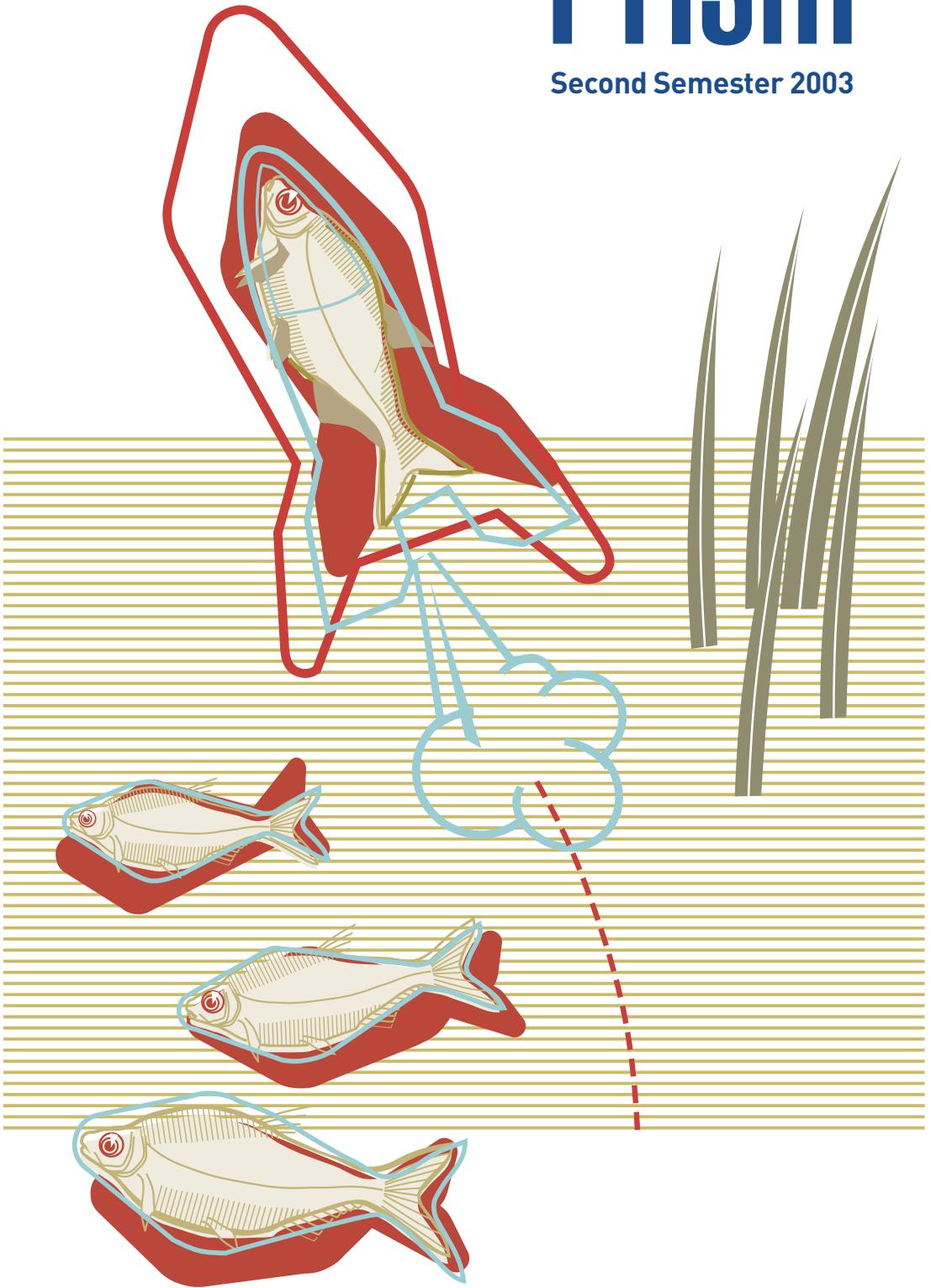


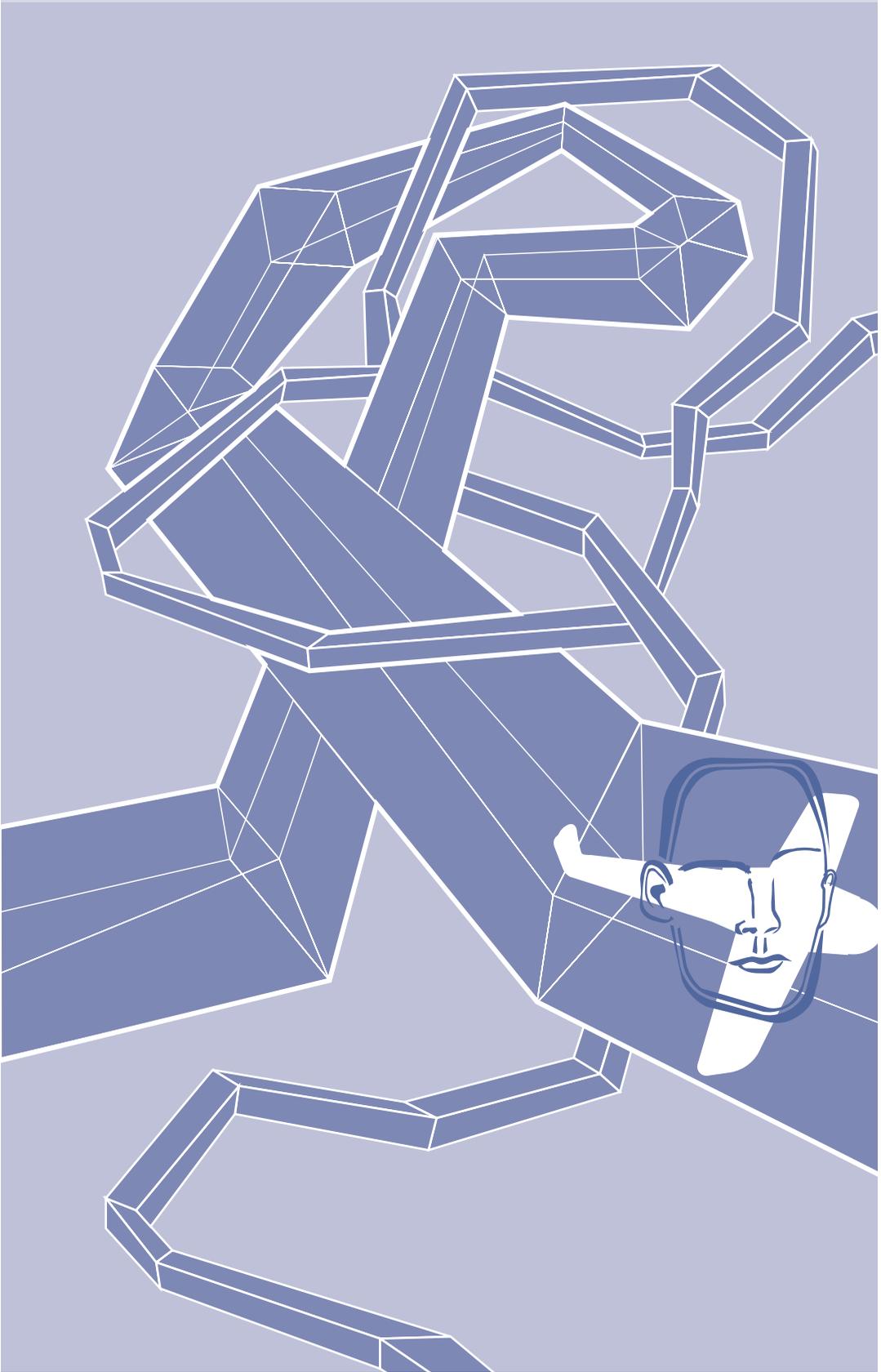
Prism

Second Semester 2003



Arthur D Little

Innovation at Work



“High Expectations, Low Profitability” – Arthur D. Little’s Global Broadband Report

Andreas Hürlimann, Nick George, and Kim Moogwi

Broadband is for telephone and cable operators the biggest hope in terms of future revenues. But while growth is rampant, few players are profitable. The heavy investments in infrastructure simply make it very hard for companies to run profitable businesses. In 2003 Arthur D. Little conducted a survey in 22 countries representing 90 percent of the worldwide broadband market to find out more about the facts behind this phenomenon. Hürlimann, George, and Moogwi discuss the results and offer advice.

Delivery of high-speed Internet access and services over high-bandwidth infrastructure (broadband) has rapidly become a defining feature of the communications landscape. Broadband is establishing itself as consumers’ preferred mode of Internet access and it represents the main engine of growth for telephone and cable operators across the world.

