Connected Homes

Thought Leaders

Essays from innovators

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The communications industry is undergoing massive change, and nowhere is that more evident than in the arena of consumer broadband. Virtually every service provider is attempting to capture this still-nascent but exploding market – from incumbents, alternative service providers, and cable and satellite operators to mobile and Internet portals. This selection of essays provides a look at the forces that are shaping the consumer broadband market, with the goal of helping service providers adapt to and profit from this opportunity.

Editor, Fernando Gil de Bernabé, reveals a coherent picture of the consumer broadband market, sensing the pulse of different key players in the industry, and providing insight and pragmatic views on how to succeed in this rapidly growing marketplace. Connected Homes contains views and vision from some of the most innovative executives and leading thinkers around the world. Essays cover the 'connected' home and consumer; the challenge of diversification into content and advanced communication services; how to monetise broadband services; and visionary examples of what is out there, beyond broadband.

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The Cisco Systems Internet Business Solutions Group (IBSG) helps customers transform their institutions, organisations, and businesses; create new services; and drive industry-leading change through the use of technology and process innovation. IBSG consultants offer a unique combination of in-depth industry, business and technical knowledge.

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Introduction

Consumer broadband: the path to growth and profitability*

Fernando Gil de Bernabé y Varela | Managing Director for Service Providers, Internet Business Solutions Group, EMEA, Cisco Systems, Inc

The communications industry is undergoing massive change, and nowhere is that more evident than in the arena of consumer broadband. Virtually every service provider is attempting to capture this still-nascent but exploding market – from incumbents, alternative service providers, and cable and satellite operators to mobile and Internet portals. This selection of essays provides a look at the forces that are shaping the consumer broadband market, with the goal of helping service providers adapt to and profit from this opportunity.

This book takes a snapshot of the consumer broadband market in 2004, sensing the pulse of different key players in the industry, and providing insight and pragmatic views on how to succeed in broadband. The book contains views and advice from some of the most innovative executives and leading thinkers around the world and from different participants in the value chain of consumer broadband. The book is structured into four sections with essays that cover the 'connected' home and consumer; the challenge of diversification into content and/or into advanced communication services; how to monetise broadband; and some examples of what is beyond broadband access.

Broadband is the future

Most residential customers are still using a dial-up connection to access the Internet. With the notable exception of South Korea, where an estimated 75 per cent of households have high-speed connections[1], the consumer broadband market is still in its infancy, with penetration rates in the US just slightly above 20 per cent, while Europe as a whole averages only 15 per cent[2].

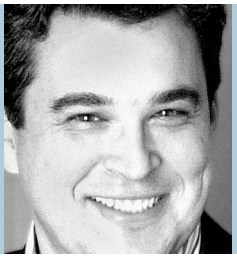
Consumer broadband provides one of the biggest and best opportunities for service providers of all types – incumbents, alternative, cable and mobile – to increase revenues and profitability. Europe and the US are expected to reach an average household penetration rate of more than 60 per cent by 2010[3]. This is good news at a time when revenues from traditional voice services are flat or declining and the ability of the telecommunications industry to even grow is being questioned.

Consumer broadband does have its challenges. Opportunities for growth are often accompanied by threats to current revenue streams. While consumer

1. Ovum South Korea Broadband Snapshot, January 2004.

2. Point Topic, April 2004; Goldman Sachs Investment Research, April 2004; Company data; Cisco IBSG analysis.

3. Company data, Cisco IBSG analysis.



*Note: this essay is an abstract of the **Cisco IBSG white paper on Consumer Broadband** available at http://www.cisco.com/go/consumerbroadband

broadband offers traditional telecommunication service providers the chance to enter the video distribution business, it also allows cable service providers to compete in the voice market. Broadband allows service providers to approximately double the average revenue per user (ARPU) in access when compared to traditional dial-up[4], but it also provides consumers with the opportunity to consolidate multiple lines for fax, voice and Internet access onto a single broadband line. Already, service providers are seeing once lucrative voice revenues erode as consumers start moving to Voice Over IP (VoIP). In Asia alone (excluding Japan) consumer VoIP revenues reached $1.7 billion in 2003 and are forecast to reach $3.4 billion by 2007[5]. And cable service providers and incumbents alike will soon face competition from pure IP-based service providers such as Yahoo!, Broadband (BB) in Japan, FastWeb in Italy and B2 in Sweden.

4. ARPU Western Europe on BB Internet access of $362 by end of 2003, versus ARPU of $185 on dial Internet access. IDC European BB Forecasts, April 2004.

5. IDC APAiC VoIP Services Forecast 2004.

Faced with these challenges, some service providers proceed cautiously, rolling out consumer broadband only when it doesn't endanger their current businesses. Some see broadband as simply a bad business to be in. One senior executive of a large European telco was heard to say in 2002 that, 'We all know that it (broadband access) is unprofitable!'[6] Many see broadband simply as an opportunity to defend their traditional voice revenues. Others are keeping broadband prices high, effectively slowing its adoption.

6. Ovum Financial Prospects for DSL, September 2003.

But this go-slow approach is often a mistake. Consumer broadband can be a very profitable business, but only if it is fully embraced. Consumer broadband drives the migration to a full IP network, and is the best reason service providers have to adopt a much-needed approach to their business. The sooner service providers migrate to a full IP network with broadband connections – 'broadband dialtone' – for every customer, the sooner these companies will be on a sustainable path to growth and profitability, becoming in the process a new kind of company: the service provider of the future.

Competing in consumer broadband is not a simple task. It requires companies to make hard choices about which segments to target, what services to offer first, how to evolve the business model, and how to change their own organisation to operate and compete more efficiently. Should telecommunications service providers focus their efforts on providing advanced broadband-enabled communications services, or should they branch out into the content business and compete directly with cable firms? Or perhaps should they do both? Should cable companies focus on broadband access and vertically integrate across the content value chain to

Credits and acknowledgements: Core members of the Cisco Consumer Broadband Initiative (the 16 month study that this essay is based on in no particular order): Mike Luke, Bill Bien, Spencer Hodson, Nick Connolly, Marco Nicosia, Niels Klussman, Gian Pablo Villamil, Michael Rabinowitz.

take advantage of the new medium, or should they focus on providing VoIP and other telecommunication services, competing even more with traditional telecommunication companies? And, how can alternative service providers take advantage of the consumer broadband opportunity to compete successfully with incumbent and cable service providers?

State of the consumer broadband market

The consumer broadband market is emerging during a time of tremendous change in the telecommunications industry. Conditions vary from country to country, but service providers around the world are experiencing many of the same trends. Taken together these trends are, for most service providers, a mixed blessing. Every piece of good news seems to be matched by a piece of bad news.

Broadband usage and spending is predicted to grow even faster, at a compound annual growth rate (CAGR) of 20.8 per cent from 2003 to 2008, and reaching over 340 million access lines by 2008[7]. However, at the other end of the spectrum, revenues from traditional fixed-line voice services continue on a downward trend, with CAGRs of minus 1.5 per cent to minus four per cent[8]. And the total number of fixed lines is now declining in both the business and consumer markets, at a rate of between minus one per cent and minus three per cent in western Europe[9].

7. IDC and Ovum Access Forecasts, March 2004.

8. IDC Worldwide Telecoms Service Forecast and Analysis 2002–2007; Cisco IBSG analysis.

9. IDC Fixed Telephony Service Forecast W. Europe 2003; Cisco IBSG analysis.

Fixed-line revenues are declining

While broadband connections are on the rise around the world, most service providers are experiencing a decline in their fixed-line business, however. This is the result of revenue erosion in the traditional voice business caused after market liberalisation coupled with an actual decline in the total number of fixed lines. In the US the number of fixed lines in both the business and residential market is declining at a precipitous rate (Figure 1). Most of the decrease is due to the increase in broadband lines and mobile phone services.

Fixed lines are declining in the United States

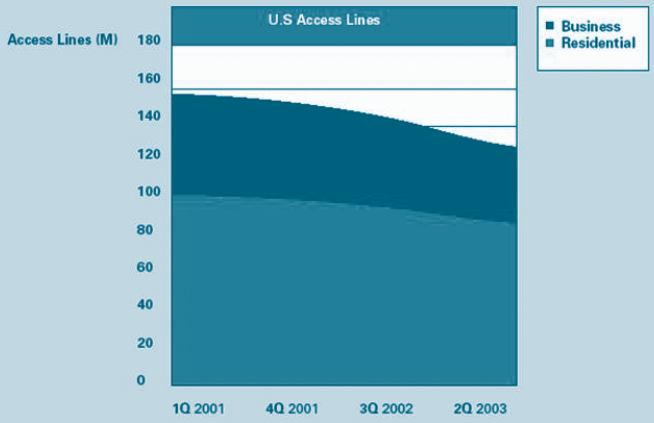


Figure 1.
Source: FCC 2003.

In Europe, the impact on the consumer fixed-line market is similar. The average amount of money spent by each household on fixed lines is expected to decline steadily between 2002 and 2007, from 237 to 207 euros per year.

Broadband connections are increasing

At the same time, broadband deployments have mushroomed over the past two to three years. Despite the economic downturn, the number of broadband subscribers worldwide grew from 33 million at the end of 2002 to 97 million at the end of 2003, and is expected to reach 140 million by the end of 2004[10]. Just as importantly, the growth was not confined to a single region, but took place around the globe (Figure 2).

10. Ovum Access forecast, March 2004.

Broadband deployments are growing rapidly worldwide

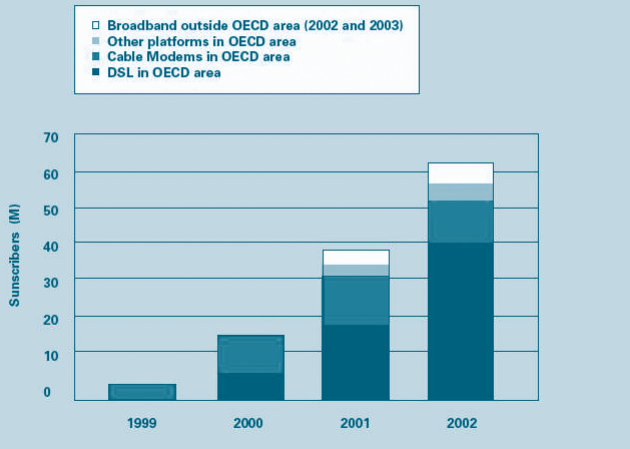


Figure 2.
Source: OECD, April 2003.

The most commonly used broadband access technology around the world is DSL, but cable accounts for slightly more than one-third of all installations. Nearly half of all broadband cable subscribers are in the US, where cable service providers have been particularly aggressive. Most market observers believe that DSL will increase its share of the worldwide broadband market in the future, and will close the difference with cable in the US as well, reaching up to 45 per cent of the total market, compared to only 30 per cent to 35 per cent today[11]. Other broadband access technologies – such as Fiber to the Home (FTTH) WiFi, WiMAX and PLC – comprised about two per cent of the total market in 2003, and will grow to as much as 10 per cent by 2008[12].

11. Company data; Morgan Stanley, October 2003; Cisco IBSG analysis.

12. ITU, September 2003; Cisco IBSG analysis.

Survey of major markets

The extent and nature of broadband connections to the home varies widely from one country or region to the next (Table 1).

