



Competition, Interconnection and Price Regulation

Module 2

ICT Regulation Toolkit

EXECUTIVE SUMMARY

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The full module is available online at:

<http://www.ictregulationtoolkit.org/en/Section.1560.html>

For more information, please see:

<http://www.ictregulationtoolkit.org>

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Introduction

This document summarizes the contents of Module 2 (Competition, Interconnection and Price Regulation) of the ICT Regulation Toolkit.

There are six other modules in the ICT Regulation Toolkit that deal in more depth with issues that impact regulation and which are only mentioned in Module 2. Readers should consult Module 4 on universal service issues, Module 5 on spectrum management, Module 6 on aspects of legal and institutional frameworks and Module 7 on the impact of new technologies.

The web site for Module 2 of the ICT Regulation Toolkit is located at:

<http://www.ictregulationtoolkit.org//en/Section.1560.html>

The material on the web site is much more extensive than what could be included in this document. The reader is referred to the web site to read the full text of what has been prepared. This document is replete with references to sections of the web site (i.e., “see Section 3.2”), and it is to the web site that the reader is referred; not to other portions of this document.

The web site documentation includes short (boxed) cases studies, Practice Notes and References that are not included in this Summary document.

1 Overview: Putting ICT Regulation in Context

Government regulation of ICTs extends into many disparate areas, ranging from pricing regulation, mergers and market entry to content, copyright, and privacy. This module considers challenges and opportunities with regard to competition and price regulation that may be significant for regulators¹.

This section discusses the regulatory challenges and opportunities facing all telecoms regulators. Special attention is paid to developing countries but the changes in technology and markets affect all regulators. It discusses how policy and regulation intersect in the context of differences between countries and as a result of changes in technology and markets. Specifically, this section provides information on:

- Challenges and Opportunities for Developing Countries (1.1)
- Policy Issues (1.2)
- Regulatory Issues (1.3)
- Key Developments in the ICT Sector (1.4)
- Evolution of Competition (1.5)

1.1 Challenges and Opportunities for Developing Countries

Establishing a regime to regulate the ICT sector can place significant demands on a developing country's legal and administrative infrastructure. In the context of competition and price regulation, for example, many developing countries do not have the resources to build large costing models.

The fact that traditional fixed technologies are not deeply embedded in many developing countries enables regulators to implement interconnection policies that are more appropriate to wireless networks, [VoIP](#), and other emerging technologies.

The absence of a well-established interconnection regime may allow regulators in developing countries to bypass policies that are no longer appropriate, in favour of arrangements that are sustainable, minimize opportunities for [arbitrage](#) and are more in line with emerging technologies. This is useful market behaviour unless the price difference between two services or markets is sustained only because of regulation. If legislatures and regulators do not promptly adjust the regulatory policy that triggered such arbitrage, the impact on the market can be substantial.

All countries are facing challenges and opportunities as digitisation [de-layers](#) networks. Digitisation separates 'carriage' and 'content' services allowing '[over-the-top](#)' services which dramatically impact traditional business models which used 'content' services (eg calls) to subsidise 'carriage' (ie line rental).

1.2 Policy Issues

This section discusses the relationship between the policy and regulatory issues that are particularly relevant to developing countries.

¹ The Telecommunications Regulation Handbook <http://www.ictregulationtoolkit.org/en/Publication.3941.html> summarises and updates material across all of the Modules in the ICT Regulation Toolkit.

A key role of policy is to set the goals to be supported by regulation. In all countries, regardless of their level of development, policy goals that drive regulation include:

- **Universal affordable access** to communications: this has traditionally been about extending telephony services. Best practice is discussed in [Module 4](#). Traditionally, it has been supported by cross-subsidies from usage to access (or handsets in the case of mobiles). This mechanism is inconsistent with competition (next point). However, politically mandated social policies such as geographically uniform tariffs still exist and can constrain the regulator's attempt to set cost-based tariffs in pursuit of [efficiency objectives](#).
- **Competition**: until recently, the general policy has been facilities-based competition (also referred to as platform-based competition) which occurs between vertically-integrated players such as the telecommunications incumbent and a cable or mobile operator. Where policy makers have decided that fibre broadband networks are a [natural monopoly](#), the policy focus has shifted to service-based competition rather than infrastructure based competition. This seems to be the case for some developed countries building fibre customer access networks. Natural monopoly leads to [interconnection](#), [unbundling](#) and [infrastructure-sharing](#) policies.
- **Efficiency**: Competition increases [efficiency](#) and drives prices towards costs. The cross-subsidies from call revenues that promoted universal access with monopoly are not possible when there is competition for call revenue. This means that line rentals and local call prices have to go up so that long-distance prices can move towards cost. Policy may dictate how fast this should occur, often through [price caps](#) and such policy should be reflected in both access and retail price regulation. In developed countries the cross-subsidy from fixed to mobile users is being eliminated with rapid reductions in [mobile termination rates](#).
- **Broadband**: Ensuring widespread adoption of broadband is a key policy objective for most countries now. Since mobile broadband will be the main delivery platform in developing countries, a key policy task is the allocation of [wireless spectrum](#). In markets aiming to upgrade copper networks with optical fibre, public investment is stepping-in where private investment lags.
- **Innovation**: a healthy ICT sector will see new services and applications constantly brought to market. Sometimes these may undermine existing service revenues. Examples of such game-changing innovation are [VoIP](#) and [Smartphone Apps](#).
- **Private sector investment** in the ICT sector: For this to occur, both policy and regulation must be clear and applied predictably and consistently. An unsolved [investment issue](#) is how to set the policy rules for public investment.

The importance attached to different policy goals depends upon the circumstances and economic and social objectives of any country.

1.3 Regulatory Issues

Regulation takes second place to competition. Competitive markets distribute resources efficiently and fairly without any need for a single centralized controlling authority. Competition maximizes benefits to society at large by increasing:

- **Allocative efficiency** – which refers to the optimal allocation of resources to meet consumer demand.
- **Productive efficiency** - which is achieved when resources are used to produce output at lowest cost
- **Dynamic efficiency** – which refers to changes in efficiency over time. It is generally regarded as being promoted where producers have incentives to invest and innovate to meet future consumer demand.

Regulation acts as a surrogate for competition where competitive forces are weak (eg in forcing monopolies to reduce prices and increase output) or where there are significant [externalities](#). Where regulation is a proxy for competition, the notions of efficiency above are used as a guide to regulatory decisions; subject to policy.

Note that there may be a trade-off between the long-term dynamic efficiency objective (investment) and the short-term allocative efficiency objective (lower prices). Regulators are faced with a complex balancing exercise. Individual regulatory decisions need to balance:

- The long term objective of ongoing, sustainable competition, and
- The resolution of immediate short-term concerns, while
- Complying with the legislative provisions under which regulators operate.

Using regulation to make markets more competitive must be done very carefully. The [impact of the regulator on competition](#) may not be what was intended. Regulators may be tempted to micromanage the market to ensure that competition (or a particular form of competition) takes place. Alternatively, they may decide prematurely that the market is fully competitive. Neither of these paths is likely to result in sustainable competition.

Regulators have to be wary of rent-seeking and aim for principled, consistent and predictable decision-making.

1.4 Key Developments in the ICT Sector

Even in developed countries, many regulatory decisions remain based on three assumptions about the sector that no longer reflect reality. Some regulators assume that,

- telecommunications mainly concerns voice calls.
- telecommunications networks remain natural monopolies.
- the firm that owns the network also provides the service - VoIP demonstrates that the basic premise of traditional voice telephony – the network and voice services must be owned and operated by the same firm – is no longer relevant.

Broadband technology in particular has made all three assumptions invalid².

² See Broken Concepts: The Australian Communications Legislative Landscape <http://www.ictregulationtoolkit.org/en/Publication.3945.html> which provides more detail on how convergence is challenging traditional legislative and regulatory frameworks.

Both policy and regulation have to adapt to, but not over-react to, changes in the ICT sector. The nature and pace of change create challenges for both regulators and regulated firms. This section provides an overview of key developments in the ICT sector, across four categories:

- Technological Changes (1.4.1)
- The Emergence of New Services (1.4.2)
- Changes in Market Structure (1.4.3)
- Investment Issues in the Sector (1.4.4)

1.4.1 Technological Change

Digital technologies are changing the ways in which the majority of people live, work, play and interact with each other³. The most fundamental shift behind all these changes is the transition to all-digital networks which has profound implications for competition and regulation. Networks used to be built vertically around specific applications (eg voice or PayTV) but digitisation de-layers networks so that content or applications are no longer network specific. A byte is a byte and Next Generation Networks are layered to serve all applications.