Its growth has been phenomenal: from the earliest deployments of the technology in the mid 1990s, total consumer expenditure on broadband is set to exceed USD 30 billion in 2003. Yet the industry is complex and players face significant challenges in getting the product and business model right, and coping with such high growth. Given significant investments in technology, services and customer acquisition, the industry to date has been characterised by low profitability.

Conducting primary and secondary research in 22 countries representing 90 percent of the worldwide market by subscribers (expected to be over 80 million subscribers at the end of 2003), Arthur D. Little set out to address three principal questions:

- How will the market for broadband develop over the next five years?
- What are today’s prevailing and expected future revenue models?
- How can current and/or new industry players become profitable?

The study incorporated perspectives from companies most actively shaping the broadband industry:

- **Content Providers** – providers of digital content on sites and platforms accessed by end-users to consume music, games, videos, etc.
- **(Access) Service Providers** – providers of broadband connectivity to consumers over cable, Digital Subscriber Line (DSL), or other high-speed network

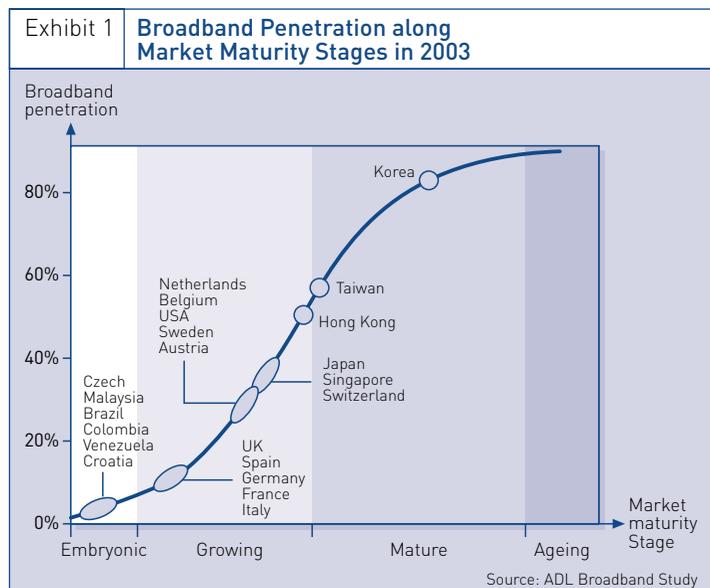
Broadband is one of the biggest growth opportunities, but companies need to find out the right business models.

infrastructure, excluding mobile technologies. We make a distinction between Network Service Providers (NSPs), who own and control the infrastructure, and pure Internet Service Providers (ISPs), who do not own the network but instead lease capacity under a wholesale arrangement.

- **Equipment Providers** – providers of modems, PC peripherals, set-top-boxes or other Customer Premises Equipment (CPE).
- **Government and Regulators** – who play a key role in determining the environment and conduct of the industry.

The Current Broadband Market

Currently expanding at double-digit rates, the broadband market is set for sustained growth in the future. As Exhibit 1 illustrates, penetration (as measured by the percentage of households with broadband access) is highest in the Asia-Pacific region, and worldwide we can see a classic “S-curve” market growth profile emerging: The global market can be characterised as High Growth, with only Korea and possibly Hong Kong having reached “Maturity”. On the current trajectory, many markets



could also see penetration approaching or exceeding 50 percent within five years. The United States, Korea and Japan combined today account for 50 percent of total worldwide subscribers. For most customers, access speeds are around 500kbits/s, with higher speeds (up to 8Mbits/s) becoming more widespread in the most developed markets.

Drivers of The Korean Broadband Success

The key ingredients of a virtuous circle involving government, industry and consumers.

Government

- Pro-active backing: e.g. National Knowledge Management Project, cyber universities, e-government.
- Effective regulation – e.g. wholesale obligation at competitive prices.

Industry

- Early launch – 1996 in Korea and Japan, two years before most European markets. Development triggered by high Cable TV penetration and cable operators' initiatives.
- Aggressive pricing (especially in comparison to narrowband) combined with a reputation for reliable and speedy (cable access) service.
- Aggressive promotion of PCs by consumer electronics manufacturers.

Consumer

- Continuous use of e-government and e-educational services.
- Locally originated content creating self-sustaining online communities.
- Migration of traditional gaming culture to highly popular online gaming.

