard regulatory solutions are the provision of unbundled local loops (ULL) and bitstream access, coupled with backhaul facilities from the local exchange to the alternative operator's point of presence. When supported by firm regulatory enforcement, each of these regulatory tools can encourage broadband take-up.

Regulatory economists talk of a "ladder of investment" in which access seekers may ascend one rung at a time. At first, they take bitstream access plus backhaul; then they build their own backbone infrastructure so that they no longer require the backhaul service; next, they deploy their own cables to the local exchange where, using co-location, they provide their own electronics and purchase just the unbundled local loop. They may even become wholesale providers in turn, thereby improving their network utilisation levels and overall return. Each of these steps up the ladder is relatively small so investment risk is minimized, but each rung also offers an improved return on investment and increased control over the end-user service offering.

The ladder of investment sounds good in theory, but in reality, the industry has developed around ADSL technology that may capitalize the regulatory arrangements and become a barrier to upgrading to fibre-solutions. This is especially true of ULL, where the point of co-location is often located within the boundaries of the copper network. The implication is that either the dominant operator is restricted in its ability to upgrade to next generation access technology or the alternative operator is left with stranded investment, coupled with the need for further infrastructure roll-out in order to retain its existing customer base. Some regulators (e.g. in Hong Kong, China) are withdrawing from ULL for precisely this reason (see Box 3).

Box 3: Withdrawal of unbundled access regulations in Hong Kong, China

Unbundled access obligations (known locally as Type II interconnection) were introduced in Hong Kong in 1995 with the objective of increasing investment and fostering competition. A review in 2003 indicated that these obligations had resulted in significant infrastructure roll-out, but warned that there was a significant risk that continuing to mandate unbundled access may discourage additional fibre-based competitive access networks, even where these are technically feasible and economically viable.

Accordingly, the regulator OFTA started a process of phasing out ULL obligations over a four year period (completed in June 2008). Withdrawal of facilities at particular locations was subject to a two-year "grandfathering" period during which the regulated interconnection terms and conditions remained in force. Thereafter interconnection was subject to normal commercial negotiation.

Source: OFTA (www.ofta.gov.hk)

The high-density, high-value market conditions experienced in Hong Kong, China are not likely to be replicated in developing countries. Nevertheless, this example illustrates the need for regulatory caution, so that mandated open access does not restrict or inhibit movement towards full broadband connectivity and competition. In general, open access obligations should be subject to change following regulatory review after a specified time period.

The second form of adaptation to existing regulatory tools is far more relevant to developing markets. Existing tools are geared to carving up the spoils of past investment – once an investment is sunk, it is a hostage to regulation. Existing tools are not designed to deliver both new investment in infrastructure and investment incentives at the same time as open access to this same infrastructure. Competition drives both investment and open access but there is a tension between the two. In developing countries, the greater need is usually to encourage investment, e.g. in fibre backbone networks and international cable landing points. It is critically important that the terms, particularly the financial terms, of open access do not unduly dis-incentivize the necessary network investment.

Regulated access prices rarely require access seekers to bear a suitable share of the first mover risk that infrastructure providers take. Based on well-established regulatory principles, such as those of the World Trade Organisation, the access seeker is entitled to unbundled access to infrastructure so that it only has to purchase the network elements it requires. The price for these unbundled network elements invariably do not compensate the infrastructure provider for the risk associated with building a stand-alone transmission or other system in an uncertain demand environment. Standard regulatory approaches to determining risk (e.g. the computation of a weighted average cost of capital) are not up to this task.

Governments cannot mandate private investment; they can only encourage it. But open access can be a discouragement. It is therefore no surprise that governments arrange their own investments in infrastructure (e.g. in New Zealand and Australia) or provide soft loans to a generally compliant private sector (e.g. in Korea and Japan). Developing countries cannot afford this approach, so they need to establish greater investment incentives and rewards through the pricing arrangements associated with open access.

Section 2.5 below presents a profile of the government-funded approach to investment in infrastructure involving structural separation of the incumbent, drawing on Singapore's experience. Section 2.6 illustrates the approach being taken to access to international submarine cables in a number of developing countries.

1.2.4 Regulatory measures for future technologies

By definition, future technologies are uncertain. Will end-to-end fibre technology be essential for next-generation broadband service, or will wireless technologies have a role to play? Is wireless the only economically viable option for sparsely populated and low-GDP areas? Whatever the answers, it certainly is not the role of regulation to pick winners (a process with a chequered history and one that is increasingly futile in a fast-changing sector), nor to keep competitors afloat. The proper role of regulation is to keep as many development paths open as possible, and, in particular, to ensure that regulation itself does not create unnecessary roadblocks.