1.4.2 Emergence of New Services

In the legacy access environment, it is a simple task to identify the carriage provider and the party to whom the carriage service is provided. All services are provided by an access provider, which charges for the telecommunications services acquired.

Some telecommunication regulations assume that the provision of a service can be related to a specific carriage service or provider. Such assumptions may no longer be valid in a next generation access environment where the relationship between services and carriage may not be fixed or known. Next generation networks effectively remove legacy carriage technology barriers to provide a broad foundation for the development of applications and services in a converging industry.

1.4.3 Changes in Market Structure

Convergence is blurring the boundaries between sectors. The historical distinctions between radio communications, telecommunications, broadcasting and the internet are blurring.

Several jurisdictions have integrated their media and communications laws into a converged legislative framework. A common feature of converged legislative frameworks in the EU, Malaysia and Korea is the use of a regulatory model that is structured on the network layers of next-generation networks, rather than on the vertical industry structures of telecommunications, broadcasting and IT.

1.4.4 Investment Issues in the Sector

In the past, telecommunications operators have been viewed as stable, monopolistic utilities. The main challenge for regulators had been to prevent excessive retail pricing by incumbent operators.

With increasing competition from new providers and new services, the telecommunications sector is becoming more volatile. Average revenues per line from traditional services are declining under pressure from competing providers and modes of delivery. In particular, the emerging de-layered structure of the industry means that 'over-the-top' applications (like Skype) which have no

³ Module 7 of the ICT Regulation Toolkit discusses new technologies and how they impact regulation.

intermediation by the carriage provider take revenues directly from the end customer. This loss of revenues is happening to both fixed operators and, with smartphones, also mobile network providers.

At the same time, network providers are expected to invest heavily in next generation fixed and wireless broadband networks. This may not happen fast enough to suit policy makers with regulatory implications for open access, competition and price regulation.

A common reason for market invention is [market failure](#) due to 'positive externalities'. That is, investment in broadband is socially beneficial (public and private benefits exceed total costs) but private investment is not profitable (private costs exceed private benefits). This is most likely in rural areas where costs are high and demand is sparse, but may also occur in urban areas.

Another form of [market failure](#) is due to 'natural monopoly'. That is, duplication of fixed broadband access networks is uneconomic. That is of special concern to countries where investment resources are scarce.

1.5 Evolution of Competition

Regulators have to understand how competition is shaped by regulation and technology and the appropriate responses. This section explores:

- Impact of the regulator on competition (1.5.1)
- Impact of technology on competition (1.5.2)
- Level of competition globally (1.5.3)

1.5.1 Impact of the Regulator on Competition

Ideally, the actions of the regulator should lead to the same outcomes we would expect in a competitive market. Sometimes, the costs of regulatory action are higher than taking no action. With fast-moving technology, inaction may be less costly than regulation.

The concept of the ladder of investment influenced many regulators who believed they could help new entrants towards facilities-based competition. The steps towards this goal that new entrants in developed markets have evolved through are:

- Retail arbitrage (resale)
- Switched reseller
- Unbundled local loop
- Facility based (fibre)

In developing markets, the addressable market for the above options is limited because the copper network in developing countries is less extensive. However, mobile technology side steps the ladder because it allows infrastructure competition to occur immediately. In this section, we consider all these phases and the role of policy and the regulator.

1.5.2 Impact of Technology on Competition

Before fibre arrived in the access network, a major assumption underlying the reliance on facilities-based competition where cable networks existed – or open access where the copper

network ruled - was that cable and telephone infrastructures already in place needed relatively low and largely symmetric cost upgrades to provide Internet services.

The low incremental cost assumption has to be abandoned where fibre is deployed in the access network. The shared core understanding is that the transition to next generation infrastructures re-emphasizes the high upfront costs involved in, or natural monopoly, characteristics of, telecommunications networks, and requires some form of shared infrastructure if competition is to be maintained in the teeth of such economies of scale.

At the same time, infrastructure competition is coming from mobile technology which has evolved to the point where it can offer broadband. Wireless broadband is increasingly viewed as a portable and nomadic service for the consumption of media rich content and video.

Across all these network types, the biggest development which comes out of digitisation is the emergence of apps (applications). Some of these apps are especially disruptive because they undermine the business models of the network providers. For example, apps like Skype provide cheap voice. They can effectively kill the case for implementing [Carrier Selection](#) on fixed networks as the mobile market is far larger and smartphone penetration is already above fixed line penetration.

1.5.3 Level of Competition Globally

Over the last decade, many countries have opened-up various telecoms markets to new entrants. However, monopoly provision of local service is still prevalent in some regions; particularly in Africa and the Arab States. The picture for domestic long distance is very similar to the local service sector.

There are different approaches to development of broadband networks in relation to preferred platforms (mobile in the case of developing countries), the scope for infrastructure competition (natural monopoly in non-urban fixed networks) and the role of public investment (where private investment does not appear).

Competition for services is also emerging from non-traditional sources with digitisation. The separation of services and platforms (or “carriage and content”) has profound implications for investment in business models and investment for networks.

2 Anti-Competitive Conduct

This section discusses anti-competitive conduct issues and remedies. Specifically, we address

- Policy Issues (2.1)
- Key Concepts (2.2)
- Common Forms of Anti-Competitive Conduct (2.3)
- Mergers, Acquisitions, and Joint Ventures (2.4)

2.1 Policy Issues

As networks migrate to digital technologies, broadcasting networks are able to carry a range of services including, potentially, voice telephony. This has important consequences for sector regulators and competition policy. Co-ordination across regulatory areas (between broadcasting,

data services, and telecommunications) will be important to avoid 'regulatory arbitrage' [1]. Mergers between entities in previously separate sectors may now raise competition concerns.

Many competitive conduct issues can be addressed by competition law⁴. But, ex-ante regulation of conduct can be quicker and cheaper. Regulators have to avoid over-reach and be consistent and predictable. In emerging markets, forbearance is wise.

2.2 Key Concepts

The aim of [competition policy](#) is to promote [sustainable competition](#). Before concluding that either a [merger](#) would harm competition or that [anti-competitive behavior](#) exists in a market, and then what remedies to apply, competition analysis follows the following steps:

- Define the [relevant market](#) or markets.
- Assess the level of competition in the market, with and without the trade practice or business acquisition in question. Important considerations in assessing the level of [effective competition](#) include:
 - Decide whether any firm in the market has [significant market power](#) and the impact of the trade practice or acquisition in question on its market power.
 - Assess whether a firm with market power has abused this position to raise prices above competitive levels or engage in [anti-competitive practices](#),
 - Assess any [barriers to entry and exit](#), and
 - Assess the role of any [essential facilities](#).

Anti-competitive behaviour may also be inhibited by imposing some form of [separation](#) between the incumbent's upstream and downstream (competitive) activities.

2.2.1 Defining the Market

Market definition focuses on the substitutability of differentiated products or services. But it must also consider other dimensions such as:

- The goods or services supplied and purchased (the product dimension)
- The geographic area from which the goods or services are obtained, or within which the goods or services are supplied (the geographic dimension)
- The level in the production or distribution chain (the functional dimension)
- The time frame or timing within which the market operates, where relevant (the temporal dimension), and
- The different customer types within a market, where relevant (the customer dimension).

2.2.2 Market Power

Market power is only damaging if the firm concerned exercises its power. For example, if it raised prices above competitive levels, this would reduce demand, generate efficiency losses, and harm the public interest. In addition, firms with market power may engage in anti-competitive behaviour.

⁴ The European Commission publishes a Competition Policy Newsletter about three times a year which contains articles written by staff of the Competition Directorate-General about policy issues and cases. <http://ec.europa.eu/competition/publications/cpn/index.html>

The European Commission defined the concept of Significant Market Power (SMP) as the ability of a firm to act independently of competitors and customers. Similarly, the World Trade Organization defines dominance as the ability of an organisation to prevent effective competition being maintained in the relevant market by having the power to behave to an appreciable extent independently of its competitors, its providers, its customers and ultimately of the consumers.