Over time these dramatic differences between countries and regions will diminish. We expect that broadband penetration will reach maturity at between 60 per cent and 80 per cent of households (Figure 3). But for now each market is defined in highly distinctive ways.

Different markets, different dynamics

USA	Europe	Japan and S. Korea
• Presence and strong competition from Cable which drives ILEC transformation • Cable network upgrades already made in the 90's • High reach of cable vs. DSL • VoIP treated by the regulator as information • Initial reluctance of DSL roll-out because of cannibalisation of narrowband access plus second line business • Copper ULL for incumbents deterred further investment • High narrowband Internet access customer base • High penetration of IT in the home	• Dominance of Incumbents • ULL and co-location deregulation has not worked as expected • Traditional cable operators are returning from bankruptcy but networks are not always upgraded (exception Eastern Europe) • Reluctance to roll-out DSL due to loss of narrowband access & per minute revenue • Lower narrowband Internet and IT penetration at home • Availability of structural funds from the EU	• Broadband is seen as a 'public-good' • Opportunity to leap-frog • High penetration and usage of IT in the home. • Japan is the world's most successful market in ULL. • Yahoo! BB, a full IP Network alternative has been driving the transformation in Japan • South Korea government developed programs in mid 90s to advance the country • South Korea to spend $10 billion in fiber or VDSL to 80% of homes by 2005.

Table 1.
Source: Cisco IBSG Team analysis.

Broadband penetration – Japan, S. Korea, United States and Western Europe

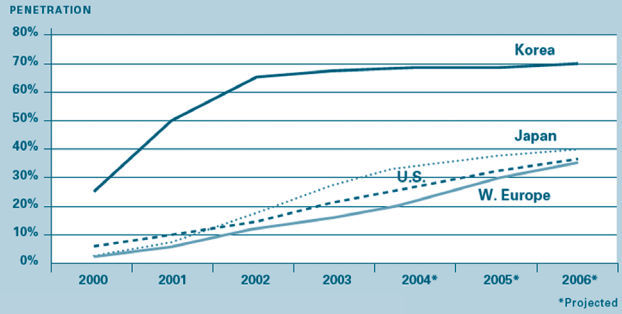


Figure 3.
Sources: Morgan Stanley, September 2002; ITU, 2003; Cisco IBSG analysis 2004.

Consumer broadband growth factors

The most important factor driving broadband growth is competition (Table 2), and the most effective competition comes from service providers using an alternate technology platform, not simply reselling the incumbent's offering. Consider what happened in Europe. Most observers might expect one of the Scandinavian countries, which typically lead in technology adoption, to have the highest rate of consumer broadband penetration, but instead it is Belgium. Belgium has both a strong incumbent service provider and two strong cable operators, UPC and Telenet, which have spurred one another to offer broadband services at competitive prices, 3 Mbps for about 39 euros[13].

13. Company data; Cisco IBSG analysis.

Six drivers of broadband growth

1. **Create strong competition, particularly from alternative technology platforms**
2. **Provide true broadband = high bandwidth**
3. **Make broadband availability (reach), at a flat and low rate**
4. **Reduce cost of equipment, provisioning and customer acquisition**
5. **Create an effective regulatory environment**
6. **Develop localised broadband-specific content**

Table 2.
Source: Cisco IBSG Team analysis.

The broadband consumer market is growing rapidly around the globe. But differences in government policies, the competitive environment, the financial health of local service providers, and demographics have meant that some countries are further along the path to becoming an information society than others.

The broadband consumer

The consumer broadband market is growing. In Europe, North America, and the developed countries in Asia, consumers continue to sign up for broadband Internet connections. Why do consumers want broadband access?

The ready answer is that people want faster downloads and uploads of files with an always-on connection at a flat monthly fee – but this is just a start.

Broadband users spend more time online

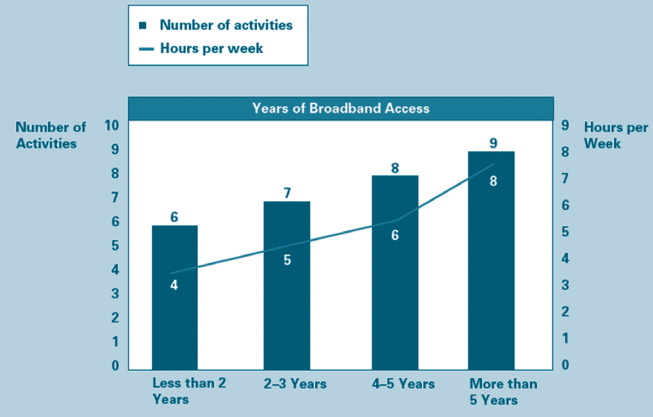


Figure 4.
Source: Stanford University, 2003.

Today's broadband consumers share several characteristics, regardless of where they live. Like their narrowband counterparts, broadband consumers use their high-speed connections to listen to music, download software, shop, send emails, play online games, book holidays, do their finances, and chat. And they do more of it. As a result, broadband consumers spend more time and do more things online than narrowband consumers (Figure 4).

Broadband promotes higher consumer telecommunications spending

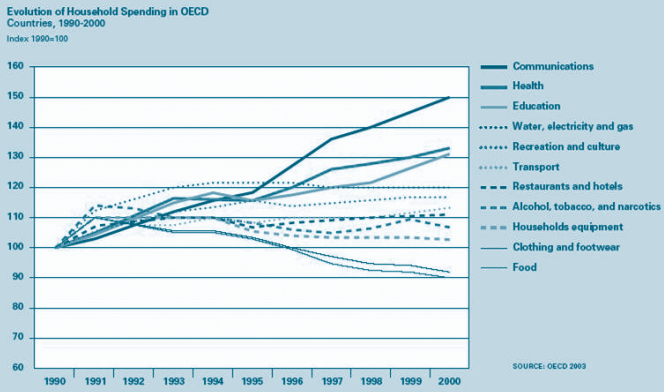


Figure 5.
Source: OECD, 2003.

The added time that consumers spend online comes at the expense of other activities, such as watching television, listening to the radio, going out dining, or reading. More than 25 per cent of broadband users say they watch less television now than they did before they had broadband[14].

14. Forrester Retail Insights, June 9, 2004.

Studies also show that broadband consumers spend more money on communication services (Figure 5), and as evidenced by the popularity of services such as Apple Computer's iTunes, they are also willing to pay money for high-value content services, should they be given the chance.

These same broadband consumers are also more likely to buy home networks to connect PCs and peripherals, and to share a high-speed Internet connection. Home networks are not only used to connect PCs and printers, but are increasingly being used to link other home digital devices such as televisions, DVD players, radios, and security systems. These and other digital devices provide a platform onto which service providers can sell value-added services (VAS).

Future VAS fall into four categories: 'Advanced Communications', 'Security and Information', 'Entertainment' and 'Home Management' (see Figure 6). It is too early to say which of these services will thrive in the next few years and the most sensible approach is to develop a portfolio that closely matches the evolving needs and wants of the broadband consumer.

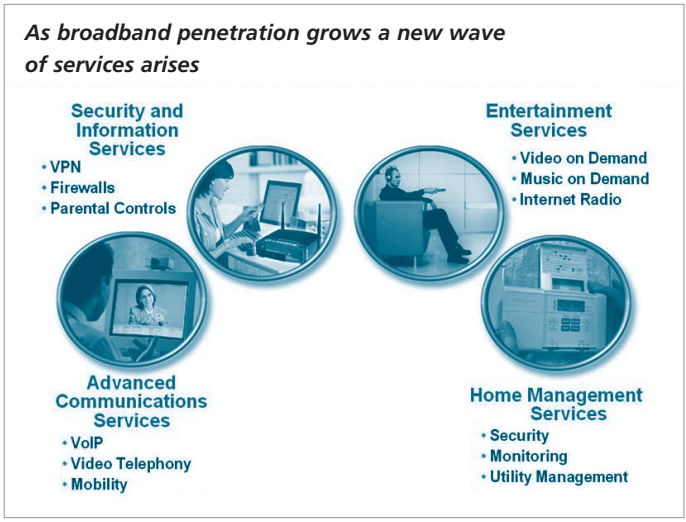


Figure 6.

Making money in broadband

Until recently, consumer broadband had a mixed reputation in the telecommunications industry. During the early phase of DSL deployment, many service providers spent hundreds and sometimes thousands of dollars on each customer – to market DSL, install the new equipment, and provision the service – money that could not be recovered in monthly charges after customer churn was factored in.

In the US, the typical capital expenditure per customer in 2000 was $630, and customer acquisition costs (equipment, marketing, and provisioning) were in excess of $400[15]. With a typical customer churn rate in excess of three per cent per month, the more customers that service providers added, the more money they lost.

But what many service providers failed to recognise is that DSL would follow the same learning and profit curves as other new businesses. Put simply, as more DSL customers are added, the incremental costs of providing the service go down, and profits go up. Today, for example, the average capital expenditure per customer has declined to about $270, and customer acquisition costs are typically below $100 and the cost of service is down to about $13. As a result, a large US incumbent can break even on a new DSL customer within one year, and turn a profit thereafter[16]. ARPUs of $30 to $40 per month are common, with gross margins higher than 60 per cent[17].

Increase penetration

The most important factor in making a profit is market penetration. Once the break-even point is reached, about a seven per cent adoption rate in Europe and a 15 per cent rate in the US, service providers can make a profit from broadband access. In Europe, the threshold is lower because of shorter local loops and higher DSL penetration[18].

15. Company Data;
Morgan Stanley Broadband Update, October 2003; Cisco IBSG analysis.

16. Company Data;
Bear, Stearns & co.Inc, DSL Report II, September 2003;
Ovum, Financial Prospects for DSL, September 2003;
Morgan Stanley, Broadband Update, October 2003; Cisco IBSG Analysis.

17. Company data;
Cisco IBSG analysis.

18. Company data;
Lehman Brothers, Wireline Services, September 2003; Goldman Sachs, DSL under a Microscope, June 2002;
Cisco IBSG analysis.

Reduce churn

Customer churn is one of the biggest problems facing service providers in competitive markets today. One of the best ways to reduce churn is to bundle services. During a recent analyst conference, BellSouth management stated that when a local or long-distance customer adds just one additional service – DSL, wireless, or dialup – churn decreases by about 45 per cent[19]. Similar results have been published by cable service providers.

19. BellSouth, Q2 2003 earnings call; Bear, Stearns & Co. Inc., DSL Report II, September 2003; Cisco IBSG analysis.

Bundling also allows service providers to lower the monthly price of broadband access without sacrificing subscriber profitability because of higher ARPU and lower churn[20]. The more services the provider offers, the longer customers tend to stay, and the more money they spend. When just one service is offered, the average life of a subscriber is 32 months. But when three services are bundled together, the average life of a subscriber doubles.

20. The Yankee Group 2003 Technologically Advanced Family (TAF) Survey, 2004.

Bundle VoIP with broadband access

Most service providers get nervous when the topic of VoIP is raised. What could be good about transitioning customers from a service they often pay for by the minute – traditional line switched voice communications in a public switched telephone network (PSTN) – to one they get for a flat fee or nearly for 'free' – VoIP? Inroads by companies such as Vonage and 8x8 in the United States, and by Skype worldwide, have already made a small dent, particularly in the long-distance and international voice market. Consumer VoIP revenues in the US are expected to grow from $700 million in 2004 to close to $10 billion by 2008[21]. In Europe, consumer IP voice revenues were $611 million in 2003 and are expected to grow to $2.1 billion by 2007[22].