Source: ADL Broadband Study

DSL (which uses copper telephone lines) is the most prevalent technology for delivering broadband, although in certain markets (notably the UK, US, Korea, Austria, Switzerland, Netherlands, and the emerging markets of Malaysia, Venezuela, Columbia and Brazil), cable has established an early lead. Cable operators have been more innovative than their telephony competitors in building up their networks faster and in bundling broadband with cable TV or telephone products. But the availability of DSL – the technology is usually almost ubiquitous compared to the limited cable footprint – will increase and ultimately outpace cable access.

Broadband customers like its key features: high speed, always on service and flat rate pricing.

Relative to other forms of access, customers like the key features of broadband: high speed, always on service and (generally) flat rate pricing. There is general acceptance of speeds of ~500kbit/s, sufficient to run the most popular applications (e-mail, web browsing, music and “limited-screen” video). Of today’s applications, only full-screen video really requires higher speeds and our study shows that the drive for higher speed has usually come from the operators (who perceived some competitive advantage from being the most advanced provider, or to drive higher revenues) rather than from a significant proportion of consumers.

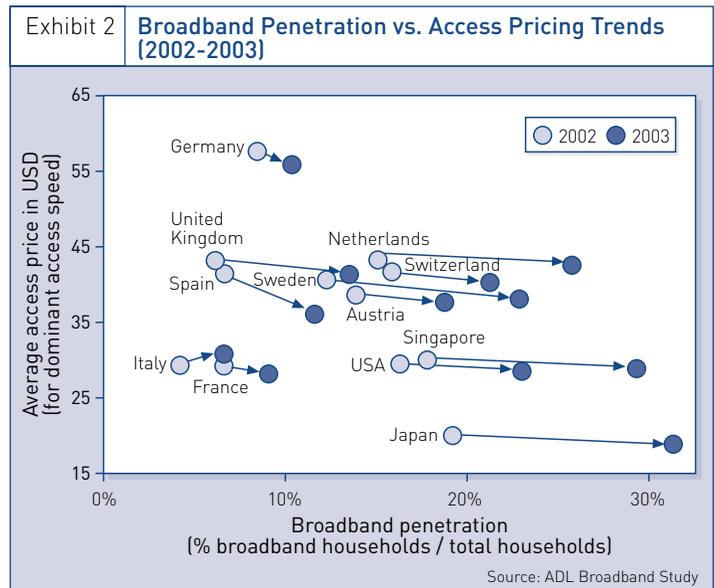
Challenges Faced by Industry Players

Despite the substantial broadband penetration growth achieved, the industry continues to face considerable challenges.

Strategic Challenge 1 (for NSPs and ISPs) – Maintaining ARPU and Margins

Today, Average Revenue Per User (ARPU) in broadband is based largely on access fees for a basic broadband subscription. In 2003, access fees are expected to account for about 85 percent of total revenues earned from broadband users. This figure is slightly down on previous years as the share of revenues earned from premium content (seven percent in 2003, from three percent in 2002) and equipment purchases/rental (eight percent in 2003, up from seven percent in 2002) increases. However, access

still accounts for the overwhelming share of user-generated revenues.



Broadband ARPU threatens to decline while increased usage will require additional

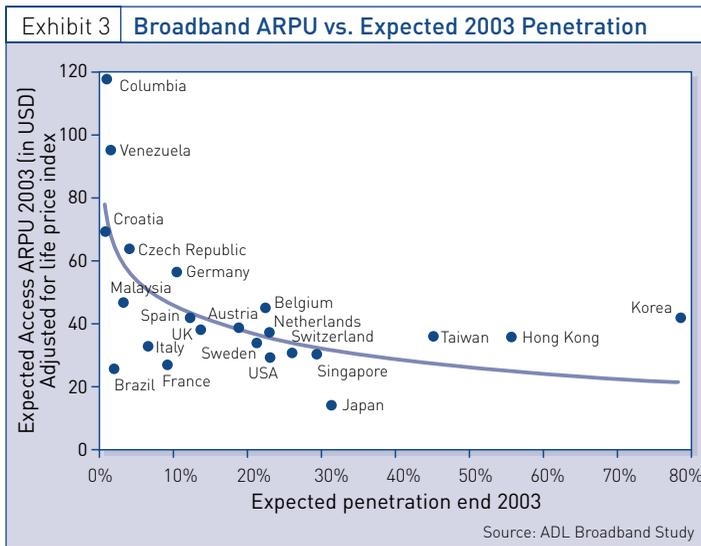
This presents a significant problem for the industry since, as markets develop, access fees have typically trended downward. As exhibit 2 shows, there was a reduction in access fees in virtually all markets between 2002 and 2003, contributing strongly to growth in these markets. The strong correlation between declining access prices and increasing penetration confronts operators in three areas:

- Declining ARPU makes it more difficult for operators to recoup the heavy costs of customer acquisition, which typically total USD 150 per customer with modem and set up and is significantly higher than for recruiting narrowband (dial-up) customers.
- Operators (NSPs or ISPs) are not generating significant revenues outside access and despite high customer usage, broadband is yet to attract significant revenue from 3rd party sources (e.g. from advertisers). Hence declining ARPU could result in a flattening of revenues as customer growth will inevitably slow down in the future.