A high market share does not necessarily imply market power. A firm's market share may increase, at least temporarily, due to a successful new invention or better customer service. And, market share in itself is neither necessary nor sufficient for market power. An incumbent telecommunications firm may have high market shares but as competition emerges, its market share cannot guarantee it the ability to charge prices higher than its competitors.

2.2.3 Separation

There are three main forms for separating a dominant firm's competitive activity from its monopoly activities:

- **Accounting separation** which requires separate income statements and balance sheets to be maintained for the wholesale division and the retail units. Accounting separation is at a high level of aggregation and may not be able to detect a [price squeeze](#). The benefit of accounting separation is that it preserves the vertically-integrated structure of the firm thereby preventing the loss of vertical efficiencies. On the other hand, accounting separation does not prevent non-price discrimination – such as delays in switching customers to competitors.
- **Functional (operational) separation** which requires the retail and wholesale arms of the vertically integrated dominant access provider to act independently of each other. Policing obligations for non-discrimination in vertically integrated operators is notoriously difficult. The 'six degrees of separation' form a spectrum of options between the other two main forms of separation.
- [Structural separation](#) is a last resort which requires an operator to separate its network infrastructure from its units offering services using this infrastructure. Also known as 'ownership unbundling' or 'divestiture', structural separation means that all of the network elements are placed in a separate legal entity.

2.3 Common Forms of Anti-Competitive Conduct

The focus of this section is on the forms of anti-competitive conduct engaged in by firms with significant [market power](#). These practices include:

- Abuse of Dominance (2.3.1)
- Refusal to Supply (2.3.2)
- Vertical Price Squeeze (2.3.3)
- Cross-Subsidisation (2.3.4)
- Misuse of Information (2.3.5)
- Customer Lock-In (2.3.6)
- Exclusionary or Predatory Pricing (2.3.7)
- Tying and Bundling (2.3.8)
- Non Discrimination and Net Neutrality (2.3.9)

In all cases, the object of regulation is to support competition as a process⁵.

2.3.1 Abuse of Dominance

A **dominant** firm abuses its power when it engages in practices with the aim of eliminating or substantially lessening competition. Abuse of dominance may entail:

- Refusals to deal, for example a **refusal to supply** an essential facility to a competitor,
- Exclusive dealing arrangements, in which a seller prevents its distributors from selling competing products or services,
- **Tying and bundling**, where a firm sells makes the purchase of one product or service conditional on the purchase of a second product or service,
- **Predatory pricing**, where a firm sets prices below cost in order to force a competitor out of the market,
- Non-price predation, where a firm adjusts the quality of its product offering to customers with the aim of harming its competitor. For example, an incumbent might offer an improved level of service to customers served by one new entrant.

It is important to distinguish between aggressively competitive behaviour that harms individual competitors but benefits customers (for example by reducing prices), and behaviour that is anti-competitive because it harms competition.

A range of possible remedies exists. Which remedy is appropriate will depend on the specific nature and seriousness of the behaviour, and the likelihood that the firm may repeat the behaviour in the future.

- **Directive Remedies**, such as injunctions or bans, require the firm to cease its abusive behaviour, or make specific changes to its behaviour so it is no longer damaging to competition.
- **Punitive Remedies** include fining the firm and ordering the firm to pay compensation to its competitors and/or customers.

Punitive remedies are intended to discourage abusive behaviour. However, this objective must be weighed against the potential to “chill” competition.

2.3.2 Refusal to Supply

Incumbent firms often control access to facilities that are essential inputs in the supply of services at the retail level. In the telecommunications sector, the local loop connecting end customers to the local exchange is often regarded as an **essential facility**.

To encourage competition, many jurisdictions require firms with control over essential facilities to provide access to competitors. Rules may also determine the way in which access prices will be agreed, and procedures for resolving any disputes.

⁵ ERG Common Position on the approach to appropriate remedies in the new regulatory framework <http://www.ictregulationtoolkit.org/en/Publication.2408.html> covers much of same ground and is a key reference document for European regulators.

Refusal to supply may include deliberate delays and obstruction such as “losing the keys to the exchange” where a competitor has the right to co-locate equipment in an exchange under supervision.

2.3.3 Vertical Price Squeeze

A firm which is vertically integrated and controls an essential input to the retail service implements a price squeeze if:

- The price the firm demands makes it impossible for an equally-efficient retail-stage competitor to operate profitably (or even survive) given the level of retail prices, and
- The firm does not charge its own downstream operation this high price.

A price squeeze has a similar effect to a [refusal to supply](#) an essential facility. In the extreme, the firm might demand a price for the essential input that is higher than the full retail price of the service.

[International approaches](#) to price squeeze differ and a number of remedies exist, including:

- [Resale Obligations](#) or
- Price floors, or
- [Structural remedies](#)

These measures may achieve the objective of preventing a price squeeze, but they can have substantial costs. In particular, under structural separation the firm would lose any efficiencies or cost savings from vertical integration.

2.3.4 Cross-Subsidisation

A cross-subsidy may be anti-competitive when a firm with market power prices services in less competitive markets higher so that it can have lower price for services it sells into competitive markets.

Not all cross-subsidies are anti-competitive. Traditionally, telephone operators have cross-subsidized high-cost (under-priced) services from low-cost (over-priced) services. Competition is very good at attacking traditional cross-subsidies. So, regulators assist incumbents with [price rebalancing](#) to meet competition, which generally increases line rentals so that call prices can fall.

Anti-competitive pricing can be difficult to identify. Ideally, competition drives prices to marginal cost. But in network industries, the cost curve declines across the range of possible levels of output so prices must be set above marginal cost to recover all costs. Since the network supports many different services, it is difficult to say which services are cross-subsidising others.

The remedies for cross-subsidization are preventative in nature and often set either a price floor or require accounting separation to separate the costs of the firm’s competitive and non-competitive products.

2.3.5 Misuse of Information

Two of the three anti-competitive practices proscribed by the WTO concern misuse of information:

- (a) engaging in anti-competitive cross-subsidization;

- (b) using information obtained from competitors with anti-competitive results; and
- (c) not making available to other services suppliers on a timely basis technical information about essential facilities and commercially relevant information which are necessary for them to provide services.

Remedies for misuse of information are generally *ex ante* in nature, and include:

- Establishing strict rules or procedures governing the use or disclosure of commercially sensitive information, and setting limits on the sharing of sensitive information between a carrier and its affiliates
- “Win back” rules, limiting the extent to which the vertically integrated firm may directly market to customers that choose to switch to a competitor.

2.3.6 Customer Lock-In

Customer lock-in involves raising customers’ switching costs to the point that the cost of switching outweighs the potential benefits from switching. Switching costs may be:

- **Transactional**, for example the cost of replacing existing equipment and technology needed to move to a different service provider, or
- **Contractual**, for example penalties for breaking an existing contract in order to switch to a new service provider.

Contractual provisions that increase switching costs are not necessarily anti-competitive. Service providers may use contractual provisions that ensure customer loyalty to recover legitimate underlying costs over a period of time.

Cases of lock-in need to be considered on a case by case basis, taking account of the degree of competition in the market, whether the firm in question has market power, or a dominant position, and the effect of the locking-in arrangements on competition.

2.3.7 Exclusionary or Predatory Pricing

Predatory pricing is a pricing strategy used by an established firm to eliminate competition from equally efficient firms, and secure a monopoly position in a previously competitive market. In order to have a reasonable expectation that the strategy will succeed, the firm must know:

- How long it must price below cost to force its competitors out of the market,
- The size of the loss that it must withstand while predatory pricing is in effect, and
- The probability that it will recover its losses once it has achieved a monopoly.

It can be difficult in practice to distinguish predatory pricing from aggressively competitive below-cost pricing (such as “loss leaders” and promotional activities).

Ex post antitrust remedies, such as fines or compensation, may be available for proven instances of predatory pricing. However, predatory pricing is difficult to prove with sufficient certainty to justify punitive measures.

A more useful remedy for predatory pricing is an appropriate price floor for the affected product or service. This is a preventive remedy, requiring *ex-ante regulation*.