21. Gartner North America Fixed Network Forecasts 2004.

22. IDC IP Voice Services Forecast 2003.

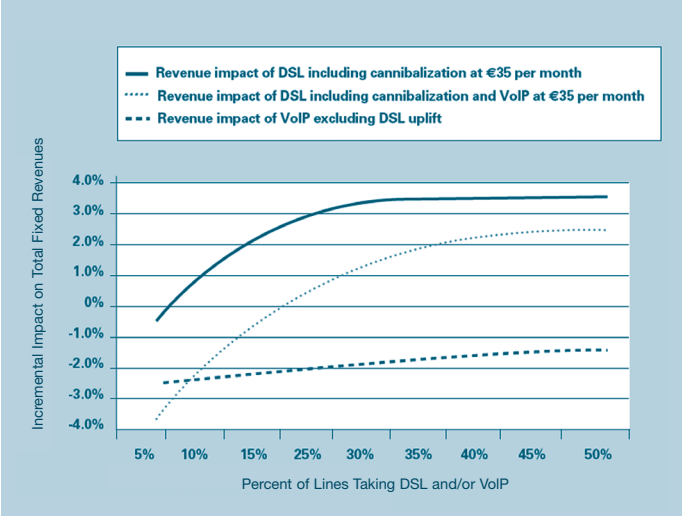


Figure 7.
Source: Oftec Data, Company Data, Lehman Brothers, September 2003.

At first look, VoIP in the consumer market does not appear particularly attractive for service providers that offer traditional voice (Figure 7). The reason it appears unattractive is because VoIP by itself has a negative impact on a service

provider's total fixed-line revenues. At 15 per cent adoption, where DSL breaks even in the USA, VoIP still shows a 2.5 to 7.8 negative impact in revenues.

This does not seem good. However, this analysis does not factor in the significant positive impact VoIP delivers through reduced churn and operating expenses. When the adoption rate reaches 15 per cent of subscriber lines, revenues, while still negative for VoIP alone, do increase at a steady rate. Combine VoIP with DSL Internet access and this becomes a good business to be in.

Converge the network to a full IP platform

Some people have argued that the benefits are greatest when an incumbent offers a combination of DSL and traditional PSTN voice. We believe that this scenario is not plausible in a competitive market since VoIP is inevitable. It is already a reality in all markets with significant growth forecast. Once a provider delivers VoIP in a market, an incumbent may not only lose the customer for broadband service, but also for traditional voice service.

Further, when all a service provider's subscribers switch to broadband, and voice is provided as an application, there will no longer be a need for a PSTN. The shift to a full IP network, which reduces the costs of operating the network infrastructure at least one order of magnitude, will cause significant changes to the financial and business model of the service provider industry. That is why broadband is driving the migration to a full IP network, and why VoIP is rapidly becoming the critical application in the adoption of broadband.

BT's recent announcement to transform its telecommunications infrastructure into a pure IP-based network by 2009 is a clear example of this trend. Matt Bross, BT's CTO, acknowledged that VoIP is seen as an opportunity, not a threat[23]. Yahoo! BB in Japan and FastWeb in Italy are examples of alternative service providers following this pathway. In the US, TWC launched a VoIP service in Maine in 2003. Comcast and AT&T have also launched VoIP services.

23. BT Press Release, June 2004.

Communications vs content: broadband strategic gameboard

The foundation of building a consumer broadband business is a fast Internet connection – such as DSL or cable modem. But that is only the start. There is a wide range of other value-added services and features that can be added on top of raw connectivity, like VoIP and home networking. The challenge is to figure out which services and features to offer and when to offer them. Some are more popular with consumers, others more profitable for service providers, and still others are just necessary. Creating a strategy for rolling out broadband services and features is critical to building a successful and profitable business.

Service providers can take two primary paths when developing a rollout strategy for consumer broadband (Figure 8). One is to offer services and features that fall under the general heading of communications, and the other is to offer services and features that fall under the general heading of content.

The strategic game board

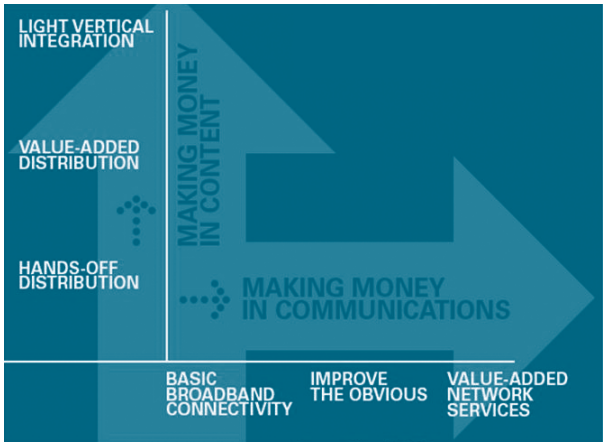


Figure 8.
Source: Cisco IBSG Team analysis.

Each approach has merit. The proponents of content claim that it is a more lucrative path, and one that allows telecommunications service providers to challenge cable service providers directly. The proponents of communications say that it is a more natural fit for telecommunications service providers that build on their existing strengths and core competencies.

Each path is described by the services offered to targeted customers, the pricing structure, the marketing strategy, the service provisioning capability, the nature of the network and the services that it enables, and the selected sales distribution channel (Figure 9).

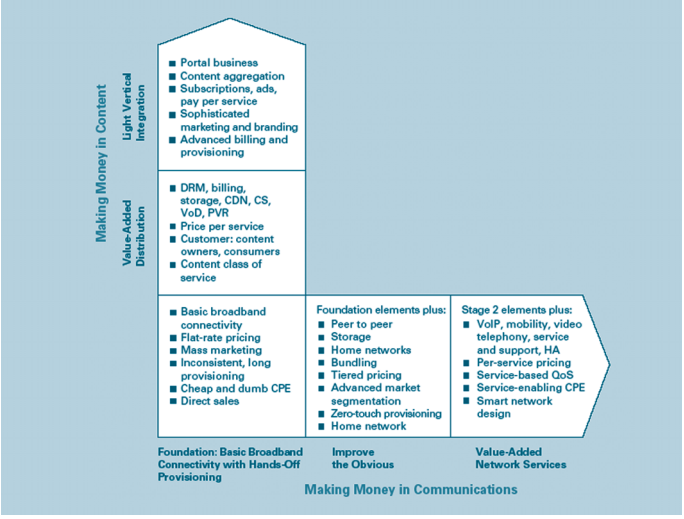


Figure 9.
Source: Cisco IBSG Team analysis.

The communications business has been and still is a larger and more profitable business than content[24]. Online paid content will total only 25 per cent of broadband access revenues over the next three years[25].

24. Content is not king; Andrew Odlyzko; AT&T Labs – Research.

25. Datamonitor, March 2003.

But can a service provider continue to make money in the long-run if it also turns to providing content? Not likely. The Internet, for the first time in the history of media, decouples the content from the platform. That is, as long as the customer has a quality broadband connection he or she can arguably get whatever content is available on the Web. We do not see the impact of this disruption yet as broadband is still in its early days, however examples such as the Apple iTunes described before should be seen as a warning sign for service providers' ambitions in making money from providing content.

Broadband strategies for service providers

Every service provider will develop its own unique strategy for tackling the consumer broadband market. These strategies will differ depending on many factors: which sector of the communications industry the company is a part of; the company's existing mix of technologies and service offerings; the regulatory and competitive environment; the culture and demographics of the customers; the company's tolerance for risk; the financial health of the company; and more (Table 3).

Imperatives for service providers

- **Get to scale on broadband**
  - **Build out broadband network capabilities**
  - **Rapidly drive penetration and take up to exploit scale, learning, utilisation economics**
- **Enter home networking market to provide platform for next generation services and protection for core business**
- **Build the service portfolio**
  - **Value added services that generate incremental margin**
- **Build more sophisticated segmentation, pricing, bundling capabilities**
  - **Reduce churn, build value**
- **Partner for content and migrate to aggregation role if possible**

Table 3.
Source: Cisco IBSG Team analysis.

Incumbents

The best consumer broadband strategy for incumbent service providers is to focus first on the same types of services they already offer – communications. There are many opportunities for new revenues and profits, and many challenges in creating the new IP networks and services, which can keep incumbent service providers busy for the next three to five years.

The content business, on the other hand, requires entirely new sets of skills, partners, and services from those that incumbent service providers are familiar with. It may still be appropriate for service providers to test or enter the content distribution business, but only after having built up strong customer franchises with their broadband communications businesses.

Incumbent service providers in non-English-speaking countries where there is little or no cable or satellite penetration should also consider offering a cable-like service to their broadband customers. In the US, incumbents such as SBC, BellSouth, and Qwest plan to resell satellite service to their customers.

Alternatives

The best strategy for alternative service providers is to turn what might otherwise be considered as weaknesses into strengths. Compared to incumbent service providers these companies are usually smaller in size, with fewer customers and less of a network infrastructure. What that allows alternative service providers to do however is to be more nimble and move faster into new markets, bringing new technologies and services to capture new customers, and lowering their operating expenses.

Alternative service providers don't have to worry as much about whether VOIP will cannibalise their existing voice business, about how to transition their old switched voice network to a new full IP network, or whether providing billing services for new content aggregators will hurt their cable subscription revenues. What alternative service providers should do is move as rapidly as possible from basic broadband services into new technologies and new services for both content and communications. The best hope they have is to change the rules of the game as rapidly as possible.

Cable

Cable service providers have the advantage of owning an existing broadband network running directly to the home. To fend off the threat from satellite video service providers, the cable service providers in the US upgraded their networks in the mid and late 1990s to provide digital quality content. Their challenge however is to begin to layer new IP-based services on top of the network. The first of these services is basic Internet access. In the US, cable companies have been quite aggressive about pursuing that market, outpacing incumbent service providers to grab the lion's share of the consumer broadband Internet access business.

But Internet access is just the beginning. Cable service providers also need to offer voice along with new digital video services, something they can do without fear of cannibalisation. Some cable companies, such as Time-Warner, have been aggressive about doing this, while others, such as NTL, have been slower.

The looming threat to the cable operator's business model – and in fact to all service providers willing to diversify into content – is the development of Internet-based content and content aggregators. What is to stop a company from developing a business modeled after Apple Computer's iTunes, but for videos? And what is to stop the NFL, MTV, or HBO from selling their offerings directly to the consumer over the Internet, bypassing the cable companies and their tariffs?

Satellite, mobile and internet portals

Satellite video service providers, meanwhile, face a long-term problem. They compete directly with cable service providers, which have wires running into every one of their customer's homes that are capable of delivering upstream and downstream broadband connectivity. With this fat pipe, cable service providers can provide a wide-range of communications and content services. By themselves, satellite video service providers can only provide downstream broadband communications. The only way they can offer two-way broadband communications and content services to consumers is by partnering with other service providers that can provide two-way broadband wired or wireless connections to the home. Incumbent service providers, with their broadband communications services, are in many ways natural partners for satellite video service providers and their high-speed content delivery infrastructure.