- And since customers with broadband have a greater propensity to use high-bandwidth applications (e.g. video, games and music), operators face the need to continue to invest to upgrade their networks to maintain service levels.

ISPs are buying market share hoping for payback by leveraging the large customer base.

Exhibit 3 confirms the trend towards lower ARPU at higher penetration, and the dilemma facing operators investing in additional bandwidth. ARPU is generally lower (adjusted for purchasing power) in higher penetration markets. And although some Asia-Pacific markets appear “above trend”, this is primarily a reflection of the greater access speeds on offer (with the average price per kilobit continuing downward). Faced with this profile, operators must wonder whether the potential returns justify the substantial investment required.



NSPs and ISPs are increasingly looking to supplement revenues from basic access with additional services, in partnership with content and application providers (discussed under challenge 3 below). Currently, ISPs are “buying market share” in many markets by aggressively pricing broadband access in the expectation that the large customer base will eventually pay back their initial acquisition costs. For example, Yahoo BB in

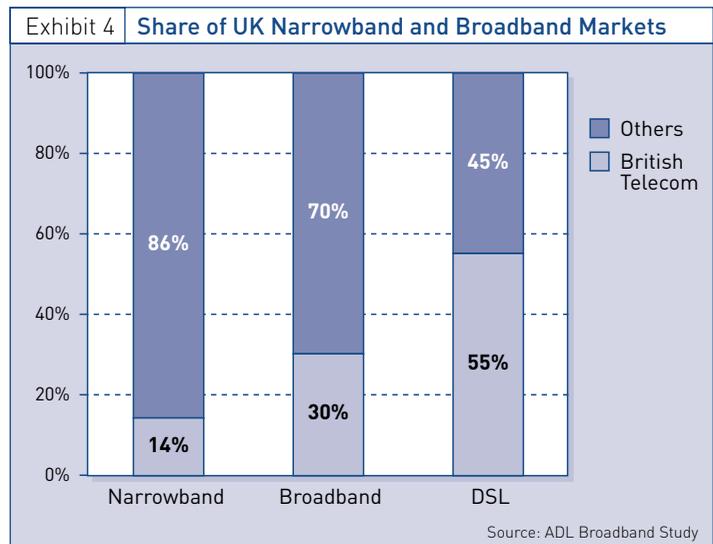
Japan has been following this aggressive market-share-strategy and “bet its continued existence” on acquiring three million subscribers it believes it can now leverage to establish a profitable business in the long-term despite the very low pricing level. We believe there is also scope to amend the prevailing “flat-rate” pricing model, including charging heavy users a premium reflecting the additional requirements generated for the network, or to reflect a guaranteed “quality of service” (e.g. successful connections and minimum access speeds). And a greater focus on

costs is required to improve margins, with operators needing to sweat assets harder to achieve profitability.

Strategic Challenge 2 (for Regulators and Alternative Providers) – Ensuring a Basis for Effective Competition in the Access Market

Control of infrastructure and wholesale products leaves many NSPs in control of the overall broadband market.

Incumbent telephone operators dominate the broadband access market, especially in Europe. The UK provides a good example of this. We estimate that by the end of 2003 British Telecom (BT) will have a market share of just below 15 percent of narrowband customers, a market in which all players are considered to have an equal chance. As exhibit 4 shows, its share of broadband will be much greater – 30 percent of the overall broadband market including cable and 55 percent of the market for DSL access. Its share continues to rise, and BT is not alone among incumbent operators. Elsewhere (e.g. Telefonica in Spain and France Telecom through its Wanadoo subsidiary), incumbents account for over 50 percent of their home broadband market.