There are many questions, but no easy answers. How does the regulator intervene to achieve the fibre-based future? Is ULL an important step in developing a customer base for high speed internet access or should consideration be given to leap-frogging that step if it has not yet been implemented? What are the appropriate and yet-to-be-exercised regulatory tools to move to the next step in the investment ladder and to achieve open access to fibre-based networks? Are sunset clauses useful or do they kill off investment that has yet to be committed? The answers to such questions need to be contextualized: they depend on the extent to which copper-based networks are already deployed and the number of competitive service providers whose business models rely on access to those networks, in particular access through ULL.

In some ways, the answers are more straightforward in developing countries. A new monopoly contract may be needed in such economies (and in low demand/high cost areas of developed economies). Economic reality dictates that near-monopoly supply is going to develop, whatever licensing regime is put in place. Regulators would therefore be wise to accept the monopoly in exchange for providing open access to passive infrastructure, with a new deal on regulated access pricing to reflect actual costs reasonably incurred. Box 4 illustrates one such arrangement in Tanzania. There should be a time-limit on the charter and designated review points along the way, allowing opportunity for the regulator to change the terms of open access if necessary.

Shifting the regulatory paradigm to respond to technological advancements in the digital era has two specific corollaries:

- Regulators need to establish a centralized information system, with a database accessible online, with information regarding passive infrastructure that can be shared (including paths and space available) with the respective prices oriented to costs. This was recognized in the GSR 2008 and 2010 best practice guidelines[17], and has been transposed into national regulations in some countries (e.g. Mozambique). However, it can only work in practice with industry support, which in turn requires a working group to design and to implement the system to meet the needs of all service providers. Appropriate information may not be easy to obtain for historical plant, but there should be a requirement for all newly-created broadband facilities to be entered on this information system, with penalties in the case of non-compliance.

Box 4: Managing the National ICT Broadband Backbone in Tanzania

Based on loans from the Chinese Government, Tanzania embarked on a USD200m National ICT backbone (NICTBB) facility project in 2009. The NICTBB involves rolling out 7000km of a national fibre backbone, in three rings (North, South and West), as well as a metropolitan ring in Dar es Salaam. It provides a fibre optic transmission network that is being operated and managed to provide high speed broadband capability to all parts of the country, enabling businesses, schools, government agencies and households to access modern high-speed telecommunications at affordable prices. The national backbone also connects with the international submarine cables (SEACOM and EASSy) in Dar es Salaam and provides land connectivity to Tanzania's neighbours.

The NICTBB is managed by the national fixed network incumbent, TTCL, but on an open access basis. All service providers have the right to use this capacity and all (including TTCL) are supplied on the same basis. TTCL retains a management fee, which is determined on the basis of a utility-level cost of capital and a government-determined cost recovery period. Transparency of operation in relation to the NICTBB facility includes a number of requirements, namely:

(a) Accounting Separation – the accounting for Backbone operation revenues, expenses and capital costs separately from the accounts for TTCL's other business operations;

(b) Independent audit of Backbone operation accounts;

(c) Publication of Backbone operation accounts in a suitable format and publication of the auditor's certificate;

(d) Equivalence of access and terms and conditions of usage for all Backbone wholesale customers, including TTCL;

(e) Preparation of a Backbone Reference Offer from TTCL setting out the terms and conditions for access and use of the Backbone facility and services applicable to all wholesale customers; and

(f) Publication of the arrangements and processes adopted to ensure the commercial confidentiality of Backbone customer information and transactions.

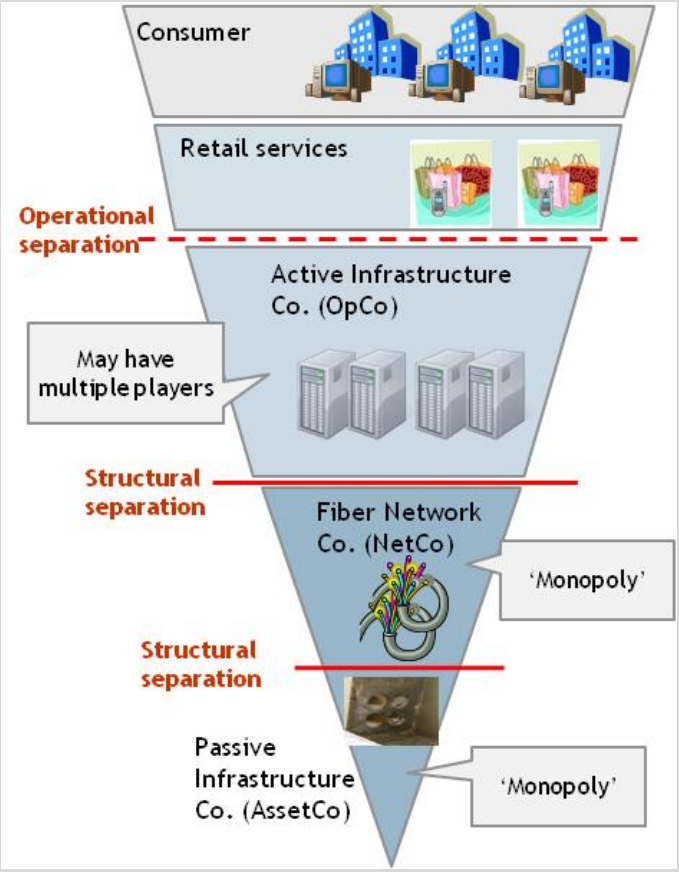
Source: TCRA (www.tcra.go.tz)