With the rollout of new technologies such as WiFi, WiMax, and 3G, mobile service providers are just now beginning to enter the broadband consumer market. It is one of the fastest growing segments of the consumer broadband market, albeit from a much smaller base. Most of the consumers that are purchasing wireless and mobile broadband services also have fixed broadband connections in the home. These consumers want to move seamlessly from wired to wireless, and fixed to mobile, without having to think about it. They want their same laptop to work at home, in the office, on the road or at a coffee shop. That requires service providers of various types to partner and offer these services as an integrated bundle to consumers.

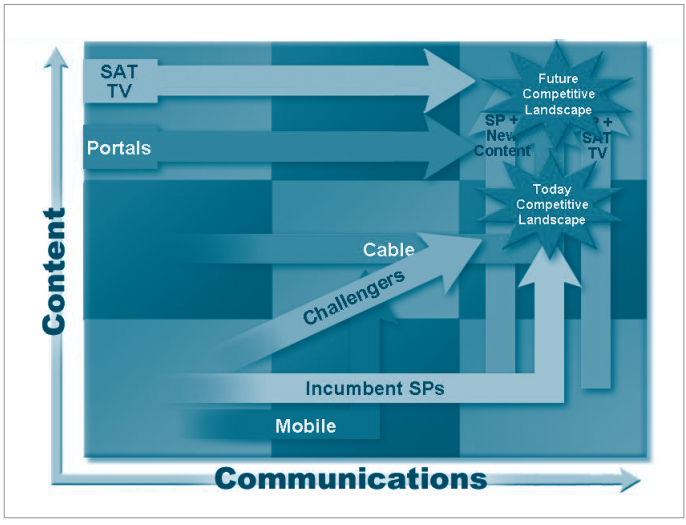


Figure 10.
Source: Cisco IBSG Team analysis.

Internet portals are not often thought of as service providers, but they are. For the most part, they do not own a great deal of physical network infrastructure. Instead, they offer their IP-based and Web-based services over the existing Internet infrastructure. In some instances, portals are actively partnering with other service providers, such as incumbents. Yahoo! has taken

this approach, partnering with SBC to brand and market consumer DSL service in the US. More partnerships between portals and other types of service providers can be expected.

In essence, a logical success strategy for most players is to leverage and stretch their core competencies and to understand the strategic and business limitations of some of the potential moves across the gameboard. NTT's DoCoMo i-mode business model is a good example of such approach.

DoCoMo developed a business and technology platform that enables third-party applications, content providers and device manufacturers to grow their business. In this model i-mode makes revenue from a number of sources, including a small commission from content and applications providers for running the i-mode platform. (see Figure 11).

i-mode Pricing

1	Monthly Fixed Rates	**$2.719 US* (tax included)**
2	Packet transmission charges per packet 1 packet = approx 128 bytes	**$0.002-0.003 US*,** ** **(tax included)**
3	Monthly i-mode information charges per site subscription	**$0.906-2.719 US* (tax included)**

* Conversion rates based on 2003 average to date (1 US Dollar = 115.87 Japanese Yen)

** ¥0.21/packet after usage in a single billing month exceeds 100,000 packets with PDC (2G) i-mode or 150,000 packets with FOMA (3G)

Figure 11.
Source: NTT DoCoMo, 2004.

DoCoMo develops and operates the telecommunications infrastructure, determining technology standards for phone terminals, and managing the framework for paid information services. This is their business domain and core competency. The i-mode business division earned US$8 billion during fiscal 2003. Over the last five years, i-mode revenues have come to represent 20 per cent of NTT DoCoMo total earnings.

Many factors therefore effect what strategy a service provider will pursue when tackling the consumer broadband market. Picking the appropriate one will play a major role in determining which service providers thrive, and which don't.

This book is organised into four sections

Section 1: explores the state of connected home and connected consumer

Bill Bodin from IBM and the Internet Home Alliance explores how, from infrastructure to mobility devices, technology is being refined to create seamless synchronisation, seamless usage and seamless access. The focus has to be on the consumer and end-to-end services. **Aldo Olivari** from Telecom Italia puts technology into an everyday life perspective by showing how connectivity is about more than just linking our house to the world; it is about connecting what is in our home. He explores a vision of the home in 2020, where household objects are connected; the service lines between them begin to blur. **Steve David** of Procter & Gamble considers changes in the relationship between manufacturers, retailers and consumers, arguing that connectivity – the addressable home and world in which everything has an IP address – requires companies, if they are to survive and prosper, to enter into a continuing dialogue with consumers. He highlights that the Internet has started to shift the balance of control of the home back to the consumer. Finally, **Paul Liao** of Panasonic discusses digitalisation and the evolution of consumer electronics (CE), the challenge of turning the connected home into a universal norm and how technology can go beyond just solving problems toward making genuine improvements in our lifestyles. Keeping it simple will be critical to succeed.

Section 2: Content vs Communications examines the opportunities and threats of two distinct paths to monetise the broadband opportunity

Andrew Odlyzko of the University of Minnesota draws on historical lessons to challenge the 'content is king' myth and affirms that the Internet is primarily a tool for person-to-person communication. He argues that the winners are impossible to predict. Not only are there formidable technical challenges to overcome, but success will often depend on politically battled standards, and, above all, on the notoriously hard to forecast decisions by consumers. **David Hulbert** from Walt Disney Television International claims that though broadband is a very exciting new communications medium it is not nearly as revolutionary as some people think. It is, after all, just another way to get into the home with lots of rich content. It provides improved communications and sharing of information. And it spawns some interesting new application genres – just as every other new form of distribution has. **Johannes Mohn** from Bertelsmann raises a number of questions and challenges, from formats and digital rights to delivery devices, that broadband and digitalisation pose to content owners and traditional distributors. Lastly, **Ashley Highfield** from BBC New Media and Technology, explains that we are witnessing a tipping point in history: as more people have digital TV than don't, and as more homes are connected to the Internet than are not. Successful media companies in this context will be those that realise that consumers want to consume media in fundamentally different and new ways.

Section 3: Making Money in Broadband shows that consumer broadband can be a profitable business. It takes a close look at the primary levers for profitability and outlines the different broadband strategies that service providers are following

Forrest Miller and **Jeff Weber** from SBC outline the relevance of integrating services over a single platform in a way that adds value for consumers. Making content available when a customer wants it – rather than when programmers choose to deliver it – will be a critical differentiator. **Pierre Danon** from BT claims that the broadband revolution enters a new phase of development as millions of homes get connected, and that we can only now start to imagine the endless possibilities of improving the quality of life of the people in those homes. **Howard Watson** from Telewest points out that cable already offers the triple proposition of digital TV, telephone and high-speed internet access, versus DSL. He believes that it won't be long before broadband-connected homes demand real time video outside normal TV requirements, such as via a home PC for entertainment or education or even public service applications, and that video content is now the major driver of demand for bandwidth. **Zhang Jia Hua** of China Telecom acknowledges that broadband service has been a major revenue growth driver for the company. He outlines that profitability is initially based on scale and price, and that the government can be a very efficient enabler or broadband adoption. **Jong-Lok Yoon** from KT looks at Korea's success as world leader in the broadband market and considers their future strategy.

Section 4: Beyond Broadband presents some of the most interesting developments beyond broadband access with industry leaders that are shaping the future of broadband today

Silvio Scaglia, founder and chairman of Italy's e.Biscom, whose pioneer FastWeb service has become a beacon for many service providers, looks at the extraordinary success story of FastWeb's 'triple-play' service and at the future potential of broadband. **Keiichi Makizono** of Softbank BB considers their position in Japan's broadband market and discusses some of the issues involved in becoming a major player in broadband-based TV. **Sanghoon Lee** of KT provides insight into KT's Beyond Broadband strategy, which is focused on providing quality life/work services over the common Internet protocol (IP) network infrastructure. **Kei-ichi Enoki** of NTT DoCoMo and responsible for the i-mode service describes an interesting model to monetize on mobile broadband. This model is based on the earlier success of the i-mode platform and I think could also apply to the wireline industry. He highlights that the future roles of wireline and mobile broadband are complementary. Finally, **Tim Kelly** from the ITU looks at the spread of broadband technology globally and points out how, in Asia, countries such as Korea and Japan are translating vision into action, and what lessons can be learned for other regions and countries worldwide.

Connected home, connected consumer

SECTION 1: CONNECTED HOME, CONNECTED CONSUMER

1

Technology to suit our lifestyle: where work and leisure are not a place

Bill Bodin | Chief Technology Officer, Internet Home Alliance and Senior Technical Staff Member (STSM), IBM, USA

Bill Bodin from IBM and the Internet Home Alliance explores how, from infrastructure to mobility devices, technology is being refined to create seamless synchronisation, seamless usage and seamless access.

Figure 1. Bill Bodin at the control centre at IBM's Pervasive Computing Advanced Technology Lab.

Internet Home Alliance

For over five years IBM has been involved with pervasive computing, which occupies every nook and cranny of computer science. Since we've been engaged in the activities at the Internet Home Alliance, we've had a chance to explore many different technologies: residential gateway technologies, middleware technologies, trans-coding technologies, even WAP and WML to manage things like kitchen appliances. This helped us figure out how to refine our software servers; optimise middleware, transactional software, and embedded databases; and deliver that to service providers who ultimately serve the end customer.

These technologies will build the infrastructure to enable the future connected home. Often from our standpoint the end consumer – the mobile worker – is not our direct customer for this technology. We work through other enterprises such as telcos, service providers, and Enterprise Hosting facilities and device manufacturers of all types, to deliver robust solutions through those channels that ultimately benefit the end user, whether they be a traditional consumer living his or her own private life, or part of a sales force, or mobile worker population. We've also taken a leadership position in

creating an Advanced Laboratory Environment so we can study the Enterprise implications. We participate and collaborate with organisations such as the Internet Home Alliance to study all of these critical research areas.

Current challenges of the market environment

Service providers, telcos and cable companies want to differentiate themselves from being a simple bit pipeline to becoming a service provider adding utility to the kinds of functions, features and software infrastructures that deliver real solutions to the user. We see this change becoming more common in being able to offer service-managed clients technology such as smart phones or PDAs or other devices that can be centrally updated. They can be kept current and, in many cases, tuned to the environment of the workforce. So dynamic software updates, prerequisite checking, all the functions and features that are a part of mission critical software distribution systems, mean that an enterprise can be run more efficiently and utilise this notion of server-managed clients very effectively.

In many enterprises, software distribution systems, middleware and software servers aren't their core competencies. However, telcos, service providers and others are being asked to deliver compelling solutions on these infrastructures. The research we have benefited from by connecting countless devices to robust server infrastructures has resulted in a product set that can allow those enterprises to focus on their core competencies. We see them guarding against obsolescence and commoditisation by delivering robust infrastructures, functions, features and services ultimately to the end user. But we also see a lot of differentiation coming in the application domains. Consider technologies like VoIP and voice recognition, especially in embedded devices that are typically hard to manipulate in the first place, with small-touch keyboards that are easy to make mistakes with and graffiti interfaces that are difficult to use. You can replace them with voice-recognition portals and enhance the ability to communicate effectively with these embedded devices. Then, when you innovate that infrastructure so that applications can be readily developed using open system frameworks, it becomes both a natural and economic fit.