2.3.8 Tying and Bundling

Tying of services occurs where a service provider makes the purchase of one product or service over which it has market power (the "tying good") conditional on the purchase of a second, competitively supplied, product or service (the "tied good"). By tying services, a service provider can try to use market power in one market to give itself an advantage in another, competitive market.

Service bundling occurs where a service provider offers two or more services separately, but gives a discount to customers who purchase the services as a combined bundle.

Bundling is common in telecommunications and other multiproduct industries, reflecting both cost savings from producing services jointly, and consumer preferences for service bundles. In telecommunications, local and long distance services are often bundled with services such as call waiting, call forwarding, voice mail, or Internet access.

Bundling is generally a pro-competitive, and customer friendly, strategy. As such bundling does not call for regulatory intervention.

2.3.9 Non Discrimination and Net Neutrality

The Internet has flourished in part due to a "hands off" approach by governments and the apparent willingness of all stakeholders to cooperate and self-regulate. As the amount of video traffic increases, carriers may feel the need to adopt network management practices to control congestion of their networks. Some carriers may try to take the opportunity to extract value by prioritizing traffic in ways which violate the tradition of [network neutrality](#).

Regulators are moving tentatively to decide how far they need to intervene. While many see the need for transparency about traffic management rules, only a few have moved to set traffic management rules.

2.4 Mergers, Acquisitions and Joint Ventures

Mergers, acquisitions and joint ventures are all different ways for two or more firms to integrate or coordinate their operations:

- A merger is a structural fusion of two firms that results in a common ownership and management structure. Mergers usually happen through stock swaps. (2.4.1)
- An acquisition is a type of merger in which a firm with more resources and greater market strength may acquire another firm. (2.4.1)
- A joint venture is a strategic alliance between two firms that share resources, equity, revenues, expenses, and management to pursue a common goal. (2.4.2)

Mergers, acquisitions, and joint ventures are motivated by a range of factors such as cost savings from synergies between the firms or economies of scale and scope, efficiencies from vertical integration, or geographical diversification or cross-selling of products.

Provisions governing mergers and acquisition are generally included in competition or antitrust laws, where these exist. In this case, investigation of proposed mergers is usually the responsibility of a competition authority. In countries with both a competition authority and a telecommunications regulator, both agencies may have a mandate to investigate mergers in the telecommunications sector.

2.4.1 Mergers and Acquisitions

Mergers can be horizontal - bringing together firms that produce the same product within the same market – or vertical – bringing together firms in potential customer-supplier relationships.

By definition, horizontal mergers reduce the number of actual competitors in the [market](#). Horizontal mergers may also produce cost savings and other benefits. If these benefits outweigh any reduction in competition, then the merger should be allowed to proceed.

If a horizontal merger is found to generate benefits that do not outweigh the damage to competition, then in some jurisdictions regulatory authorities may impose ex ante obligations on a merged firm. In both the United States and Europe, National Regulatory Authorities may impose conditions on a merger that would otherwise be anti-competitive.

Vertical mergers involve complementary services while horizontal mergers involve substitute services. Vertical mergers are more likely to increase efficiency than horizontal mergers but may raise competition concerns in limited sets of circumstances.

2.4.2 Joint Ventures

Joint ventures can have many different objectives, and have different implications for competition. Telecommunications joint ventures raise three broad types of competition concern:

- The potential for collusion among the parties in the joint venture,
- A loss of potential competition, and
- The potential for market exclusion and access discrimination.

Joint ventures with the purpose of fixing prices, restricting output, or allocating markets between firms reduce competition, and generally should not be permitted. Regulators or competition authorities should consider whether the joint venture will increase market power sufficiently to cause a substantial lessening of competition.

3 Access to Customers and Facilities

Section 2 discussed the conduct issues arising from market power. In this section, we discuss how the major source of market power can be countered through access policies.

[Market power](#) can be earned (eg by superior service or patented innovation) but in communications it often comes from control of an [essential facility](#). Typically, the incumbent has a legacy access network which it is uneconomic to duplicate and for which there are no close substitutes (ie a natural monopoly). This market power is removed with mandated [open access](#).

Specifically, this section will address:

- Policy Issues (3.1)
- Key Concepts (3.2)
- Interconnection (3.3)
- Unbundling (3.4)
- Infrastructure Sharing (3.5)

Section 4 will look at the important question of the price for access.

3.1 Policy Issues

The regulatory approach to [open access](#) has [evolved](#) as competitive business models have changed. Changes in technology have been a major catalyst for these changes.

In the next two sub-sections, we explore how the focus of access policies has shifted with the evolution of competition (also discussed in more detail at section 1.5.1) and the emergence of digital communications.

- Evolution of competition (3.1.1)
- IP interconnection (3.1.2)

Policy issues include infrastructure versus service competition, universal service (Module 4) and affordability⁶.

3.1.1 Evolution of competition

Competitive business models and the focus of regulation continually evolve. Three distinct phases are identified:

- **Calls:** When developed country fixed markets were liberalised in the early 1990s, incumbent pricing structures relied on subsidising take-up of fixed lines with high call tariffs; particularly for long-distance and international calls. Regulation in this era consisted of mandating Call and/or Carrier Selection and setting origination and terminating [interconnection](#) rates paid to the incumbent.

This form of market liberalisation has not been successful in developing countries because fixed networks present a smaller market opportunity than mobile networks and the margins between regulated fixed network interconnection rates and retail prices have been small.

- **Access:** The advent of broadband and VoIP services shifted the focus of competition to control of the access line and consequently all services provided over it. The fight for control of the access line led to major players launching triple play (bundling voice, broadband and IPTV services) or even quadruple play (adding mobiles as part of the package). The focus of regulation shifted from interconnection to [unbundling](#) of part of all of the copper line.

The assumption of business models in the access competition era was that control of customer access also controlled revenues delivered over that infrastructure. With digitisation this assumption no longer holds leading to the era of service competition (eg from Skype).

- **Services:** The [de-layering](#) of the industry that has arrived with IP has broken the nexus between carriage and content. None of the content providers at layer 4 in the figure below need to deal with the providers at the other levels. With the shift of competition towards services on both fixed and mobile networks, the focus of regulation is on identifying new sources of market power and addressing new issues such as [network neutrality](#) and content regulation.

⁶ TMG's Broadband Strategies Handbook, September 2011 for *InfoDev*
<http://www.ictregulationtoolkit.org/en/Publication.3961.html> surveys broadband policy and discusses the implications of broadband for law and regulation (Chapter 4) and universal service (Chapter 6).

Broadcast television and telecommunications have been regulated differently. But digitization leads to industries converging. As IPTV allows broadcasting over IP networks new regulatory issues arise.

3.1.2 IP Interconnection

All next generation communications networks (NGNs) will be digital and existing fixed and mobile switched networks are migrating quickly to digital networks. So, switched interconnection is giving way to IP interconnection as networks become digital. The paradigms ruling each of these currently are very different.

Access regimes for switched telephony (PSTN) networks have been highly regulated while the [peering and transit](#) arrangements associated with the highly successful development of the internet are unregulated.

There is a regulatory issue with the transition from switched interconnection to IP interconnection because the different regimes offer arbitrage opportunities. But the arbitrage window between, say, fixed-to-mobile termination and VoIP closes as the difference in costs narrows.

Since network operators cannot expect to make money from switched interconnection when they move to IP Interconnection, they have to remove cross-subsidy between high margin calls and low margin line rentals and move towards volume based charging (probably implemented as monthly data caps).

3.2 Key Concepts

The vocabulary of access regulation is shifting with the move from switched to IP interconnection. Between these, unbundling became important.

In the switched interconnection world, key concepts include:

- [Originating and terminating access](#) – This refers to exchange of voice traffic and the interconnection rates are usually timed.
- [Call selection and carrier pre-selection](#) – These were used to provide call services to the incumbent's customers. They are being replaced by unbundled copper loop and by apps on digital networks.

As competition [evolved](#) from calls to access, new concepts emerged such as,

- [Full and partial unbundling of the copper local loop](#)

And, with the migration to all digital networks, came:

- [Bitstream access and dark fibre](#)
- [Peering and transit](#) - Peering, also known as 'Sender Keeps All' or 'Bill and Keep' is a zero compensation arrangement by which two ISPs agree to exchange traffic at no charge. Transit is an arrangement in which larger ISPs sell access to their networks, their customers, and other ISP networks with which they had negotiated access agreements.
- [Net neutrality](#)

- [Applications \(Apps\)](#)

3.3 Interconnection

Interconnection is what allows users on each network to communicate with users on any other network. The ITU's most notable achievement has been the agreement of standards that allows a seamless, global telephone network.