- Regulators need to re-think the whole approach to assessing costs. Long run incremental cost (LRIC) has been the regulatory standard of recent years for establishing access and interconnection prices, and this pricing standard continues to be appropriate for existing networks, including broadband facilities. However, where substantial new investment in entirely new infrastructure is concerned, costs are not incremental in any meaningful sense, and the application of LRIC is liable to understate actual costs and deter investment. The problem is that LRIC assumes network build at the efficient level for actual demand, but in practice national broadband networks have to be funded on the basis of highly uncertain forecasts. Consequently, price controls, at least in the early years, may be better set on a fully allocated costing basis. Such a costing approach can still be forward-looking (i.e. based on forecasts of costs and demand) so long as there are annual reviews allowing over- or under-recovery of costs to be clawed back. This way, the balance of incentives will tend to reward investment risk and efficiency improvements.

1.2.5 Case study: the national broadband network in Singapore

Singapore provides an example of extensive government activity and funding aimed at developing next generation access networks, with the ultimate goal of providing high speed broadband for all. A significant degree of separation among industry participants was required in order to ensure effective open access to the infrastructure by downstream operators. After extensive consultation, this separation has taken the form shown in Figure 5.

Figure 5: Structural separation in Singapore



Source: IDA (Infocomm Development Authority of Singapore)

This supply structure has been designed to provide telecom operators with open access to essential facilities and is based on the following principles:

- Operational separation between Retail Service Providers and OpCo (wholesaler).
- Structural separation between OpCo and NetCo (fibre network).
- Structural separation between underlying infrastructure ownership (AssetCo) and management of the fibre network (NetCo).

At the core of the structure, NetCo is responsible for the design, build and management of passive infrastructure like ducting, manholes, poles etc. In order to make available the promised speed of 100 Mbps-1 Gbps, NetCo has to roll-out a new fibre optic network to all Singapore households, leveraging on the existing passive infrastructure (e.g. ducts, manholes and exchanges) owned by AssetCo. Starting from a 22 per cent broadband coverage ratio, this implied roll-out of new infrastructure to around 800,000 Singaporean households in less than 10 years, and full broadband coverage has now been achieved. NetCo is owned by a consortium of SingTel (30 per cent), AXIA (30 per cent), SPH (25 per cent), and SPT (15 per cent).

OpCo is responsible for the management of active infrastructure facilities like GPON, active Ethernet network elements and OSS/BSS platforms. OpCo provides wholesale network services to retail service providers, which in turn provide service to retail customers. Broadband penetration is aimed to increase from 15 per cent in 2005 to 50 per cent (between 100Mbps and 1Gbps) by 2015, with subscriber numbers increasing from 600,000 in 2005 to over 2 million by 2015. This number of broadband subscribers was, in fact, reached at the end of 2010, although many are operating at speeds lower than 100Mbps. OpCo is wholly owned by StarHub, but OpCo is operationally separated from StarHub's other activities.

In order to achieve the goal of providing broadband access to all Singaporeans using the above model, government funding was made available covering 28 per cent of the investment (USD178m over planned investment of USD664m) needed for OpCo and 36 per cent of the investment (USD513m over planned investment of USD1.42B) needed for NetCo. The remaining funding of over USD1.4 billion is to come from the private sector. The tender process for both NetCo and OpCo included a minimal funding requirement as part of the selection criteria.[18]

Singapore has opted for a relatively radical form of separation (i.e. structural or ownership separation) in order to ensure non-discriminatory access to essential passive infrastructure facilities. The Singaporean government and regulator appear to have come to the conclusion that the provision of passive infrastructure needed for the rollout of high speed broadband access is not prospectively competitive and acts as a bottleneck in the market. By separating ownership of these facilities from all market players (including SingTel), this approach removes the downsides of vertical integration from the market structure, though it is not clear at what operational cost to SingTel this was achieved.

Singapore, of course, is a small and affluent island-state and, as such, cannot provide a template for countries where the provision of services to rural areas is a key policy target. Nevertheless, the approach to structural separation has recently been adopted in New Zealand, and there is no reason why it should not work elsewhere. The case of Singapore provides some interesting points for further discussion:

- Even in an affluent city-state with favourable operational circumstances (e.g., a high proportion of multi-dwelling blocks), significant government funding was needed. This suggests that in most countries, government funding may be needed to achieve a vision of this magnitude.
- Structural separation (in this case, requiring SingTel selling its passive infrastructure) may come at a significant operational cost.
- The valuation of the passive infrastructure becomes a hot topic, particularly because a low valuation results in lower funding requirements. This is a key risk to any owner of existing passive infrastructure.
- There is a risk that the market is satisfied with current speed and/or is not willing to pay a significant premium for a faster service. This is a significant market risk to both government and private investors.
- AssetCo in particular becomes an entrenched long-term monopoly in this structure, with associated risks for efficiency, customer orientation, and innovation.