That would be a similar situation for the additional services that consumers themselves would buy, not necessarily driven by their workplace, but all the different connected home-enabled solutions that will emerge. The home consumer is simply a special case of the end user. Obviously we go about accessing data, whether it is a critical presentation file, a document, an MP3,

or MPEG4 with video but embedded with e-commerce transactions. So no matter whether it's a field worker trying to accomplish a specific task on behalf of an enterprise, or a consumer, there's very little difference in the core kinds of infrastructures through which you would flow those solutions.

Figure 2. The electronic media environment of the Advanced Technology Lab.

When you look at the industry there's really a critical mass of functionality assembling out there. There are very robust and capable PDAs; wireless is becoming more seamless and prevalent every day. We used to think about metropolitan area networks; now we're making them happen in universities and municipalities. So we're starting to see that wireless roll-out as being a disrupter to technology in terms of classical technology, as we had it before. We're no longer restricted to that simple communications call, we're plugging into VoIP, using multiple simultaneous protocols such as WiFi and GSM; and we're using those to accomplish tasks you just couldn't accomplish any other way. And we're doing it on smaller and smaller devices.

Competitive implications for the marketplace

The thing that really resonates with becoming nimble is becoming open. It was about an approach to open systems and open architectures, very early on. We've had to deal with so many different architectures and integrations of different technologies on behalf of our customers that we've taken that approach and made it a very open architecture so that it's an easy fit with anyone's technology. When customers take that same approach they find they decrease the time it takes to create a new application suite, to integrate different server back ends with different databases, different middleware, different transactional frameworks, all the way down to the development environments. When they take those steps they find out how easy and seamless it is to move their technology through its paces and revolutionise their technology on a regular basis.

There are many different base technologies driving this. There are Java technologies that are able to isolate the differences of specific hardware sets and make it common to programme across devices. There are tools based on XML that can further abstract the underlying details and make data more

cross-leverageable. Open standards are all part of that; Linux is driving a lot of that mindset today.

> 'When you're dictating an email through your PDA, then you're talking about pervasive computing, real ubiquity.'

The IP environment is huge because it drives opportunity. Once we have something that is out of the realm of the analogue and into the realm of the digital, we have ways of leveraging that technology in extremely diverse ways. When you're dictating an email through your PDA, through that WiFi hot-spot to your own personal voice portal which is grabbing every word you say, translating it directly into text and delivering it to the recipients that you simply call up vocally, then you're talking about pervasive computing, real ubiquity. Those processes can be leveraged when you have a digital conduit to the back-end. Regardless of the kinds of horsepower you may have on the client front-end, you could be doing this from a low power processor in your car, on a PDA or you can even be dictating it with a standard mobile phone. So once you have that voice conduit built, there are so many different ways you can leverage it. People with disabilities will find it easier to deal with data, walking into a restaurant and being guided by their own PDA because now they have a WiFi conduit to that particular enterprise, that particular restaurant or other business. And they are actually broadcasting guidance to take you through your task, whether it's ordering a meal or traversing the landscape inside a huge store.

Figure 3. IBM's research vehicle codenamed – 'Blue Octane'.

IBM Advanced Technology Lab

The lab was created four years ago. We recognised a need to study this kind of computing paradigm in real life. To do so we created a living lab, where we would actually study how people use technology, what kinds of technology

conduits need to be placed between objects, what discovery mechanisms need to be there, what software distribution mechanisms need to happen in real time, and what protocols would be used in an advanced architecture to make all this technology affordable. So we took a clear space and transformed it into a living household, with set-top boxes, residential gateways, power line protocols, VPNs, even e-fridges in the kitchen and networked vehicles parked in the garage. By the way, we don't consider our vehicle as parked in the garage; we consider it as wirelessly docked in the garage. So many use cases have really bubbled up around many different kinds of paradigms, whether it be entertainment-based paradigms, mobile worker paradigms, productivity, multi-modal paradigms where you actually have an input device that enables you to touch or talk to an input device, even to register how much content is coming across. For instance, in your in-vehicle information system, the electronic control modules on your car are now able to tell you – or the system, the data bus on the car – exactly what's going on because you might not be able to pay attention to that elaborate graphic screen that's presented to you. We need to turn that rich user experience off and start talking to you through embedded text to speech functionality. We can traverse through your own personal portal from your set-top box, and set up autonomous relationships between weather repositories and your home sprinkler system. So if your sprinkler system's due to start at midnight and finish at 2am, if there's a band of thunderstorms coming through the area at 6am, it's going to know about it because it has a collaborative relationship to your residential gateway that's listening on the web for these data feeds. It's going to make decisions that save you money. And it's going to do so for a very low cost. It won't be an elaborate proprietary-based system costing tens of thousands of dollars to implement per household. This is all based on a very thin client architecture built on Java, that can receive applications and meaningful data from the enterprise and make decisions based on that data to make your life more effective or more affordable.

'We can download something via a set-top box and have that content ready, willing and able to participate on any other client device that might be in the home.'

So we're utilising low-cost wireless communication mechanisms or even wire line in the form of power line protocols that are incredibly more robust than the initial X10 protocols and allow for dynamic discovery of particular end points, enabling tens of thousands of client devices within a house to function or operate. These protocols also enable a lot of accountability, essentially creating a transaction between an electrical device and a computer software enabled device so we know that the operation was completed successfully, on time and was as robust as any other kind of transaction.

The current entertainment paradigm is to download a tune off the Internet for 79 cents and burn it to CD. We're taking this many steps further by looking at clustered electronic media and content protection that we call xCP, or Extensible Content Protection, allowing delivery to a whole house or even whole enterprise. A stream of data can be used in that entire cluster. So we can download something via a set-top box or another device and have that content ready, willing and able to participate on any other client device that might be in that home, whether it's an MP3 player with wireless enablement or even synchronised through another PC or your in-vehicle information system that is now an extension of your own media centre and knows that you want particular electronic media routed to that particular device. You can even provision it by sitting on your couch and dragging and dropping them from your set-box top to your vehicle, all wirelessly.

So far it's been difficult to enable the flexibility that digital content provides because we've been left to our own resources as consumers to find a way to get it from this device to that device and synchronise it. So what this mechanism, protocol and infrastructure offers is the ability to run things seamlessly, to make them usable from a transparent perspective. Consume it on either a new MP3 player or existing stereo with media server, wherever we want to enjoy it.

Technology to suit our lifestyle

We see connectivity in kitchen appliances, things that are now devices that are converging on multiple different protocols. A perfect example is Whirlpool's Polara range, which now uses convection air technology, oven technology and cooling technology in a transactional framework. Traditionally if you prepared a meal the night before it went in the fridge and when you wanted to start cooking, you needed to be home from work to do so. But with the Polara, that entire transaction becomes seamless. You input the cooking instructions with a web-enabled device and see every step right up front: you tell it when you need it and it keeps it cool until it starts the cooking process; you won't

Figure 4. White goods research, asset monitoring, RFID, speech recognition.

need to disrupt your workday. Or if you're out and about you have seamless access to mobility tools that we've crafted for things like WAP and WML to get in touch with it on your mobile phone or connected PDA. So if you're running late that day, or ran into an old friend who you'd rather have dinner with, you can put all those plans on hold or cancel and cool that food. You can make use of it the next day and have all that freedom at your disposal.

So we see many different kinds of technology happening in kitchens. It takes a service provider infrastructure to accommodate all that. So when we talked about trillions of devices years ago, we're finally getting there because when you consider the ovens of the future, the rapid cook technology, the e-fridges that tell you that you're out of a certain item (it might be telling you on your mobile phone or on your PDA), we're talking about being able to scale to that kind of infrastructure and deliver software solutions and data when you need it directly to your mobility devices.

'When you have people focused on solutions they are using to their advantage, they don't want to leave.'

Your in-vehicle information system won't just function when you use your car – it can always be on. You might establish a relationship between your car dealership and have a diagnostic service in real time. So their servers might be looking after the health and well-being of your car, ensuring it's maintained properly so that it's not a safety concern to you and you get more life expectancy out of the vehicle. That might even transcend to how leasers deal with lessees. What they want back at the end of the term of the lease is a vehicle that was very well maintained. As a consumer you want to save as much as possible on the lease payment. So for the price of connectivity in forming that bond between your vehicle and the people who furnished it, they can now check on that vehicle periodically to ensure that it's being maintained properly. And you as a consumer save money because they can count on a particular return and condition when the lease is actually up.

Return on investment

The ultimate return on investment today is that players such as telcos keep their customers and gain further market share in that customer space. When you have a cellular phone infrastructure today, there is often no differentiator between brand A or brand B, and quite likely you're going to make a decision based on price or on coverage irrespective of the services that that particular telco or wireless service provider actually provided. In that kind of relationship there's no brand loyalty and from a consumer's perspective, no need for it. When you start providing the services that people become enamoured with, that people accept and use on a daily basis, you begin to build a community of folks who are passionate about the kinds of services that actually exist on those devices. And if you as a service provider are providing those services, it

makes brand loyalty the next step. When you have people focused on solutions they are using to their advantage, they don't want to leave. There's an opportunity to protect your customer base as well as grow the revenue share of that individual consumer.

There's competition out there, but that's never going to change. So those who can capitalise on it are going to engage with open architectures; with advanced tooling that makes application development very easy; with infrastructures that can adapt to different client devices, no matter what the characteristics of those client devices are; and with matters of server managed client infrastructures and software distribution and prerequisite checking at the lowest level to ensure that updates happen seamlessly. They're not going to create usability problems for these customer sets. None of this is magic – it's all computer science, enablement and integration, delivering the whole infrastructure that can make these applications and customer paradigms and scenarios execute flawlessly.

That's what IBM's role is, ensuring that that infrastructure is robust and available for service providers to take advantage of and enabling them to become providers of value added services and create that community among their own customer sets. We're replacing more non-integrated architectures for things like VOIP and SIP. We're making everything seamless for field force workers and consumers. Many of the emerging standards that we're participating in are gaining incredible traction and providing a framework and landscape to increase interoperability.

An infrastructure, landscape, road map and means to an end...

There's a lot of excitement over the adoption of emerging technology, standards and infrastructures. Enterprises are ready and willing to differentiate themselves in the marketplace and we're putting together an infrastructure, a landscape, a road map, and a means to an end to allow them to do just that. We want to empower our customers to build on a firm foundation and provide revolutionary technology on an ongoing basis. We're enabling services, no matter what that service needs to be, all the way through to the end user, with imperceptible synchronisation, compelling user input methodologies and seamless access. It's technology that's going to be very usable, not just for the computer-savvy road warriors, who are out there all the time, but for the average person as well, who for one reason or another is going to work outside the office for some reason. And this technology… knows no bounds.

The connected home: a look into the future

Aldo Olivari | CEO, Telecom Italia Lab, Italy

Aldo Olivari of Italy's Telecom Italia Lab explores definitions of the home marketplace and the complexities of the technological integration.

Homes connected to the world

Let's face it. Your children are on the other side of the world and send you an email with the web address where you can see the pictures of the excursion they just had as you were sleeping. The Australian Grand Prix gets into our homes through satellite and cables and you can even select the camera to get the view you like best. Your daughter records a video question to the rapper on the screen and waits, hoping her clip will be shown to everybody in the Q&A part of the show with the rapper talking directly to her. The office is no longer shut off by our home walls, its tentacles are getting inside the studio and beyond. Our homes, indeed, are connected to the world.