Without strict regulatory controls, dominance by the incumbents is not surprising since they determine both timing and extent of network upgrades required to support broadband service. They also set the wholesale price and hence to a significant extent can determine their competitors' margin (wholesale access can account for

over 50 percent of the retail price charged by most ISPs). Since costs of customer acquisition, set up and service are typically higher for broadband, independent ISPs find it extremely difficult to make an overall margin, but they have few, if any, alternatives for wholesale access. This stems from a failure in many markets to fully implement an “unbundling” of the local loop (LLU), bit-stream access or to establish an infrastructure competition with the corresponding wholesale offer. There are clear correlations between competition among infrastructure providers, high broadband penetration and relative low access prices. In the most highly penetrated market Korea, Hanaro Telecom, Thrunet, Dacom, Onse and Dreamline all compete with KoreaTelecom via cable, DSL, LAN and wireless networks.

Regulators must ensure competition in a market tending towards oligopoly.

European regulators face an important challenge with broadband to ensure that competition is maintained long-term. They must push for lower wholesale prices as demanded by independent ISPs. However, the ISPs themselves also need to demonstrate greater discipline on pricing. To date, where wholesale prices have been reduced, ISPs have also looked to reduce retail prices, maintaining low margins.

Strategic Challenge 3 (for Content Providers) – Extract More Value from a Rapidly Expanding New Distribution Channel

As we described above, premium content or other value added services account for only a small proportion (about seven percent) of total customer spending on broadband.

Content providers report significantly increased usage as customers migrate from narrowband to broadband. Usage levels in broadband households are typically about two hours a day – more than twice narrowband usage levels, and approaching TV viewing levels (typically about three and a half hours a day). The “always on” and flat rate pricing features of broadband are undoubtedly key drivers of usage, but the customer experience while online is also strongly enhanced by the higher access speeds. In the highly developed markets of the Asia-Pacific region, users and publishers are increasingly publishing “web-

Even in Asia-Pacific translating usage into revenue has proven challenging.

ready” content to target the large broadband customer base and are exploiting strong local gaming traditions to build revenue models. Local and national e-government programmes (e.g. Korea’s National Knowledge Management Project) are playing an important role in migrating communications and reference material online, which is important in building momentum for greater Internet – and with it broadband – access.

Broadband represents one of the fastest growing new markets for content providers, but translating usage into revenue has proved challenging. Premium content for broadband has faced a number of important hurdles, although some are now being addressed:

- **Technology and cost considerations in delivering high-resolution services.** Although there remain issues for delivery of full-screen video, broadband access speeds are now generally sufficient to support most types of streamed content. But the cost of new streaming services is still high, increasing the uncertainty among content providers over the commercial viability of this channel.
- **Customer expectations for “free content”, inherited from narrowband Internet.** Most content is still delivered free of charge to the end-user. Although users are now comfortable with online payment mechanisms, expectations are still firmly based on free content, with widespread copying and pirate material available. With low rates of subscription (content provider’s preferred charging model) for broadband content services, providers have had to innovate and reduce the “entry hurdle” to premium, e.g. making material available on a pay-per-play basis. Over time, better encryption and digital rights management are expected to facilitate growth of the premium content market.
- **Cultural perspectives: the TV as the principal source of multimedia entertainment.** To date, consumption of broadband has not successfully migrated from the PC to the TV. In time this may represent an opportunity for both content providers and manufacturers of equipment, migrating the typically “lean forward”

services and equipment for the home office to incorporate the “lean back” aspects of TV viewing, consistent with mainstream consumption of digital content and entertainment. But providers today are still on the learning curve, with most admitting their current offerings are “trials” or “first generation”.

- **Channel Conflicts: Optimising the distribution mix.** But perhaps above all, content providers face the challenge of growing revenues from broadband while avoiding cannibalising existing markets (e.g. CD or DVD sales). Piracy remains a key concern, but more broadly providers fear a dampening effect on sales of other formats. But rather than offering “like-for-like” services which pose a significant risk of cannibalising other revenues, we believe broadband can best be positioned as complementary to other channels, e.g. targeting broadband users in viral marketing campaigns to promote new releases, or extending a franchise brand through material not available elsewhere.

We expect content providers to overcome their initial hesitation and increasingly embrace broadband alongside other media. We also expect content providers increasingly to distribute content directly to end users, without going through an intermediary or partner. Some content providers initially sought to offer services mainly in partnership with ISPs (e.g. with T-Online in Germany) that offer managed links and streaming services, and in so doing reducing their investment in hosting and delivery infrastructure and securing some marketing support. However, as the market builds, providers will offer and bill their services direct to the customer (e.g. BSkyB in the UK, with its skysports.com subscription service), excluding the ISP or NSP from any share of revenues. In such circumstances, we believe broadband represents an important and viable new market for content providers, with significant benefits likely for early movers.