1.2.6 Case study: open access to Africa Coast to Europe (ACE) submarine cable

ACE is a submarine cable system for West Africa, with landing stations in 20 countries stretching from

France to South Africa. In each of these countries, a Terminal Party is established to operate the cable landing facility and to own and maintain the cable segments within the country, which comprise a terrestrial segment and an undersea segment from the cable landing station to the limits of national waters. The Terminal Party is composed of one or more Landing Parties, each of which makes a designated minimum investment in the ACE landing point for that country. This investment is in the range $25-50m, depending on the aggregate number of investors. In most of the African countries, a Special Purpose Vehicle (SPV) has been established to act as the Terminal Party, and investment in the SPV may come from a number of sources, including operators, governments, and international development agencies. For example, the SPV in São Tomé is called SPTC, a limited company jointly owned by the government of São Tomé and the incumbent operator, CST. The government contributes funds into SPTC for the ACE project which originate from the International Bank for Reconstruction and Development.

The SPV in each African country has a strong position, and sometimes an effective monopoly, in the market for access to international capacity. In some countries, there is no other international access via undersea cable, and satellite access is both expensive and severely limited in capacity. This means that the SPV has the potential to act independently of rivals and contrary to consumer interests: in other words it has Significant Market Power. National regulatory authorities therefore need to act to regulate these organizations.[19] Such a process has recently started in Liberia, where the regulator, the Liberian Telecommunications Authority, has commissioned a project to:

- Identify the market to which the international capacity provide by ACE belongs;
- Determine whether the Cable Consortium of Liberia (CCL – the Terminal Party for ACE) has a position of SMP in this market; and
- Introduce regulations to ensure open access to the facilities of CCL, and hence to the ACE cable, in a manner that adequately rewards the investors in CCL and at the same time ensures effective competition in international services to and from Liberia.

This market analysis process follows the EU regulatory framework and is a good example of how regulators in developing countries can adopt best practice regulation from elsewhere and adapt it to fit their circumstances.

One of the challenges faced by the Liberian Telecommunications Authority (LTA) and other regulators in similar positions is to gauge future demand for this new facility. It is relatively easy to identify capital expenditure, depreciate it over the 20-year lifetime of the cable, and add the return on capital deployed based on a regulated weighted average cost of capital (WACC) and annual operating expenditure, which can be estimated as a percentage of the capital investment. However, setting prices requires that this total cost be divided by some measure of demand, typically measured as units of committed bandwidth in E1 or STM1. The difficulty is that demand is highly uncertain and also likely to grow rapidly. If short-term demand forecasts are used to set prices, those prices will be too high and may stunt the realization of demand. If average demand over the longer term is considered, then initial prices will be below cost and the SPV risks under-recovery of investment in the event that the demand forecasts prove optimistic. Appropriate arrangements are therefore likely to involve a price cap with an annual review that allows for any under- or over-recovery to be to carried forward and influence the following year's prices.

1.3 Open access to the transport

Open access to transport concerns level 4 of the OSI model and layer 2 of the open access model presented in Figure 2.

1.3.1 Is regulation needed?

As discussed above, the greatest threat of market failure is at the wholesale infrastructure level. So long as competition is protected in wholesale markets, effective competition may emerge at the transport level without the need for much or any *ex ante* regulatory intervention. The question of regulation at the transport level is principally one of traffic management.

1.3.2 Traffic management

The issue of traffic management arises because demand for broadband capacity may, at least at peak periods and at certain bottlenecks in the network, exceed supply. This situation arises even in the most developed markets, as new bandwidth-hungry applications proliferate and operators cannot roll-out broadband infrastructure fast enough to keep up with this demand. Traffic management is a particular concern for mobile broadband given the constraints of

spectrum availability. The long-term solution may be to build more capacity, but in the short-term, it is necessary to ration bandwidth supply. This can essentially be done in three ways:

- On a first-come-first-served-basis. This would limit the number of users who could gain access at peak periods, but those who do gain access would notice no deterioration in their service level.
- By sharing available capacity equally between all active users at any given time. This gives all users equal access to the capacity, but all of them will suffer reduced service quality during periods of high contention rates.
- By giving preferential status to some traffic streams over others. This allows for some users to pay for higher and guaranteed quality of service, while others would suffer a greater loss of service quality during peak periods.

There are no fundamentally right or wrong answers in this debate. However, some answers have been deemed to be unacceptable if accompanied by evidence of market power and distortion (see Figure 6). In the US in particular, there is a strong and vocal body of opinion that claims "net neutrality" (i.e., the right of all users to equal service quality) as a sacred principle of the Internet. Others take a more relaxed approach, pointing out that it is commonplace for higher quality of service to attract a higher price, and the Internet should be no different.