It has happened over the past ten years, as we moved from using the twisted pair just for voice to hook onto the Internet. ADSL made it quicker and more than that it made it always-on, always connected. Cable television, basically non-existent in Italy, is widespread in other countries, bringing in another feed. In some areas, and it will be growing by the end of this decade, optical fibre is providing such a bandwidth that many are wondering 'what for?'

And it's not just wire. GSM is now basically a one-person, one-phone business. Personal communication is here both because of terminals being associated with specific individuals and because of software transforming any terminal into my terminal (profile, cookies and Internet sessions). 3G is coming as well, with a potential for higher engagement given the variety of communications options offered. Digital Terrestrial Television is just another Pandora's Box to be exploited.

And connectivity is about more than linking our house to the world. It is also about connecting what is in our home. WiFi, IR, Bluetooth, UWB, homePNA[1].

Possibly, we have never been confronted with so many technological options. That is good and it is bad. People in general, and probably rightly so, are a little scared of technology. Technology is essential but it needs to be transparent. One should be able to do what is needed when it is needed, naturally, seamlessly. We do not need to know the variety of technologies available to build a bridge over a creek, a stream, a river, a ford. We just expect it to be there and walk on it.

1. WiFi: Wireless Fidelity, IR: Infra Red, UWB: Ultra Wide Band, PNA: Phoneline Networking Architecture.

Developing technology is not easy. Making it disappear from perception to become a 'given' in everyday life is difficult. This is what this paper is about.

What is 'home'?

Home sweet home… I am not planning a discussion of the home concept which, in any case, changes slightly from one culture to another: in Italy we tend to put great importance on the home and its roots, much more than in the US, for example, where the mobility of life loosens the ties with any particular home. This is also visible in construction techniques, Italian houses being more 'rock'-constructed, while in the US they tend to be constructed more of wood. The average size of an Italian home is somewhere in between that of the US and Japan. Durability and size have significant implications on the way the house/home is refurbished and lived in.

1.2

The Maslow hierachy of needs

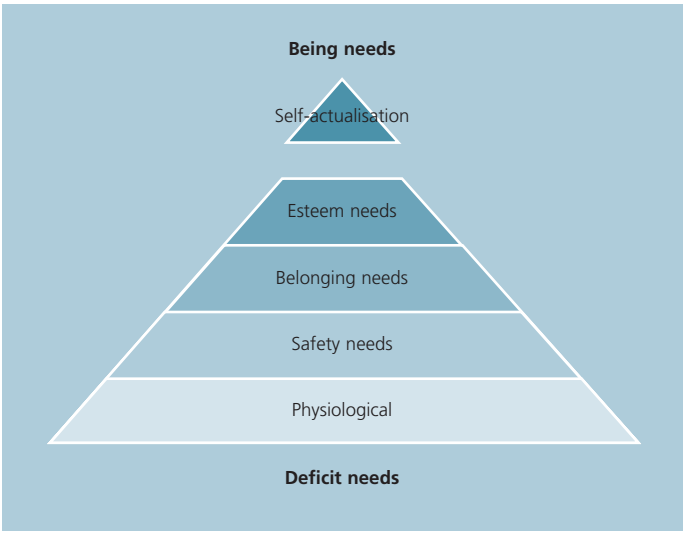


Figure 1.

By the middle of the last century the American psychologist Abraham Maslow came up with a layering of people perceived needs. This layering assumed the shape of a pyramid: at the lowest level those needs are felt by everybody while as one moves up in the hierarchy less and less people might perceive them. Physiological needs, such as eating, drinking, sex, are universally felt. Once these needs are met, people perceive as 'urgent' needs of safety, such as sheltering, and so on through the needs of feeling part of a community

(belonging), of having ownership of something. Up one level we find the needs of being recognised in the community, being respected, becoming active in the community. At the top layer are the self-actualisation needs.

The lower four levels were called the deficit needs, something that, if missing, would make you feel bad. Once the deficit is removed, you are OK. You no longer perceive these needs. These needs can be fulfilled completely. You can only eat as much food and then you are satiated. On the contrary, the upper level, also referred to as Being Needs, is potentially infinite in breadth. You may never have enough of it.

'Communication services are a fundamental means for older people to keep in touch with loved ones and to utilise remote healthcare services.'

This pyramid is a useful reference for our discussion on the connected home, since the home cuts across all levels and, from a business standpoint, the possibility of having home-linked needs associated with the self-actualisation (uppermost level) creates a potentially endless space for appealing services. Pure communication services (like POTS, Plain Old Telephone Services) may be associated with the belonging needs and as such can be fulfilled and saturated (we are already seeing in developed countries the drift of communication services into the 'utilities' area, commodity and flat rate as derivative).

Let's look briefly at the variety of home-linked needs. It is unlikely that any communication-related service can fall into the physiological needs level. More than 40 per cent of the world population, according to the latest ITU[2] statistics, has never made a telephone call and, probably, if given a chance to choose between a telephone or some wheat and rice, would go for the latter.

2. ITU – International Telecommunications Union, www.itu.org

As soon as we move up to the next layer, safety needs, we find many telecommunications-related services, some of which have not yet been satisfied because of immaturity in the technology. The ability to monitor objects and people in the house for safety reasons is a well-perceived need. The hurdles to overcome are false alarms, deployment cost and ease of use.

Personal relations, therefore, which drive the bulk of yesterday's and today's voice telecom services, may be seen as working at the belonging needs level. A fixed phone hanging on a wall will do. The fact that we are longing for designer phones and cordless, video communication means that we have basically exhausted the needs belonging to this level and we are looking at other things that may be better categorised as esteem needs and, particularly, needs relating to self-actualisation. It is, however, interesting to notice that, as culture and habits evolve, some services that were originally considered part of the higher levels have tended to sink in the pyramid and become a way of

life. SMS, for example, has become a basic service. No youngster would ever consider buying a phone not including SMS (nor would a mobile phone manufacturer ever consider proposing such a phone). Video phones may follow the same path by the end of the decade. That will depend on many factors, most of which, sadly to say, we don't yet know. However, in this case, as in many others, the evolution of technology may tip the balance one way or the other.

So the pyramid paradigm should be taken with a grain of salt. At the upper levels we certainly find the needs to relating personal relations and self-realisation, the need to know about things and continuous learning (although this is often reduced by lack of time and tiredness from other activities).

The inner drive to buy new things is pushing towards diversity in the offering. Better ways of doing things, where the perceived value is a shortening of the time required, are also part of these upper levels. Among these we find home automation – the automated vacuum cleaner was much higher in the wish list of customers than video conferencing in a recent conference on the house of the future which we organised at the Future Centre in Venice.

Healthcare is not just a basic need – it is something that can be seen at the upper levels: getting better healthcare, saving time by providing customised monitoring, trusting the healthcare offered to elderly loved ones. The elderly are likely to spend a significant portion of their time at home, possibly far away from us, and if their home can be their safe, trusted cocoon, on the other hand it should not become a jail. Communications and communication services are therefore a fundamental means for older people to keep in touch with loved ones and to utilise remote healthcare services.

The home, therefore, and this is something relatively new, is transforming itself from being a shelter to a node in a network made of other homes, of events, of people sharing the same interest. In other words, the home is becoming fully connected.

Interest of men and women towards the e-home

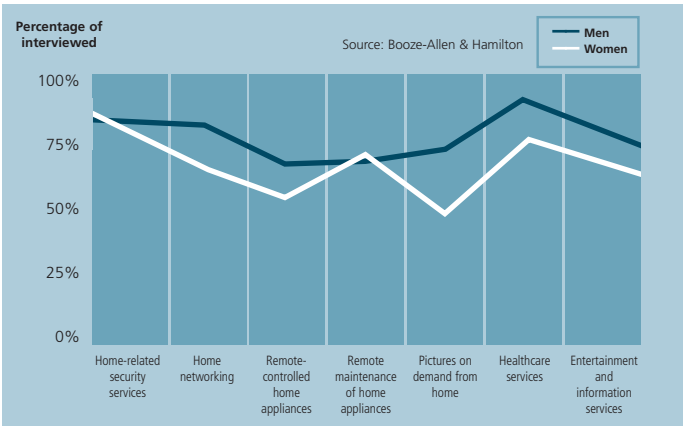


Figure 2.

There is also another aspect, in a way symmetrical to the connectivity with the external world, which is inner connectivity. Everything in a home can be connected, and I'm not just talking of fridges and microwave ovens or window shutters and television. I'm also talking of information that we are going to see emerging as the main resource in our homes, as I will be discussing later on.

Figure 3.
Roomba vacuum cleaner by iRobot. It can sense the environment.

There's a market out there

There have been a number of polls trying to understand what people want and how much they would be willing to pay. Putting aside, at least for a while, the issue of how much they are willing to spend, let's look at what they say they want.

The interest for potential home services deriving from a connected home is high. Most market research (see Figure 2) indicates a very high interest, which is to a certain extent surprising if compared to similar studies in other fields (such as: would you like interactive television? Would you like Car Navigation Services?).

In the area of connected homes more than 50 per cent of people interviewed declare they would like to have the variety of services being outlined.

Clearly this is still a long way from actually using them once available and paying for them. Still the market seems interested. The goal is not to spoil this market by an offering that is not meeting its expectation.

Among these expectations, mostly unexpressed, is ease of use. People get easily and understandably frustrated by new procedures, interfaces, objects. Bad instruction manuals, often only approximately translated from the manufacturer's native tongue, do little to help, and neither do big manuals for that matter.

Increased efficiency (or time saved) deriving from the use of the service is another important issue, probably explaining why the robotic vacuum cleaner so nicely stimulates lay-people's imagination.

Today's mobiles are quite complex objects if you are using them beyond a voice call. Try to configure one for the MMS service and you'll see what I mean. There is a similar complexity in hooking up objects to a home network (either they connect flawlessly or it's a mess, and the latter is more likely than the former). In fact, one can envisage in the near future the adoption of e-learning to help people understand and manage their interconnected appliances.

Risk is obviously something that by definition should not exist in the home. The amount of accidents occurring is a clear evidence against that. Nevertheless, anything targeted to go into our houses should be carefully designed to be risk-free. Add up all of these 'taken for granted' requirements and squeeze them into the market willingness to pay. You get very low margins, if any at all. The good news is that electronics is on a continuous downward slope in terms of price. The technology crammed inside the Roomba (left) used to cost tens of thousands of dollars. Today it's packed into a $50 bill (the price of the vacuum cleaner is about $250, $200 of which pays for the standard vacuum-cleaning facilities and the remaining $50 for the electronics).

1.2

The desire for connectivity in the home opens up the gate to new players. As soon as two objects are connected, the services boundaries that used to be so well defined in a standalone object tend to blur and fade. Moreover, it becomes possible to piggy-back on existing objects to offer new services by companies that are not necessarily involved in those objects' production. A home that becomes connected to the world may benefit from third-party services. Remote monitoring of equipment may become entangled with insurance services; monitoring of the elderly can become an enabler for healthcare centres providing remote assistance, and so on.

Who owns the home marketplace? There used to be different pretenders each targeting a very specific part. The telecom operators were there providing telecom services; the consumer electronics industry was selling televisions, stereos, cameras, fridges; content providers used to target the individual people as they went by the news stall or to a cinema. Connectivity is changing this. Content can be delivered right into the house; its usage can be monitored so that the offer is continuously morphed into the real use.

Connectivity makes it possible to offer services rather than products. The product in many cases becomes a 'Trojan Horse' to sell services.