Content providers will overcome their caution and potentially realise revenue directly from consumers, bypassing the access providers.

Strategic Challenge 4: For CPE Providers, How to Build Added Value as the Market Matures?

Competition among providers of customer premises equipment (CPE) for broadband access has been fierce. The proportion of customer spend on CPE that we highlighted earlier (eight percent of total ARPU) is relatively low, for two reasons:

CPE prices have fallen. Manufacturers are now looking to increase the functionality offered to enable greater value-added functionality.

- Part of the total CPE costs are absorbed by operator subsidies and hence reflected in their costs of customer acquisition. They range from 50 percent up to full absorption of CPE costs.
- Furthermore, CPE prices have been falling, driven down by competition for market share among providers, and by the strong purchasing power of ISPs and NSPs who place large orders for equipment to offer them to their end-customers.

Furthermore, CPE prices have been falling, driven down by competition for market share among providers and by the strong purchasing power of ISP and NSP customers, who place large orders for equipment to offer them to their end-customers.

Falling prices, ease of use and interoperability of CPE have been important drivers of the broadband market. CPE manufacturers are now increasingly looking to increase the functionality offered, enabling greater value-added functionality for the “smart” home of the future. Manufacturers are looking in particular to incorporate wireless technologies that would enable control of remote devices, or enable functions such as remote monitoring and enhanced communication. Building value in this way is the best protection against a continued decline of average prices and commoditisation of the CPE market. It should also over time serve to expand the applications of broadband from the home office to living room or kitchen.

Can the Industry Deliver Profitability and Build Value?

Despite the rapid growth of customers, broadband presents risks as well as opportunities for value creation for all players, as illustrated below in exhibit 5.

Exhibit 5 Risks and Opportunities for Value Creation from Broadband		NSP	ISP	Content Provider	CPE Manufacturer
Broadband: value adding Broadband: value destroying	<ul style="list-style-type: none"> ■ New engine for growth (especially for cable and incumbent Telcos) ■ Opportunity to re-capture share of internet market lost to ISPs 	<ul style="list-style-type: none"> ■ Higher ARPU than in narrowband business ■ Opportunity to exploit revenue potential of more services ■ Attract more advertising revenue 	<ul style="list-style-type: none"> ■ New distribution channel ■ Greater usage (typically x2 narrowband), additional potential of games (x3 on broadband) 	<ul style="list-style-type: none"> ■ High growth market ■ Wireless upgrade potential ■ Premium “smarthome” technology potential 	
	<ul style="list-style-type: none"> ■ Expensive network upgrades / on-going maintenance and service issues ■ Increasing bandwidth / contention requirements ■ Regulatory intervention on wholesale and potentially LLU 	<ul style="list-style-type: none"> ■ Heavy SAC (150 \$ / customer) ■ Higher connection and on-going maintenance costs than narrowband ■ Higher wholesale costs, lower margins than narrowband ■ Margin on reselling capacity consistently competed away ■ Lost kick-backs on dial-up minutes 	<ul style="list-style-type: none"> ■ Highly fragmented market ■ Risk of piracy ■ Conflicts with off-line channels possible – partnerships critical ■ Fragmented new market ■ Culture of “free” inherited from narrowband 	<ul style="list-style-type: none"> ■ Fiercely competitive, low margins ■ IT equipment and software competes with traditional consumer electronics 	

Source: ADL Broadband Study

Considering the pure broadband operations, NSPs are the players closest to achieving profitability.

Broadband also presents a challenge for investors, with few “pure play” opportunities to invest in broadband businesses, since providers of broadband access, services or equipment are often part of much larger organisations. In the absence of reliable benchmarks, valuing broadband is very difficult. Investors have in the past attributed the highest price/earnings multiples to content and equipment providers, with NSPs trading on less aggressive multiples. However, it seems that for their purely broadband operations, it may be the NSPs that are closest of all players to achieving profitability.