Figure 6 lists the main aspects of net neutrality and summarizes the range of possible approaches as represented by regulators in the UK, France and the US. It shows that net neutrality rules affect both consumers (in terms of accessibility rights and transparency of traffic management policies) and players in the Internet value chain. In the latter case, the key questions are where, if at all, *ex ante* regulation is required and where the threat of *ex post* competition sanctions is sufficient to discipline behaviour along the value chain and prevent abuse of a powerful market position.

Figure 6: Main aspects of net neutrality

Principle	Ofcom position (UK)	ARCEP position (France)	FCC position (USA)
Accessibility	***Pro*** Users have access to all legal content, services and applications	***Pro*** Users have access to all legal content, services and applications	***Pro*** Users have access to all legal content, services and applications
Transparency	***Pro*** Crucial to disclose traffic management practices to key stakeholders including consumers and online service providers	***Pro*** Crucial to disclose traffic management practices to key stakeholders including consumers and online service providers	***Pro*** Crucial to disclose traffic management practices to key stakeholders including consumers and online service providers
Non discrimination	***Neutral*** No *ex ante* regulation	***Pro*** Not allowed to discriminate against certain content, services or applications	***Pro*** Not allowed to discriminate against certain content, services or applications
Traffic management	***Neutral*** Only intervene in case of clear abuse	***Con*** Only engage in acceptable traffic management, e.g. for spam or viruses	***Con*** Only engage in reasonable traffic management
Differentiation	***Open*** Potentially possible without imposing minimum QoS	***Open*** Potentially possible given minimum QoS	***Con*** No price or quality differentiation

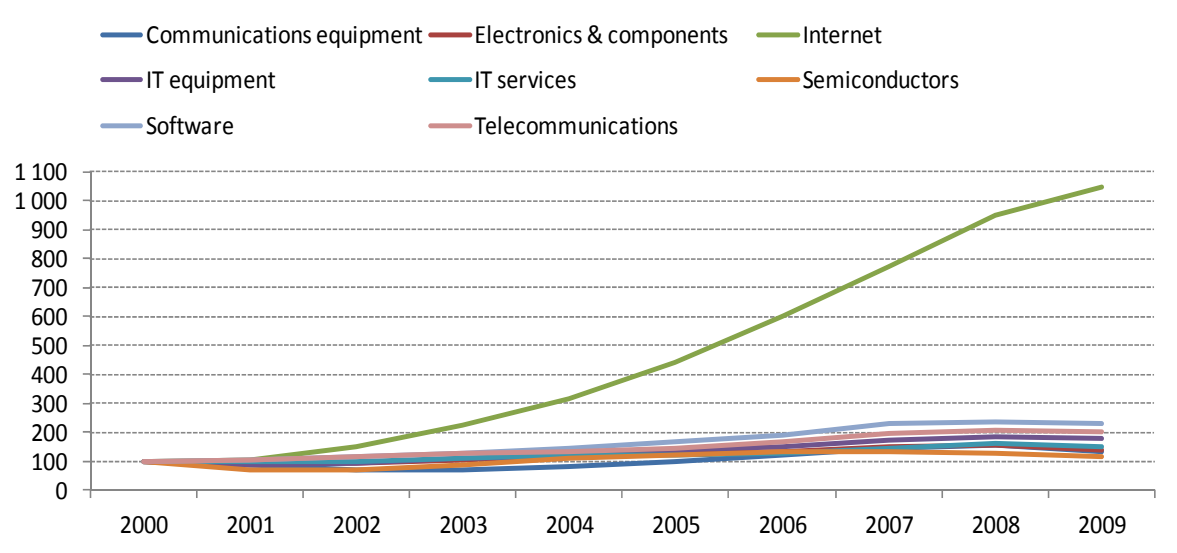
Source: A viable future model for the Internet, AT Kearney, December 2010

Although traffic management is usually presented as a transport layer issue and the action that a network operator may seek to take (e.g., choking traffic and limiting transmission rates) looks like a transport measure, the motivation underlying the adoption of traffic management measures and how these measures are implemented are often about content. Certain types of content require greater or more clearly specified quality standards. For example, voice requires guaranteed continuity and video requires guaranteed bandwidth. There is also a growing concern that the platform operator may be held liable for breaches of intellectual property rights, privacy rights, or other transgressions caused by service providers on the network.

Is net neutrality desirable or achievable? Possibly, but it would be unwise for developing countries to try to adopt the purer forms of net neutrality. In such countries (at least outside the urban environment), both demand for broadband applications and supply of broadband networks are presently limited. There may be *de facto* net neutrality in place. However, demand is much more likely to outstrip supply in the coming years, simply because the barriers to growth are so much higher when it comes to building bandwidth. Some form of traffic management is almost inevitable. If implemented well, traffic management measures could provide the funds necessary for further network expansion.