Telecom operators, at least in theory, should be the ones who are best placed in this changing market. They have a long-standing relationship with the customer, they know how to manage complexity and how to aggregate offer, they can provide a single bill, and they have the 'pipes'.

On the other hand, people are seldom choosing 'pipes'. On the contrary they choose nice sets, whether they are fancy flat screens or new digital cameras.

These are bringing new types of equipment into the house and new ways of using them, which are slowly reshaping habits. Look at the iPod phenomenon. Its design and ease of use has convinced people to buy 100 million songs in a few months, songs which might previously have been downloaded for free (though illegally) from the network. Customers have indicated that they are willing to use that same network and pay for the songs: the value lies in the easiness of the mechanism. Rather than spending several minutes looking for a song, risking viruses or worse, I would rather pay 99c and get the song from iTunes.

At the same time Apple has managed to enter the home of its clients. It lets them create their libraries of preferred songs and at the same time it is learning what they like and customising its offering. Customisation has become feasible and it's beginning to be exploited.

As this happens, new value chains form. Intermediation, as shown by DoCoMo in its iMode offering in Japan, where they cluster the offering of hundreds of providers, can win the market. It is no longer a matter of providing connectivity and letting people and companies use it in the way that trucks use the motorway. In most cases it is not the broadness of the lanes (for which read broadband) that is winning the market but the type of services being provided along with it, the trust in the content exchanged, its adaptation to specific needs, time, place and mood.

Needs as perceived by various market segments

SEGMENTS / NEEDS	Technical innovators	Gadget lovers	Technical family	Young professionals	Busy families	Over-50s
Saving time	●●●	●●●	●●●	●●●	●●●	
Entertainment	●●●	●●	●●	●	●●	
Efficiency	●●	●	●	●	●	
Information	●●	●	●●	●●	●	●
Control	●	●	●	●	●	●
Security	●	●	●	●	●	●●
Peace of mind				●	●	●
Well-being	●	●		●	●	●
Easiness	●					●●
Protection						●●
Communication	●		●	●		●
Independency	●					●●●
Relations	●		●			●
Health care						●●

Note: This estimate has been gathered in the study on scenarios for the home of the future carried out at the Future Centre of Telecom Italia Lab. The number of asterisks indicates the level of interest: ● = nice to have, ●● = important, ●●● = very important.

Table 1.

The technology enablers

It is not just connectivity in terms of pipes. There is much more to affect the way we experience and exploit connectivity. And this is related to a number of enabling technologies that have been evolving to a point where they are making a difference. Let's consider a few of them.

Microprocessors have become cheaper and more powerful, and embed connectivity capability to a point that one can easily imagine every object embedding a chip. Microprocessors by themselves would do little to change our home but coupling them with sensors, also on the way to becoming cheaper and easier to embed, can transform a static environment into a reactive one. It's no longer just confined to fire-alarm or anti-theft devices. The carpet can sense if somebody is walking on it, the couch reports someone sitting on it – all this information and more can be analysed to detect the anomalous behaviour of an elderly person and trigger a warning message.

Storage capacity has increased enormously: today hard disks have reached 1 TB of capacity, that is they are able to store more than 500 movies. 8GB compact flash cards can store 6,000 photo quality pictures. These figures are top-of-the-line and demand a premium price. However on the one hand today's average capacity of 120 GB for hard drive and 512 MB for compact flash is more than enough to enable new behaviour in the connectivity domain. And the evolution is surely not stopping here. Today's top-of-the-line will become average capacity in two to three years' time and by the end of the decade 1TB in hard disks and 20 GB in compact flash will be standard capacity. Still on the storage side we are likely to see polymer memory becoming available within two years and common by the end of this decade, with capacity in the TB range.

Local storage increases willingness to amass data from a variety of sources. Those compact flash cards in PDA, mobile phones and digital cameras (by the end of the decade it might become difficult to distinguish a mobile from a digital camera) are continuously creating information that can be readily transferred to the home storage hub for later perusal. Having all the information stored at home will make it common for people to call their home from anywhere in the world to get the information they need at that particular time, thus multiplying, as a matter of fact, the number of servers connected to the network. Basically, every home will be a server. This situation clearly generates opportunities for service providers to manage this resource and exploit the information. Privacy, security and availability are just a few of the obvious requirements that any one of us will place on whatever contains and manages our information.

The whole discipline of Artificial Intelligence seems to have been stuffed away in a dusty drawer of unfulfilled dreams, but this is not in fact the case. Today those same issues that were dealt with in AI are now under the banner of artificial life and under the disguised name of cognitive science. This is at the forefront of research programmes funded by the US administration (along with Nanotech, Biotech, Information, the NBIC initiative, where C stands for Cognitive Science) and those about to be launched by the European Community.

Software agents are going to play a significant part in the connected house. It will be up to them to manage a significant part of the communications,

bringing in the right information to store locally and presenting it at the right time on the best device available.

Some of these agents will stick to our back, harvesting information as we move around in our daily life ready to upload that information once we are back home. In a sense our homes are also going to be connected using ourselves as pipes. Microsoft has recently announced the capability to use human skin to transfer information and at a Japanese university there has been a demonstration of a network made by human beings moving around in a room able to carry information from one to another. Just by entering our home we will activate a synchronisation process merging the info we have on us with that in the home.

Large-screen technology is already delivering 80-inch screens (plasma with LCD following). Their cost, however, puts them into the jewellery domain rather than that of consumer electronics. This is going to change in the coming years thanks to an improvement in the production processes (with better yields, the main problem leading to high cost for these kinds of technologies) and to new technologies. Coming soon the SED (Surface-conduction Electron-emitter Display) with the promise to deliver very large screens at an affordable price and by the end of the decade the NED (Nano Emissive Display) aiming at the same low-cost large-size factors. Large screens are interesting for our discussion for the following reasons:

1. The size of a screen given a certain resolution implies a minimum distance of the viewer from the screen. At today's resolution an 80-inch screen requires a minimum distance of seven metres – that's more than the average living room can offer. The only way out is to increase the resolution, but this requires more bandwidth to transport it. Viewing an 80-inch screen from three metres (which normally would require a room with at least with four metres of space) means to quadruple the resolution, hence the bandwidth should go up by several Mbps, on the very upper limits of standard advanced ADSL. VDSL or, even better, fibre would be a better connecting technology.
2. The psychological effect of large screens when viewed at a viewing angle greater than 130 inches is to embed the viewer in the action, which is what happens at an IMAX theatre). On an 80-inch screen this happens at about two metres. Clearly this does not pan out within the average living room. To get this effect (assuming a viewing distance of three metres) we should use a 126-inch screen. This size is not likely to be available, at a mass consumer affordable price, before the middle of the next decade. What psychologists have noticed is that once people feel embedded into the action their behaviour changes. They shift from being a passive viewer to becoming active participants in the action. This stimulates interactivity and will bring a host of new issues in movie making. From the connectivity point

of view this means that interaction will become the natural way of viewing shows, hence the need for multimodal communication.

3. Large screens, say the size of a home window, give the impression of – guess what? – exactly, a window. People would on the one hand be tricked into mistaking them for windows, hence something to look through, and on the other hand will spontaneously start to use them as windows. This is already happening in Japan, where flat screens, strategically placed in corridors (these being narrow make the screens feel wider) are showing the cherry blossoming, exactly like having windows on a garden. Again, this way of using screens has a significant effect on connectivity, implying an 'always-on' type of connection – broadband, obviously.

Our connected house will require more and more electrical power. Actually, this increase is not because of connectivity, which uses fairly low power consumption compared with the oven, washing machine or even TV set, but because of the variety of appliances electrically powered. There is, however, an issue of energy related to connectivity. As we progress towards connecting more and more objects, having sensors, little appliances scattered around, we are increasing the need for portable energy sources, ie batteries. The average house has already witnessed a significant increase in battery chargers, seemingly incompatible with one another. It is not just the inconvenience of having several chargers around (which may be compared to the number of remote controls), it is a matter of how long a single charge can last. Technology is likely to offer solutions in the coming years. Fuel cells are becoming smaller, lighter and cheaper. They have not been approved so far by the FAA so it is not possible to carry them on a plane (this significantly limits the market) but there is no problem in having them in our houses. A further technological evolution, batteries based on nanotechnology, promises to provide instantaneous recharging capability. One would drop one's cellphone on a pad and through induction recharge the battery in a few seconds.

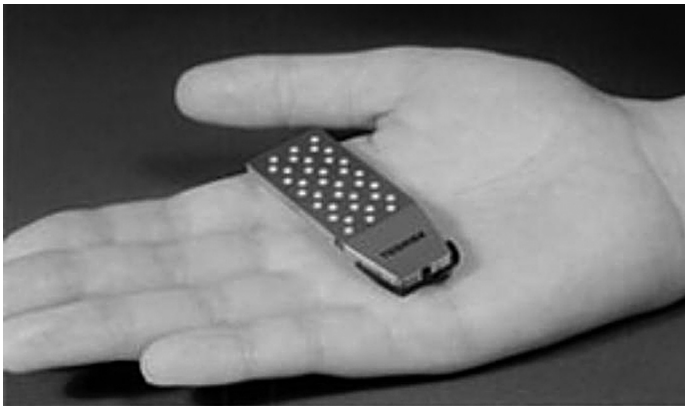


Figure 4. Fuel cell produced by Toshiba. Expected on the market by the end of 2004.

Technology(*)	Actual speed	Future speed
ASDL	few Mbps	16 Mbps (1)
VDSL	tens of Mbps	100 Mbps
Fibre (FTTH)	100 Mbps	Gbps
Power Line	2 Mbps	8 Mbps
Cable modem	few Mbps	20 Mbps
3G	384 kbps	10 Mbps (2)
WiMax	–	34 Mbps (3)
Satellite	34 Mbps	100 Mbps

(*) There are a number of other access technologies, like free-space optics and LMDS that are not considered since they better fit business clients than residential.

(1) There are other ADSL flavours, proprietary, that provide higher speeds, up to 40 Mbps – and more – used in Japan. The ADSL 2+ is expected to provide 20 Mbps.

(2) The speed indicated applies to HSDPA downlink.

(3) The number indicated represents the shared capacity. The equivalent speed is possible only if no other traffic is present.

Table 2.

Seamless technology integration

Clearly the technologies presented are not the only ones shaping the evolution of the house, but on the one hand they are crucial and on the other they provide a good idea of the variety of factors independently progressing although in a way converging onto our homes.

Now the key here is this independent evolution. It is independent because of the actors involved and underlying technologies, but the market is acting as a unifying force.

Our homes can potentially be connected to the world by a variety of (technologies) pipes as shown in Table 2. Some of these coexist and there is a need to integrate them seamlessly into each service. More than that. We are going to see services taking advantage of the variety of pipes through multimodal communication: exploiting each of the available pipes to carry at best (most efficiently and economically) the information and then merging everything transparently for the user. This will be a key issue (as we are already witnessing in the mobile area with multi-standard cellphones and seamless handover from 2G to 3G) and something that operators can leverage to make a difference to users.

Speaking of the users, and given the variety of access points and connecting pipes we have just characterised as ‘transparent’, they will be more and more focusing on the terminals in their hands. Technology is coming to ease the adaptation of terminals and networks, like software radio, where the network handshakes with the terminal and downloads the software required to have the connection and service established.