Telecommunications operators will interconnect voluntarily in some circumstances. Regulators become involved where incumbent operators have little incentive to allow access to their network, or to allow access on reasonable terms. The motivation for interconnection regulation is that efficient competition in downstream markets would be difficult, or even impossible, unless entrants can access the incumbent's network at appropriate prices, terms and conditions.

With new networks (both fixed and mobile) based on Internet Protocols (IP), switched interconnection is becoming a thing of the past. IP interconnection is becoming the new standard; although the rules have not yet been agreed.

3.3.1 Forms of Interconnection

One-way interconnection occurs when payment goes only one-way (eg when rail operators seek access to rail networks). Two-way interconnection occurs with reciprocal payments (eg between networks with customers who communicate across networks). One-way and two-way interconnection can co-exist. For example, new entrants often obtain parts of their networks from the incumbent carrier (one-way interconnection), and then exchange traffic with the incumbent (two-way interconnection). There are several approaches to structuring interconnection payments which are discussed at 4.3.

The distinction between one-way and two-way interconnection is less important than whether the parties concerned compete or cooperate.

3.3.2 Interconnection Agreements and Dispute Resolution

Often a regulator will require the development of a Reference Interconnection Offer (RIO) as part of opening the sector to competition. The RIO sets out the terms and conditions for interconnection services that a competing operator can choose to accept without further negotiations. The purpose of the RIO is to avoid disputes and to shorten the entry time for a new competitor.

However, disputes about access and interconnection are common in the telecommunications sector. Reliance on the courts to resolve disputes between telecommunications firms is costly and can involve substantial delays. The [World Trade Organization - Reference Paper](#) includes obligations relating to dispute resolution. Under the Agreement, Member countries must establish an independent domestic dispute resolution body, so that interconnection disputes can be settled within a reasonable period of time. This need not be the regulator, but it often is.

This section of the tool kit discusses ways of meeting the challenges in dispute resolution.

3.4 Unbundling

Unbundling requires the incumbent to allow entrants to lease certain individual building blocks that make up a telecommunications network. The administrative costs of defining, and setting prices for, a range of network elements can be high. In addition, unbundling can impose high compliance costs

on incumbent carriers. Regulators should carefully consider the merits of unbundling on a case-by-case basis, with a thorough assessment of the likely costs and benefits. The main forms of unbundling are:

- **Resale** is often mandated as the first rung on the 'ladder of investment'.
- **Leased lines** are an important access product through all stages of competition except service competition. They may be long-distance transmission links on 'thin' routes. Or, they may be data 'tails' providing originating/terminating access for data services. These have tended to be displaced by unbundled local loop where the entrant has more control over the service specification.
- **Line-sharing** (or partial line unbundling) where the incumbent must provide access to the non-voice frequencies of a local loop and access to space within a main distribution frame where DSLAMs and similar types of equipment can be interconnected to the local loop. Where entrants use line sharing to provide broadband service, they can also buy resold local service (line rental and calls) to provide a more complete bundle of services.
- **Local loop unbundling** is also known as full unbundling and occurs when the raw (unconditioned) copper pair is used by the entrant to provide both voice and (ADSL) data services.
- **Sub-loop unbundling.** With FTTN, sub-loop copper between the node and the final customer may be mandated; but it is unlikely to be commercially viable.
- **Bitstream** access can be used where fibre replaces part of the copper access network (Fibre to the Node) or all of the copper access network (Fibre to the Home). Bitstream is the most common form of unbundling in fibre networks. It can be at Layer 2 (ATM or Ethernet, in most fibre networks) or Layer 3 (IP).
- **Dark fibre** (unlit optical fibre) is another form but it may be constrained by the architecture of the FTTH access network. It is possible with point-to-point (PTP) fibre where there is one fibre for each end customer back to the point of interconnect (POI). But it is not possible with the cheaper passive optical network (PON) in which a passive optical splitter splits the incoming light from the POI over typically 32 (but up to 128) fibres going to end customers.
- **Wavelengths** are likely to be unbundled on PONs in future but the standards do not yet exist for this solution. With wave length multiplexing (WDM), the end-user is accessed by using a separate wavelength.

Because unbundling copper has been so successful in stimulating competition, regulators have looked for fibre analogues to the unbundled local loop (ULL) and line sharing service (LSS) found in copper networks. Unbundling of copper loop is not easy with fibre-to-the-node (FTTN) and impossible with fibre-to-the-home (FTTH). Regulators are still struggling to determine both what access products are appropriate in the new environment and how they should be priced without discouraging further investment in next generation networks (NGNs)⁷.

⁷ BEREC, Next Generation Access – Implementation Issues and Wholesale Products, March 2010 <http://www.ictregulationtoolkit.org/en/Publication.3980.html> discusses how wholesale products are affected by the transition to fibre networks and discusses options for regulation.

3.5 Infrastructure Sharing and Colocation

One of the most important policy concerns underlying the growing regulatory interest in sharing is the promotion of rapid and efficient network deployment. In many developing countries, the network in question is the mobile network, which is increasingly becoming the dominant form of infrastructure in these countries, as well as the backbone for the provision of universal access. In more developed the emphasis is on fixed networks.

There is a distinction between passive and active infrastructure sharing:

- Passive infrastructure includes all the civil engineering and non-electronic elements of infrastructure, such as physical sites, poles and ducts (and also power supplies).
- Active infrastructure covers all the electronic telecommunication elements of infrastructure like lit fibre, access node switches, and broadband remote access servers. Active infrastructure sharing can be a matter of degree. Mobile Virtual Network Operators do not own their own spectrum but may rely to a greater or lesser extent on components provided by the incumbent.

The policy issues related to competition and sharing are complex. Sharing offers both the possibility of enhancing competition and the risk of hindering competition⁸.

On the one hand, sharing policies can help to increase competition in the ICT sector. One of the greatest impediments to market entry in the sector is the cost of network deployment. Sharing allows operators to enter the market at a much lower cost than what they would encounter if they were required to construct their own network infrastructure. Sharing also helps to overcome barriers to competition such as the control of bottleneck facilities by dominant operators.

On the other hand, too much sharing undermines the incentives for investment in infrastructure-based competition. In the early days of liberalisation, some regulators prohibited facilities sharing. A very permissive sharing regime makes it possible for operators to become active without investing in their own infrastructure. If most operators rely on the same underlying infrastructure providers, it is likely that there will be little ultimate differentiation in their services. The benefits of competition like lower prices and consumer choice are reduced as a result.

Ultimately, there is an inevitable tension between the equally important goals of reducing barriers to market entry and stimulating investment in infrastructure. Both of these goals are relevant to maintaining healthy competition in the ICT sector. Striking the appropriate balance between these goals is a delicate matter for policy makers and regulators.

⁸ GSR 2008 background paper, Backbone networks: Extending Open Access to National Fibre Backbones in Developing Countries <http://www.ictregulationtoolkit.org/en/Publication.3984.html> has a comprehensive discussion of infrastructure sharing with international case studies. See also the BEREC-RSPG report on infrastructure and spectrum sharing in mobile/wireless networks, June 2011 <http://www.ictregulationtoolkit.org/en/Publication.4015.html> reports on infrastructure sharing arrangements in Europe.

4 Regulating Access Prices

The heart of regulation is regulating access prices. It is the key to new entrant business models. The previous section warned of regulatory over-reach on mandating access services because not all inputs are essential, bottle-neck input services so making them available will deter new investment. This section alerts regulators to how access pricing can shape competition.

In developed countries fundamental changes in the approach to access pricing are taking place with the transition to all digital networks. Developing countries have the opportunity to leap-frog legacy pricing approaches as the networks being built now are digital.