Insights for the Executive

We conclude this summary by offering some perspectives on the evolution towards profitable broadband and potential courses of action for industry players:

- We believe telco-based NSPs are likely to realise profitability in their broadband operations. In the Asia-Pacific region, the leading operators are starting to report profitability and the majority of US and European NSPs expect to do so from 2006 onwards. We consider this group most likely to maintain profitable operations, on account of their high retail market share and dominance of wholesale access provision. The principal risk would appear to come from the regulators, through mandating lower wholesale rates or LLU. NSPs must develop a business-led investment strategy for future infrastructure upgrades as customer demand for access bandwidth continues to increase. At the same time, future revenue opportunities, such as providing business support services to partners, must be assessed while maintaining low-cost broadband operations.
- For content players, the ball is very much in their own court. They have a very strong position and are presented with a rapidly expanding new digital distribution channel. However, the need to overcome their initial caution over piracy and cannibalising other channels necessitates both sound channel strategies as well as proactive partnering moves. We believe a viable premium content market can be developed as the market continues to expand, aided by better encryption and rights management systems. But providers need to be clever in promoting broadband as a complementary rather than alternative distribution channel. In the current climate advertising is not a reliable revenue source, although advertising may present a longer-term opportunity with further market growth.
- Leading CPE manufacturers need to extend functionality of devices to protect against commoditisation in a highly competitive market. Higher specification devices present an opportunity, potentially connecting multiple devices around the “smart” home, and offering a wider range of services for the user. Today CPE manufacturers earn low margins on modems and PC peripherals and the products are largely “plug & play” and interoperable. In absence of a product/functionality-led strategy, manufacturers strive for cost leader-

ship. Interoperability and ease-of-use are imperative in designing new devices.

- For government and regulators, the job of facilitating and policing a viable industry is only half done. Most express satisfaction with the high rates of growth currently being achieved combined with falling prices. However, the continued robustness of the industry is undermined by the current low profitability. Governments and regulators need in particular to remain vigilant for dominance by incumbent telco-backed NSPs and ensure the conditions exist for all players to compete on a fair and equal footing.
- Non-telco-aligned ISPs seem unlikely to achieve profitable broadband operations under the current market conditions. At present, their product range and pricing is heavily influenced by NSPs, and in general (despite notable exceptions such as Yahoo broadband in Japan) they have struggled to capture customers in sufficient volumes to build critical mass. They need to push national and international regulators strongly for wider or cheaper wholesale access and maintain discipline on retail prices to ensure the benefits are not simply passed on to customers. They must develop smart pricing strategies to further expand broadband usage and orientate their advertising and marketing messages away from product features and towards consumer needs. They have the greatest need to exploit new revenue sources, in particular variable access pricing or quality of service premiums. Other opportunities include bundling with services such as IP telephony, home networking, security services, etc. As we noted above, however, content providers are not willing to share content distribution revenues, and hence ISPs must offer other lowcost facilitating services, such as platform management and billing services to content providers. We expect some smaller local ISPs to fail; surviving ISPs need to build scale and expand revenue streams.

Definitions and Glossary	
ARPU	Average Revenue Per User
Broadband	Any internet access service with an always-on functionality and an access speed of at least 128Kbit/s
Broadband Coverage	The percentage of households that can potentially be connected to a certain broadband access technology without major infrastructure upgrades (also called „homes passed“)
Broadband Penetration	The percentage of households who have at least one broadband subscription to any broadband access technology (DSL, cable, etc.)
Cable	Cable-TV, mainly through coaxial cable
CAGR	Compound Annual Growth Rate
CAPEX	Capital expenditure
Churn	The percentage of customers cancelling their subscription and disconnecting from a broadband service per month
CPE	Customer Premises Equipment, e.g. telephone, modem, router or other service provider equipment
DRM	Digital Rights Management
DVD	An optical disc technology expected to rapidly replace the CD over the next few years
FTTH	Fiber to the Home
HMI	Human-Machine Interface
IP	Internet Protocol
ISP	Internet Service Providers have for a long time owned the internet customers in dial-up narrowband (e.g. AOL) and are now reselling broadband access to customers
Kbit/s, Mbit/s	Kilobits of data per second, Megabits per second
NSP	Network Service Provider owns the network and provisions broadband access to its customers
OPEX	Operational expenditure
P2P	Peer-to-Peer (e.g. Kazaa, Gnutella)
PWLAN	Public wireless LAN
SAC	Subscriber Acquisition Cost
VAS	Value-added service
VoIP	Voice over Internet Protocol
xDSL	Digital Subscriber Line is a technology for bringing high-bandwidth data to homes and small businesses over ordinary copper telephone lines. xDSL refers to different variations of DSL, such as ADSL or VDSL

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