At heart, the issues of traffic management and net neutrality are about the balance of power between network operators and content providers. Figure 7 demonstrates that only internet companies such as Google, Amazon and Facebook have reported any significant growth in revenues over the past 10 years. A more equal distribution is clearly desirable, not in the least so that operators can fund the bandwidth explosion that internet content requires. Traffic management is one way for network operators to force the issue. In this sense, traffic management is primarily a commercial matter, and regulators would do well to keep out of it wherever possible.

Figure 7: Trends in revenue in the ICT sector, 2000-2009 – Revenues for the main categories of the Top 250 ICT Players, 2000-2009



Source: OECD Information Technology Outlook 2010, presentation by Christian Reimsbach-Kounatze to the Third Inter-Parliamentary Forum, 5 May 2010. www.oecd.org/document/20/0,3746,en_2649_33757_41892820_1_1_1_1,00.html

1.4 Open access to digital services and content

Open access to digital services and content concerns levels 5-7 of the OSI model (session, presentation and application) and layer 3 of the open access model presented in Figure 2.

1.4.1 Is regulation needed?

Assuming that the regulatory measures described in the previous sections have been implemented, there is likely no requirement for *ex ante* regulation in these parts of the value-chain. Open access in the lower wholesale levels will ensure a vibrant, competitive market for digital services and applications. Service providers will be able to access the broadband network facilities that are required for distribution of their content.

Markets for digital services and content possess none of the three essential criteria for *ex ante* regulation identified by the European Commission. They do not have:

- High barriers to market entry. Service providers generally face far lower barriers to market entry compared with network operators. Although barriers for some forms of content (e.g. blockbuster movies) are significant, rival content can be produced relatively cheaply, and the Internet significantly reduces scale advantages in areas such as distribution.
- Lack of a trend towards competition behind those barriers. Competition behind market entry barriers is likely to be intense as many small providers seek to innovate and obtain a competitive edge in an open market.
- Characteristics that suggest that competition law is insufficient to control abuses of dominance.[20] If there are issues of dominance, they cannot be predicted in advance and are therefore not conducive to *ex ante* regulation. Any potential issues can be resolved through the application of *ex post* competition law. Examples include prohibitions on bundling proprietary software such as web-browsers and enforced opening of operating systems.

The above suggests that the market for digital content is and should continue to be disciplined by commercial forces rather than regulatory intervention. This does not entirely preclude the role of regulation in digital services and content. Some countries identify content that is in the broader public interest and that must be available on a free access basis to end users, usually through free-to-air broadcasters, but increasingly also through a range of digital platforms. All sorts of events may be included in the list of such content, including important sporting and cultural events. This form of regulation is beyond the scope of this paper. However, regulators should note the importance of restricting the scope and scale of the content for which free access is mandated, as this type of regulatory intervention will distort the commercial contracts between network and content providers and could distort economic welfare.

The main role for governments and policy makers is to create an environment in which the creation and distribution of digital content can flourish so that the associated socio-economic benefits and industry gains can develop. This role involves a potentially wide range of incentives and support mechanisms (see section 4.2 for examples), which combine to stimulate demand and thus to achieve returns on the huge investments required in broadband networks. By getting this part right, it is possible to obviate the need for public money to be spent on network roll-out. This is a critical success factor for developing countries in particular.

1.4.2 Regulatory tools to promote digital demand

Figure 8 compares the take up and availability of broadband services in eight developed countries. With the exception of the Republic of Korea and Singapore, take-up is very much lower than bandwidth availability. This suggests that demand stimulation programs are important, and may have been neglected by regulators and policy makers.

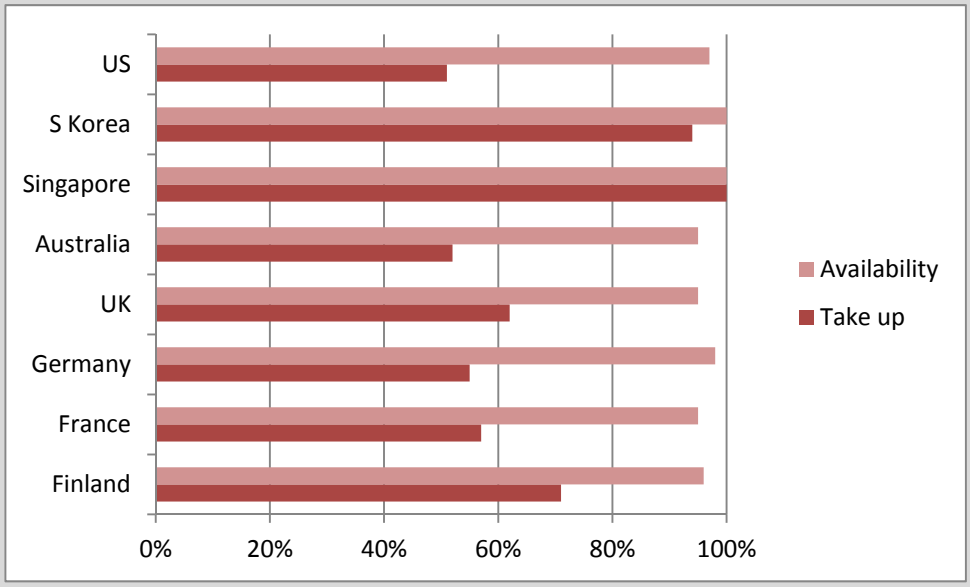
Market players may be expected to take on many of the demand stimulation activities. But there is also a role here for government authorities. It is worth noting, for example, that the two countries with the highest take-up of broadband (Singapore and Korea) are also the countries with the most extensive government-led demand stimulation programmes. Box 5 summarizes the characteristics of the major Korean programmes and demonstrates the need for a multi-faceted approach. This is also the theme of the OECD Policy Guidance for Digital Content[21] which suggests three broad types of regulatory action:

- Policies that promote an enabling environment (e.g. stimulating digital content creation and dissemina-

tion, facilitating research and development, ensuring capital funds are available, and addressing skills shortages and training requirements);

- Enhancing the infrastructure (e.g. policies that encourage investment, improve applications, and enhance accessibility of digital content); and
- Fostering the business and regulatory climate (e.g. encouraging innovative business models, ensuring a non-discriminatory policy framework, and recognising the rights of creators and users of digital content).

Figure 8: Take-up versus availability of broadband services



Source: Plum Consulting, 2009

Box 5: Selected Korean demand stimulation initiatives

- Establishment of an agency (the National Internet Development Agency) to promote the Internet, conduct policy research aimed at further developing the use of Internet, and cooperate with international organizations concerning Internet governance.
- As part of the Digital Divide Act of 2002, provided free computers and a free, five-year Internet subscription to 50,000 low-income students with good grades, and provided a further 500,000 low-incomes students with extra-curricular training in computer use.
- Established 8,263 Local Information Access Centres throughout Korea where the public can access the Internet for free, distributing free used PCs to the disabled and to those receiving public assistance, and education and training programs for the elderly and disabled.
- Established "PC Bangs", LAN gaming centres in which users can play multiplayer computer games with others.
- As part of a "PC for Everyone" initiative, purchased 50,000 PCs and provided them to low-income families on a four-year lease with full support for free access to broadband for five years.
- As part of the Ten Million People Internet Education Project, provided Internet education to about a quarter of South Korea's citizens.
- The One Million Housewife Digital Literacy Education Project trained a million housewives in 18 months. The government offered 20-hour, week-long courses to housewives for only about $30 and provided subsidies to 1000 private training institutes across the nation.
- Established an Educational Broadcasting System, transmitting high school education programs via the Internet. Because students need broadband access in order to get their assignments and access education programs, these schemes also encourage parents to get high-speed access for their children.

Source: Author

The key attribute of demand stimulation programmes in Korea is that they fit within a master plan for developing the ICT sector. Each master plan covers a period of around five years, and includes linked measures for public and private investment (split roughly 50/50), demand stimulation, universal access and industrial policy. For example, the current master plan is the u-Korea Master Plan, Phase 2 (2011-2015), based on an ultra-broadband convergence network with speeds in excess of 100Mbps. The demand-side measures have been designed to:

- Stimulate and aggregate usage of broadband by public bodies;
- Promote and support the growth of e-commerce;
- Provide public services (e-tax, e-learning, etc.) online and educate and support consumers in their use; and
- Establish digital literacy initiatives to overcome the digital divide.

In the UK, Ofcom recently surveyed a sample from the 30 per cent of households that do not use (broadband) Internet to find out why.[22] The results are as follows:

- 55 per cent of those surveyed do not see the relevance of the Internet or do not have the skills to access it.
- 30 per cent could not afford to pay for a PC and the monthly broadband subscription required to use the Internet.
- 14 per cent could neither afford to use the Internet nor see its relevance;
- Only 1 per cent did not use the Internet because broadband was not available to them.

Affordability is clearly a big issue (even bigger in developing countries), but is beyond the scope of this paper.[23] This leaves the questions of how to increase ICT skills and how to increase the perceived value of using the Internet. Figure 9 lists the different types of projects that government authorities have used in other countries to meet these two requirements without distorting market mechanisms.

Figure 9: Typical Government-led broadband stimulation measures

Category	Measure
Measures aimed at disadvantaged groups	ICT literacy programs for: – unemployed people – older people, e.g. to promote independent living – disabled people Free PC and Internet subscriptions to low income groups
Programs aimed at schools and use the universities	ICT literacy programs for pupils ICT literacy programs for teachers Free PC and Internet subscriptions
General measures to stimulate demand	Tax breaks for purchase of PCs Deployment of broadband Internet access points in public buildings such as hospitals, libraries and government offices Grants to stimulate community deployment of next-generation access broadband Grants to set up a privately run Internet cafes Aggregation of broadband demand when public bodies procure telecoms services
Measures to make the Internet more attractive to content providers and safe for end users	Measures to prevent illegal copying and file sharing Measures to protect end user privacy and identity security Measures to remove barriers to secure e-payments while preserving security Measures to remove any unnecessary restrictions on access to Internet applications and content Measures to protect children using the Internet from harmful content