This section explores the following topics:

- Policy Issues (4.1)
- Key Concepts (4.2)
- Pricing Interconnection (4.3)
- Pricing Unbundled Access (4.4)
- Pricing Infrastructure Sharing (4.5)
- Pricing Resale (4.6)

4.1 Policy Issues

Mandating access stops the owner of the essential facility using its market power to control supply and regulated access pricing stops it using its market power to control the price. In trying to support competitive processes, regulated access pricing seeks to achieve three forms of economic efficiency:

- Allocative efficiency so that resources, products, and services are allocated to the person or persons who value them the most.
- Productive efficiency so that market participants use scarce resources as productively as possible and the most efficient provider is not precluded from serving customers, and
- Dynamic efficiency so that all firms (entrants and incumbents) have incentives to invest in technologies that reduce costs and/or expand product offerings.

It is unlikely that all these can be achieved simultaneously. More importance has been given to dynamic efficiency as the policy focus has shifted from opening access to existing copper networks to encouraging investment in fibre networks.

In addition, there are social objectives. Historically, many incumbent operators have maintained high prices for long distance and international services, and used the proceeds to support below-cost prices for basic services. This was made possible by statutory monopoly and allowed the wide-spread adoption of affordable telephone service. However, with the introduction of competition for calls these cross-subsidies became unsustainable.

Among the policy challenges in moving to digital networks,

- the relative prices of wholesale services may affect the transition from copper to fibre and consistency among them is essential. Take-up of fibre access has been slow where it has to compete with copper access services which have low regulated prices

- off-setting the above, as users move off copper to fibre, cable and mobile services the unit costs of copper and consequently access prices increase; which raises affordability concerns for the users left on copper
- the migration to IP Interconnection raises transitional issues and there is no consensus yet on how to price digital interconnection

Fibre presents a new challenge for policy. Operators are facing potentially significant investment costs to upgrade existing infrastructure to keep up with technological change. However, revenues for new broadband services are uncertain and existing revenue streams are threatened by ‘over-the-top’ services. The most certain source of revenue is retail access pricing – and that is threatened by open access and increasingly capable mobile broadband.

4.2 Key Concepts

Broadly, the key concepts in the regulator’s access pricing tool kit are:

- **Cost oriented prices** (4.2.1) - as required by the WTO Reference Paper which can be developed from bottom-up or top-down cost models or from benchmarking rates in similar countries who have used cost models.
- **Cost models** (4.2.2) - bottom-up costing for LRIC (long-run incremental costs) where a firm prices in such a way as to cover only the incremental costs of the product (ie the product’s LRIC), sales of that product make no contribution to the firm’s common costs.
- **Regulatory accounting** (4.2.3) - top-down costing associated with FDC (fully distributed costs) where all costs, including joint and common costs, are fully allocated to all the operator’s services/products according to a specified distribution/allocation key
- **Benchmarking** (4.2.4) – compares access prices across a peer group of countries to determine what price would be reasonable.

4.2.1 Cost Based Prices

Regulated pricing is needed where an unconstrained provider of an essential facility could exploit its position to charge well above cost. Regulation is a proxy for competition which tends to drive prices towards cost. But cost is a flexible concept.

The WTO Reference Paper requires “cost-oriented rates that are transparent, reasonable, having regard to economic feasibility”. This leaves a wide degree of flexibility in how to define and measure cost-oriented prices. How it is interpreted in practice is a combination of national guidelines and case law.

The two main options are the [Bottom-Up](#) and [Top-Down](#) costing approaches. Some regulators use a hybrid of these by taking account of actually incurred costs adjusted for efficiency. Both costing approaches are demanding for a small, developing country with limited resources. A cheaper alternative is [benchmarking](#).

Bearing in mind that the object of pricing regulation is to produce what be expected in [competitive markets](#), contestable market theory suggests outcomes will lie between a range with the ceiling defined by stand-alone cost and a floor defined by long-run incremental cost.

4.2.2 Cost Models

Bottom-up cost models are favoured by many regulators because they reduce reliance on information provided by the incumbent; a necessary feature of top-down models, even when the accounting framework is specified by the regulator.

Bottom-up models for fibre access are appropriate because they are new. Assuming fibre networks are built in an efficient manner, operators can be fully compensated for their construction at today's prices.

The bottom-up approach develops the cost model on the basis of the expected demand in terms of subscribers and traffic and sets the network design and estimates the related costs on the basis of a network engineering model⁹.

Some regulators have become disenchanted with bottom-up costing models because they essentially rebuild the network from scratch each time the access price is reviewed and each time the models and their many assumptions are contested.

4.2.3 Regulatory Accounting

Top-down modelling attempts to measure LRIC starting from the firm's actual costs as set out in its accounts. This method does not involve detailed network modelling. Instead, a top-down model separates the firm's assets and costs into service groups, and then adds the extra costs associated with interconnection to arrive at an estimate of LRIC.

Top-down modelling uses the firm's current operating costs and either historic cost accounting (HCA, which HCA reflects the cost at the time of purchasing the asset) or current cost accounting (CCA, where network assets are valued at replacement costs). Normally regulators would be expected to use either HCA or CCA and not mix the two approaches. In practice, some regulators recognize that those assets which cannot be economically replaced (such as for example ducts) must not necessarily be valued at their full replacement costs.

4.2.4 Benchmarking

Both bottom-up and top-down cost models are complex to develop and lead to uncertain outcomes. In some markets the detailed information required may not be available. A more practical alternative to developing cost models for a developing country with limited resources is benchmarking.

Benchmarking has two main purposes in interconnection pricing. In situations where detailed cost models can be estimated, benchmarking can be used as a common sense check on the results of the modelling. Alternatively, benchmarking can be used directly to set interconnection prices.

In a benchmarking exercise, adjustments need to be made for differences among jurisdictions, for example population density, local area size, extent of urbanisation, traffic patterns and call durations, input prices, scale economies, exchange rates and taxes.

⁹ For a review of cost modelling issues, see Development, implementation and use of bottom-up fixed and mobile network cost models in the Kingdom of Bahrain, Position Paper, October 2011
<http://www.ictregulationtoolkit.org/en/Publication.3990.html>

4.3 Pricing Interconnection

With the exception of countries using 'receiving party network pays' (RPNP) for calls to mobile networks, in the switched interconnection context the main basis for pricing originating and terminating access has been some form of LRIC; determined from bottom-up or top-down cost models (or benchmarking countries that do either or both).

The exception (RPNP) uses Bill and Keep (BAK) where the calling party's network retains whatever revenue it raises through retail usage charges. One advantage of a bill and keep policy is that it can be adopted quickly without the need to employ a cost analysis.

Except for RPNP, pricing interconnection becomes problematic in an IP environment because many parties can be involved in handling any packet. BAK looks very similar to internet [peering](#), so it has been suggested that pricing IP interconnection will converge on BAK¹⁰. This makes BAK look attractive except for mobile operators in countries with 'calling party network pays' because they have enjoyed high termination rates.

However, there are a couple of problems with BAK. First, it does not address the leakage of revenues that comes from the de-layering of the industry. BAK assumes there is some reciprocity: *'You can keep revenues from your customers and so shall I'*. But, 'over-the-top' service providers like Skype get to BAK without having a network and making no direct contribution to any networks its customers use. Indirectly, Skype's customers pay their respective network provider for data traffic they generate using Skype services. Such leakage could increase the risks of investing in broadband networks.

Second, while vertically-integrated network operators can BAK retail customers with managed IP voice and SMS services enabling them to maintain a premium over services delivered over 'best-efforts' internet (like Skype), the options for wholesale-only network operators are more limited. The options are discussed in the next section.

4.4 Pricing Unbundled Access

Regulating unbundled access has traditionally been done in the context of fixed copper networks and priced to some form of LRIC. Models have been used to calculate the LRIC costs of unbundled local loop, line sharing and transmission (both access tails and transmission links).

The approach to pricing access on fibre networks is still evolving to deal with both the different kinds of access products required (eg bitstream access and sub-loop) and the different level of risk associated compared with copper networks.

At the same time as adjusting for risk, the relativity between access prices for copper networks and fibre networks has to be managed as this will affect the transition to fibre networks. And, the price relativity between different kinds of access products on each access platform will affect investment choices.

¹⁰ European Union: BEREC, Next Generation Networks Future Charging Mechanisms / Long Term Termination Issues, June 2010 <http://www.ictregulationtoolkit.org/en/Publication.3977.html> is an economic assessment of the merits of Bill-and-Keep for pricing in NGN networks.

On legacy copper networks, regulated access prices tended to be per month or per unit of capacity. This may no longer be appropriate on fibre access networks with fast growth in traffic volumes. It puts the onus on the access provider to increase the capacity of the network to handle extra traffic without a proportionate contribution towards the cost of doing that. Ultimately at the wholesale level, a monthly fixed fee for each access line plus a charge per GB for total volume downloaded across those lines may become a best practice option.

Another reason for moving in this direction is that both mobile and fixed broadband networks have had content and carriage effectively unbundled by the de-layering of the industry brought about by digitising networks. The network operators' responses and the regulator's role in this development are discussed in [Section 5](#).

4.5 Pricing Infrastructure Sharing

There is a general consensus that infrastructure sharing should be based on cost-oriented pricing and open access models. Countries have differed, however, on the approach taken to establishing costs.

4.6 Pricing Resale

The generally accepted price rule for resold services is 'retail minus avoided retail costs' (RMAC). Under this rule, the price paid by resellers is equal to the providing firm's retail price of the service less its cost of retailing functions avoided with resale.

RMAC is equivalent to the Efficient Component Pricing Rule (ECPR) also known as the Baumol-Willig access pricing rule which says that the marginal costs of access include not only the direct costs but also the 'opportunity costs'.

An issue with RMAC is that comparisons between retail services and wholesale services are complicated because retail business units do not necessarily use the same cost elements, in the same quantities, in the same geographic areas and for the same end-users as wholesale customers.

5 Regulating 'Over-the-Top' Services

Internet telephony, or "Voice over the Internet Protocol" (VoIP), is the first 'over-the-top' (OTT) service with major implications for the business models of both fixed and mobile network operators. More recently, text messages (SMS) have also been delivered OTT affecting the revenues of fixed and mobile operators.

OTT services are enabled by the [de-layering](#) of the industry. IP has separated carriage from content and allowed 'over-the-top' content and applications providers to deal directly with end users over networks whose owners and operators are excluded from these transactions. The move to LTE's all-IP architecture will create a more open environment for these OTT providers and third party services.

It is not only telecommunications that is affected. Internet television over broadband fixed and mobile networks is de-stabilising existing broadcasting industries.

In the following sections, we look at the policy issues raised by VoIP and other OTT services and the new concepts that apply before turning to regulatory options for managing VoIP and other OTT se

- Policy Issues (5.1)
- Key Concepts (5.2)
- VoIP (5.3)
- Other OTT services (5.4)

5.1 Policy Issues

Proliferation of content and applications services is to be welcomed – they add utility for users. Some new ‘over-the-top’ (OTT) services did not previously exist and do not undermine the current operator business models (eg location-based GPS mobile services). Some new OTT services may threaten the economics of investing in fast broadband networks and (eg internet television).

But, change is inevitable. As network operators migrate to next generation networks, voice services will become software applications riding over the network. During this transition, policy-makers are finding different paths to balancing innovation, investment and competition.

Regulators cannot hold back the tide of changes to maintain the status quo. To a large extent, existing operators are able to change their business models to stay afloat. For example, OTT services manifest themselves on networks as traffic. If network builders and operators align revenue models more with traffic, their financial position is more secure.

5.2 Key Concepts

VoIP has been around for a number of years but there are several other ‘over-the-top’ (OTT) concepts that will become increasingly important. The concepts are all the product of the digitisation of fixed and mobile networks. Key concepts include:

- [VoIP](#) (5.3) - also known as voice-over-broadband (VOB) or internet telephony takes a number of different forms.
- **SMS** (5.4) – the short message service (texting) has been a very lucrative business for fixed and mobile operators.
- **Applications (Apps)** (5.4) –carried over the data part of mobile service.
- **Cloud Services** (5.4) - The general idea of the ‘cloud’ is to store your media on the internet so you can access it from any device anywhere.
- **Internet Television** (5.4) –delivered over the top of the Internet Service (ISP) provider’s network.

5.3 VoIP

VoIP is the first of the apps enabled by IP to threaten traditional telecommunications business models because they depended on voice revenues (and mostly still do). In the future voice telephony will migrate completely from circuit switched telephony to VoIP. Once this happens, Internet interconnection and pricing models may replace the current arrangements. Until that

happens, VoIP network operators will need to interconnect with incumbent network operators' PSTNs.

Despite its limitations, users increasingly view VoIP as 'functionally equivalent' to conventional telephone service¹¹. The quality of VoIP has improved and users can now obtain a PSTN telephone number and receive calls originated on the PSTN. Technical and consumer protection aspects are discussed in [regulatory implications of VoIP](#).

The ability of mobile broadband users to access Skype using iPhones led certain European operators to block Skype access over their networks to prevent loss of revenues. Regulators are now beginning to stop such practices on the basis that it is inconsistent with [net neutrality](#).

Wireless networks will have a substantial impact on VoIP service development, particularly in developing countries. As wireless and VoIP traffic increase, differences in the terms and conditions under which wireline, wireless and VoIP operators interconnect networks will create opportunities for [arbitrage](#) and distort markets.

5.4 Other 'Over-the-Top' Services

There are a number of other OTT services apart from VoIP that have been enabled by IP and which all have significant implications for market developments. They may pose a challenge for existing providers but do not seem to be as challenging for regulators as VoIP.

While network quality is a major constraint to some OTT voice applications, SMS applications are less reliant on QOS, due to them using less data and having a higher tolerance for latency.

Cloud services allow computers and mobile devices to seamlessly and silently upload files to one master location. Now, instead of consuming no bandwidth when syncing 100 MB of photos back to a computer, cloud syncing uses 100 MB of data when uploading data and then an additional 100 MB downloading to each device connected to the cloud. There are no clear issues yet for competition and pricing and any that emerge are likely to be addressed first in developed markets.

Video was the 'killer app' that prompted the building of cable and broadband networks. The network builders assumed they would be the providers of the content. But the impetus for delivering content over broadband is now coming from non-traditional sources that do not build the networks they rely on. Not only have the builders of networks been deprived of the revenues that they expected out of video but also they have to augment their networks to keep-up with the growth in video traffic; on which they earn very little. But regulators do not want to stifle innovation across content and devices. Carriers will have to adapt their business and pricing models.

6. Mobile and Wireless Network Regulation

Mobiles have been a spectacularly successful communications technology in both developed and developing countries. Most markets can support mobile competition. Also, mobile is the best way to extend telephone service in developing countries because mobile infrastructure is cheaper to deploy

¹¹ See GSR 2009 Discussion Paper, Voice over Internet Protocol (VoIP): Enemy or Ally? <http://www.ictregulationtoolkit.org/en/Publication.3831.html>

than fixed networks. Compared with the fixed network, regulation of mobile competition and pricing is light because competition makes regulation less necessary.

Wireless networks share many of the same competition and pricing issues as the fixed network and examples of mobiles have been used in previous sections. In this section, we focus on issues which are specific to wireless and mobile networks. Where specific issues are covered in depth in other Modules, we shall touch only on how they affect competition and pricing.

In this section we shall explore:

- **Policy Issues** (6.1)
- **Key Concepts** (6.2)
- **Spectrum Policy** (6.3)
- **Interconnection** (6.4)
- **Roaming** (6.5)
- **Infrastructure Sharing** (6.6)
- **Enhancing Competition** (6.7)

The important guiding principle emerging from these topics is that regulation should neither dictate users' preferences nor interfere with the flood of innovation flowing through mobiles.

6.1 Policy Issues

There are a number of policy issues with aspects specific to mobiles:

- **Spectrum Policy** (6.3)
- **Interconnection** (6.4)
- **Roaming** (6.5)
- **Infrastructure Sharing** (6.6)
- **Enhancing Competition** (6.7)

Mobile and other wireless services are becoming effective substitutes for fixed telecommunications services for some users. An open question is whether the success of mobiles will hinder the development of fixed broadband services. It probably does not matter if fixed services are available to businesses in cities and residential customers find mobile broadband adequate.

As with the fixed network, [digitisation](#) is presenting mobile operators with the same challenge to traditional business models.

Policy makers have been generally sympathetic to infrastructure sharing where mobile operators seek to share the extra sites required to migrate to new technologies and accommodate increased traffic.

Unbundling of the kind seen on fixed networks has not generally been applied to mobile networks. Mobile operators have not been obliged to accommodate call competition with carrier or call selection and the nearest equivalent to unbundled local loop and bitstream access, which is the MVNO (6.6), is not usually mandated.