Source: Author

1.5 Conclusions

This discussion paper has highlighted the importance of open access regulation in the digital economy and the key issues to be addressed by regulators, especially in developing countries, when implementing open access. From a review of theory and practice, the following conclusions may be drawn about "best practices" in open access:

- Open access is critical for facilities that have the characteristics of economic bottlenecks, i.e. facilities that cannot be economically duplicated.
- In the digital economy, the scale and scope of investment in national broadband networks means that these resources cannot be viably replicated, so open access is necessary.
- Where public funds are committed to broadband infrastructure investment, there is further justification for open access arrangements to maximize the economic benefits across as broad a base of users and suppliers as possible.
- The terms of open access should allow fair and equivalent access for all digital service providers, but they should also provide a reasonable rate of return for the infrastructure owner and manager.
- Open access is not an economic requirement in the transport and content layers: competition can thrive in these layers if open access is ensured at the infrastructure level.
- Traffic management may be required to establish an economic balance between the supply of bandwidth and the demand for applications that use this bandwidth. However, this is primarily a commercial matter, and *ex ante* regulation is not generally required.
- There remains an active role for policy makers and regulators, to create the environment in which dynamic digital content creation, dissemination and maintenance can thrive.
- Countries with mandated open access to broadband infrastructure supported by government-led initiatives to stimulate demand will be in the vanguard of the digital economy.
- The above conclusions apply with greatest force in developing economies where competitive markets are more fragile and their future success is dependent on supportive policy and good governance.

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1 Cohen Tracy & Southwood, Russell, "Extending Open Access to National Fibre Backbones in Developing Countries"; ITU (2008) at www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR08/documents_presentations/Session_5_Cohen.pdf

2 *Info*Dev, "Open Access Models: Options for Improving Backbone Access in Developing Countries" (2005) at www.infodev.org/en/Publication.10.html

3 *GSR08*, "Best Practice Guidelines on innovative infrastructure sharing strategies to promote affordable access for all" (2008), at www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR08/PDF/GSRguidelines08_E.pdf

4 *GSR10*, "Best Practice Guidelines for Enabling Open Access" (2010), at www.itu.int/ITU-D/treg/bestpractices.html

5 See the Commission Recommendation on Regulated Access to Next Generation Access Networks (2010), at http://ec.europa.eu/information_society/policy/ecomm/library/recomm_guidelines/index_en.htm

6 BEREC, "Report on Open Access", February 2011, at http://erg.eu.int/doc/berec/bor_11_05.pdf

7 Although competitive infrastructure provision is viable in urban and metropolitan areas – see the discussion in www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR10/documents/GSR10-paper1.pdf, p28.

8 European Commission, "Community guidelines for the application of State aid rules to the rapid deployment of broadband networks (2009), at http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2009:235:0007:0025:EN:PDF

[9] World Bank, Information and Communications Development, 2009, p6 at http://issuu.com/world.bank.publications/docs/9780821376058

[10] ITU GSR 10 discussion paper on the impact of broadband on the economy, by R. Katz, at: www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR10/documents/GSR10-paper1.pdf

[11] 2007/879/EC, "Commission Recommendation on Relevant Markets"

[12] European Commission, Access Directive 2002/19/EC at http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2002:108:0007:0020:EN:PDF

[13] EC2002/C165/03 at http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2002:165:0006:0031:EN:PDF

[14] European Commission, *Market Analysis and SMP Guidelines, ibid.*

[15] *Ibid.* at para. 75.

[16] *Ibid.* at paras. 78-80.

[17] GSR 2008 Best Practice Guidelines on innovative infrastructure sharing strategies to promote affordable access for all,(2008) and *GSR10*, "Best Practice Guidelines for Enabling Open Access" (2010), at www.itu.int/ITU-D/treg/bestpractices.html

[18] All figures quoted in this profile are sourced from IDA.

[19] Guidelines for this purpose have been published by the West African Telecommunications Regulatory Authority (WATRA) at: www.itu.int/ITU-D/projects/ITU_EC_ACP/hipssa/events/2010/WA5.2.html

[20] In developing countries, competition law is often not well developed, so a lower evidence threshold may apply in these cases.

[21] OECD, Policy Guidance for Digital Content, 2008 at www.oecd.org/dataoecd/20/54/40895797.pdf

[22] See Ofcom, Accessing the Internet at Home, 2009 at http://stakeholders.ofcom.org.uk/binaries/research/telecoms-research/bbathome.pdf

[23] Readers are referred to the following papers for *info*Dev (2010) material on improving affordability of broadband connectivity: "Building broadband: Strategies and policies for the developing world" at www.infodev.org/en/Publication.756.html and "Broadband for Africa", at www.infodev.org/en/Publication.526.html.