6.2 Key Concepts

A key difference between fixed and mobile networks is the technology used in the customer access network. The fixed network uses copper or fibre (or both) to provide wired connections. Mobiles use radio spectrum to connect the end-user; mobiles are 'wireless access lines'.

- **Spectrum** (6.3)
- **Interconnection** (6.4) is similar to the fixed network except where RPNP applies.
- **BAK** (6.4) or 'bill and keep' is associated with RPNP and is similar to **peering** (3.1.2) in the internet.
- **SIM** (6.7) (Subscriber Identity Module) card is used in all GSM mobiles. Multiple SIM cards allow the same phone to be used on different networks.
- **MVNO** (Mobile Virtual Network Operator) is a form of **infrastructure sharing** (6.6) used by entrants without spectrum and using varying amounts of other capacity.

6.3 Spectrum Policy

Mobile's need for spectrum is a direct result of the growth in data services; in particular, video which takes up a lot of bandwidth¹². In developed countries, access to spectrum for mobiles is more of an issue than for developing countries where making spectrum available in developing countries may be less costly and is typically used less intensively.

In the US and Europe a major source is the spectrum released in the migration from analogue to digital television; the **digital dividend**. More recently, there has also been interest in making more effective use of broadcast television spectrum with the US being the first country to allow the unlicensed use of **white spaces**.

6.4 Interconnection

The interconnection issues associated with mobiles depend on which of two charging regimes apply. Most countries use Calling Party Network Pays (CPNP) but a few countries apply Receiving Party Network Pays (RPNP) which allows for bill and keep (BAK) payment systems where there are no inter-operator payments (end users at each of the call may pay a fee to their respective operators).

IP interconnection will eventually replace switched interconnection as new mobile technologies are data-centric and data traffic is becoming more significant than voice traffic. The transition will be harder for operators in CPNP countries if voice interconnection rates are high because IP interconnection is very cheap.

There is no access pricing issue with RPNP because there are no wholesale termination charges. The end-user placing the call pays the operator providing the mobile phone without the operator completing the call receiving any payments (BAK).

BAK is now finding favour as a possible wholesale charging arrangement in both fixed and mobile next generation networks for IP interconnection (see sections [3.1.2](#) and [4.3](#)) because it is similar to 'peering' on the internet. This regime also reduces the amount of interconnection issues that a regulator has to deal with.

¹² Module 5 of the ICT Regulation Toolkit looks at spectrum policy and regulation in detail.

For CPNP countries the cost of terminating traffic on mobile networks continues to be a key regulatory issue. Both main forms of mobile termination under CPNP may be regulated:

- Fixed to Mobile call termination (F2M)
- Mobile to Mobile network call termination (M2M)

The wholesale termination rate is usually the same for both F2M and M2M; which also has to deal with text messages (SMS, short message service) and MMS (picture and video transfer). Calls to the fixed network (M2F) are usually terminated at the same rates as fixed (F2F) calls.

Where there is a large fixed network, mobile operators have used high F2M termination rates to promote mobile adoption through cheap SIM cards and handset subsidies. However, in many developing countries the fixed network is often not large so the fixed network cannot provide cross subsidies to mobile users (and is not recommended anyway).

In the Mobile to Mobile (M2M) context, mobile networks typically price on-net calls lower than (off-net) calls to other networks. If M2M termination rates are high, larger mobile networks are more likely to attract customers in a sort of 'club effect': to get cheaper calls, customers select the mobile operator that the people they call most also use. Without regulation, an operator could increase its termination rate to generate more revenue without affecting its own customers. The new revenue could be used to offer deeper on-net discounts to attract more customers which then generate more incoming calls and more revenue for bigger on-net discounts and so on.

6.5 Roaming

Roaming can be domestic or international. In the case of domestic roaming, a new entrant will seek arrangements with other operators to extend coverage to its customers into areas where it has no network. Such roaming is less costly to manage than active infrastructure sharing. But it may lead to a greater degree of uniformity among operators' retail offerings.

International roaming is a monopoly like **mobile terminating access** (section 6.4) but is more complicated because of the international dimension: national regulators generally have little or no control over bi-lateral agreements between mobile operators in different countries.

6.6 Infrastructure Sharing

Generally speaking, network sharing is a useful tool for regulators and policy makers who want to encourage network deployment in unserved or under-served areas¹³. Several instruments can be used to promote network sharing. National roaming arrangements are probably the most simple and effective arrangements.

A more complex form of sharing is the mobile virtual network operator (MVNO). The types of MVNO range from resale to bulk buying:

- The resale end of the market buys the existing suite of products and services off the provider at a small discount and resells them under their own name.
- At the other end of the spectrum, the MVNO buy minutes, texts and data in bulk and provides its own SIM card to its customers.

¹³ See GSR 2008 Mobile Network Sharing <http://www.ictregulationtoolkit.org/en/Publication.3985.html>

MVNOs first appeared in Denmark, Hong Kong, Finland and the UK and today exist in over 50 countries, including most of Europe, United States, Canada, Australia and parts of Asia, and account for approximately 10% of all mobile phone subscribers around the world.

6.7 Enhancing Competition

While many markets can support mobile competition, regulation may be necessary to support the competitive process. Apart from stopping [anti-competitive conduct](#) there are some regulatory initiatives which could support a more competitive mobiles market.

A regulatory instrument that has been used extensively to promote competition in mobiles is mobile number portability (MNP). European Law treats number portability as a human. But in smaller developing countries, the benefits and costs of implementing number portability should be considered carefully. The technical options employed in large markets for MNP may be too costly for small countries and they will be overtaken by technological changes which will change how we think about numbering and customer switching.

7 Regulating Retail Prices

Before competition, price regulation was needed to correct monopolistic tendencies (i.e. restricting output and holding up prices) by the incumbent. This was usually done with rate of return regulation or with [price cap regulation](#).

With competition, the regulatory focus shifts from regulating retail prices to access prices and maybe neither (e.g. if there is effective infrastructure competition); but not both. To protect competition, the regulator may still need to act to prevent anti-competitive conduct [2]. And, there may be cases where access price regulation alone is not effective (e.g. [mobile termination](#) in CPNP countries).

This section reviews,

- **Policy Issues** (7.1)
- **Key Concepts** (7.2)
- **Price Caps** (7.3)

7.1 Policy Issues

Before the development of effective competition (e.g. state owned monopoly operators) the regulatory concern is that prices will be set substantially above cost so that the operator earns a monopoly level of profit. Wholesale prices are not relevant because there is no competition. With monopoly, the regulatory focus is on regulating retail prices to get the outcome one would expect if the market was competitive.

When regulating either access or retail prices (or both), regulators observe the principles of [economic efficiency](#) because that leads to the outcomes we expect in a competitive market. But regulators are expected to target not only economic efficiency objectives but also politically determined social equity objectives which may include:

- Managing **tariff rebalancing**: An important outcome in the transition from monopoly to competition is the elimination of **cross-subsidies** through tariff rebalancing. So, price caps, geographical averaging or other similar schemes may be introduced to support the affordability of telephone services.
- Maintaining geographically uniform prices: It costs more to provide services in rural areas than in urban areas but for political reasons it may be necessary to insist that customers pay the same in any area. This social policy presents a clear conflict with economic efficiency principles.
- Affordability: the fear that fixed services might become less affordable after tariff rebalancing has been mitigated by the rapid adoption of mobile services.

Since cross-subsidy is no longer viable, policy-makers need to find other instruments to ensure affordability. These could include direct subsidies to disadvantaged users or to operators (after competitive tenders) to fund roll-out.

7.2 Key Concepts

Key concepts include:

- **Price cap regulation** (7.3) - the regulated business is given a price cap regime (with or without consideration of the rate of return), which provides some level of incentives for operators to function efficiently and reduce costs.
- **Tariff rebalancing** (7.1) - seeks to increase access prices, and reduce prices for services that have traditionally subsidized low access prices. The objective is to ensure that the price for each service reflects the underlying cost of providing that service.

7.3 Price Caps

Many approaches have been developed to regulate prices. Price cap is one of the most widely accepted ways of price regulation. The UK was the first country to introduce price-cap retail price regulation and the first country to remove them.