Terminals are a mass-market consumer product. Huge numbers are making the difference between failure and success. It is unlikely that operators may start to develop their own terminals for their clients; besides, a terminal should potentially be able to connect to any access gateway. However it is likely that some operators will muster sufficient skill and economic weight to be able to partner and influence the evolution of terminals. Furthermore, connectivity is no longer solely a matter played at the wire(less) layer. The game is played at the upper layers and here the operators can have a lot to say and to offer.

Because of the variety of connection options available to a house, the seamless integration of them is crucial both to the dweller and to service providers.

Interest in adopting technology by the various market segments

SEGMENTS / NEEDS	Technical innovators	Gadget lovers	Technical family	Young professionals	Busy families	Over-50s
Shared broadband access	●●●	●●	●●	●●	●●	
Shared peripherals	●●●	●● ●●	●● ●●	●	●	
Intercom	●	●●	●●	●●	●●	●(●)
Videoconference	●●	●	●	(●●)	●	(●●)
Home PBX	●●	●	●●	●	●	
Digital television	●●●	●●	●●	●●	●●	●(●)
Multimedia content streaming	●●●	●●	●●	●●	●●	●
Games	●●	●●●	●●	●●	●●	●
Music (MP3)	●●	●●●	●●	●●	●●	●●
Digital Pictures	●	●	●●	●	●●	●
Monitoring with Closed circuit TV	●●	●●	●●	●●	●●	●●●
Home automation	●●●	●●	●●	●●	●●	●●●
Energy monitoring	●●●	●●	●●	●●	●●	●●●
Health monitoring						●●(●)
Appliances				●	●	

Table 3.

Clearly it is connected objects, to the extent of the service provided. In Table 3 we show an estimate deriving from analyses made at the Telecom Italia Future Centre in Venice on the interest in using various types of equipment by different market segments. Independently of the different inclinations to use one or the other, it is clear that several of them will be coexisting and need to integrate in the home environment. Here we see the interplay – I would not venture to say the convergence – of consumer electronics, information technology and communications. These have been, historically, different players. Now their markets and the requests from their clients start to overlap. Some may choose to extend their reach, others may decide to partner. Both strategies can be seen today.

Surely there is a drive towards horizontal business, but the situation is not clear-cut. In order to exploit horizontal business one has to understand, and possibly venture into vertical ones, either directly or, again, by partnering. It is quite difficult to create a platform for third parties without a clear understanding of their business. The fact that their business is continuously moving requires continue adaptation, as if one is part of that business.

The value chains are stable if each ring in the chain provides significant added value and the barrier to providing that added value is sufficiently high. Technology is cutting costs, making these barriers smaller and smaller. Connectivity and communication are surely disrupting existing value chains.

Living in the house of the future: quite different from todays?

How is a house likely to look 20 years from now? Pretty much the same. Same walls, same windows, same roof, on average. The fact is that the lifecycle of a dwelling is measured in tens of years, and in some countries such as Italy in hundreds of years.

So, even if we are likely to have, within 20 years' time, smart material providing much better insulation, efficient solar cells, and window panes adapting the transparency to the need and even transforming themselves into screens, it is unlikely to see these innovations sweeping the market.

At the same time we can see that our houses have changed dramatically in the past 20 years. In many homes telephones are cordless, no more cables dangling, there is a PC somewhere, there are plenty of remote controls, microwave oven, dishwashers, and printers are all newcomers of the last part of the century. It is therefore quite realistic to expect big changes in the next 20 years 'inside' the house, in the way we live in it. Let's take two snapshots.

Always-on connectivity

By 2020 our houses are going to have big screens, in many places. My toddler's room has one taking most of one wall. That particular screen is, most of the time, a window on his grandparents' living room. They live far away (or possibly just few blocks down the street) and they have set up a connection to their big screen in their living room. When the toddler steps into his room the screen gives the sensation of opening into the living room of Grandaddy. When Grandpa happens to be there the toddler can see him just a few metres away from him, can get close to the screen and feel his hand. The feeling is provided by tiny actuators, wirelessly controlled, in a glove that he and Grandpa wear to transmit and feel touch.

The communication is quite natural with all technology hidden. There is quite a lot of technology, actually. Obviously the screen itself, the glove, but also the connectivity supporting it. Sensors are detecting presence in both rooms and are therefore asking the network for a broadband connection to transmit fluid

images of what is going on in the other room. No need to do that if both are not there. If only one is present an image of the other room would do, if none is there the screen can go blank (or rather assume wallpaper pattern hiding in the wall). As action evolves, more bandwidth may be required, and the flexibility and dynamical allocation of bandwidth by the network make this possible. Some communication may take place through different channels. Grandpa may want to have the little one listening to the music he is listening at that moment or to some music he has recorded somewhere. There's no need for a microphone to capture the music (and the ever-present problems of distortion and the Larsen effect). Information is tagged, as everything else. The identifying tag can be sent and information will be retrieved locally using an appropriate channel. Probably the sound will reach the toddler from his new teddy bear radio connected to the network.

Information about information

Taking the lead from the Microsoft research project we can imagine that by 2020 as we go along in our daily life we will have tracking devices on ourselves, nicely woven in our dresses, able to absorb whatever we do and the environment all around us. No more conversation being forgotten, or discussions about whether it was 'pinkish or purple'. Everything will be stored, and as we walk back into our home this information will be duly recorded.

The PAN, Personal Area Network, connects all devices we have on us and exchanges information with the HAN, Home Area Network. A media hub is likely to act as coordinator for the exchange and storage. Possibly some of this information may be considered as 'crucial' and is likely to be stored on the network for added reliability.

The Ocean Store project running at the University of California, Berkeley, is exploring ways of fragmenting information, making it virtually undetectable, and then spreading it in hundreds of copies over million of servers.

The issue, at least one out of many, is not if there can be sufficient storage capacity. By 2020 there will be plenty. The point is that as the closet gets bigger and more crammed it gets more and more difficult to find what we want.

Technology is going to help. Intelligent agents, cognitive-based applications, tagging of information with location, time, context data all will make it easier to find what we are looking for.

Inevitably, the more information that is available the more stimuli we need. It is nice to have a picture reminding us of a photo safari – nicer would be to click on the picture and see it becoming a movie with the feed coming in live from some webcam positioned where we shoot it (or nearby).

Information is valuable, as long as it is available when I need it and it makes sense (or can be interpreted) in my context. Information about information is

even more valuable. This is something very recent and may become normal in 20 years' time. Sitting in our studio we can already ask for a snapshot of a specific point in the sky (azimuth, longitude, latitude and light-year distance) at the NVO, the National Virtual Observatory of NASA. What we get is not an image taken by an astronomic observatory retrieved from a database. What we see is a picture resulting from the merge of hundreds of images taken over the years by many observatories and the result is a staggering resolution. The technology behind it is the Data Grid. We are likely to see many more of these information about information. Some web engines are looking for information by observing what and how people search for information.

New approaches are needed once we really have the possibility to mirror our lives in bits. And communication, connectivity will be an essential ingredient.

Wrapping it all up

There is a lot of potential; technology is evolving rapidly, making it not just feasible but economically viable.

Clearly the path is long and winding. And there are many hurdles to overcome, not solely technological.

As our house gets connected, bad guys have a new potential entry gate. The old locks are no more effective and new ones are, so far, not effective either. Security concerns are very important, practically and psychologically. They may block the market and if the market is blocked so are the investment in technology research and technology evolution is stymied.

Spamming is another big concern and so far no effective solution has been found. Privacy will remain an important concern.

The houses of the future will not just contain a lot of information, they will also generate a lot – or at least their residents will. Already today the amount of information produced by people far exceeds the ones produced by professionals and this gap will widen. Connectivity will make it possible to spread this information and disrupt the current value chain by altering the perceived value of content. Ownership remains therefore a big issue.

The abundance of information does not necessarily mean better quality; actually from a purely statistical point of view it will be much more difficult to find diamonds among the garbage. Trust and authentication will be very important issues.

Usability of services and information is probably the single most important factor for the economical viability of evolution. The economics is shifting from products to services and unless people are going to use services (over and over) there will be no revenues. This requires a level of usability and easiness that is still beyond current possibility.

The evolution will be a complex one and has to be taken step by step. The strategy of Telecom Italia Group is quite interesting in this respect. There is a strong push to widen the ADSL market. The variety of offers is aiming at targeting the broadest possible community. This community today is represented by those who wish to connect to the Internet. Clearly there are, and there will be, a significant number of families who are not interested in connecting to the Internet (even for free). These families may be taken on board, over the next years, by offering other services that require always-on connectivity. Healthcare and elderly monitoring are obviously interesting ones. ADSL may satisfy these needs without saddling the network, particularly the metro area network with increased traffic load.

The connected house services are possibly more affected by always-on connectivity than by broadband. The provisioning of Alice Flash, ADSL coupled with WiFi connectivity in the home, is a further step towards creating a connected home. The ease of connecting wirelessly the various appliance will surely stimulate users to adopt connection enabled equipment and create the culture of being connected from anywhere and through anything.

The ADSL offering will evolve in terms of the speed offered, eventually leading to a replacement of current ADSL with faster ones whether they be VDSL or fibre.

Terminals, as we've noticed, are crucial both for the client who experiences the world through them, and for the operator who can use them as a platform for service delivery and as a gateway to other appliances. Telecom Italia is aggressively pursuing this market, creating in partnership with manufacturers and with the continuous help of its research centre new terminals, devised in such a way as to be flexible, open to new services, and manageable through the network

Product quality is very important and manageability cannot be a burden placed on clients. They expect end-to-end quality as a given. TIM, the Group Mobile Operator, is similarly and synergistically pursuing the same strategies: the connected home is such if it is also accessible to residents when they are on the move.

The connected home is here; it will just get better, through the effort of many actors from many fields. It will take several flavours, suiting different countries, cultures, needs and also fads.

Telecom operators have a lot at stake in the connected house and are striving to be main players. Which is what Telecom Italia is doing.

Consumers take the lead

Steve David | Chief Business-to-Business Officer, Procter & Gamble, USA

Steve David of Procter & Gamble considers changes in the relationship between manufacturers, retailers and consumers, arguing that connectivity – the addressable home and world in which everything has an IP address – requires companies, if they are to survive and prosper, to enter into a continuing dialogue with consumers.

We're not in control any more

You may well ask why on Earth is a consumer packaged goods (CPG) company like Procter & Gamble talking about consumer-oriented connecting technologies. If you think about it, though, it's not so strange. We've been talking to consumers via TV, radio and newspapers for more than 60 years. It's how we get our brand messages out to them. Today, however, getting those messages across is getting a lot harder, as consumers are faced with more than 500 TV channels and many incompatible technologies (ie mobile phones). For example, 40 years ago, for a company like P&G to reach 80 per cent of its target audience, say women aged 18–45, would take three 60-second TV commercials; today, it would take in excess of 115 30-second spots.

What interests P&G, given this fragmentation among TV and radio stations, magazines, catalogues and the Internet, is how consumers are reacting to the data overload. How are they sorting through all of this maze of information to make informed purchase decisions? There's one thing for sure, there is a clear move away from consumers being relatively passive creatures towards active 'swarms' of consumers, who increasingly distrust brands, manufacturers and institutions. Consumers are coming to rely more on a new set of influencers – family, friends, advocacy groups and, hopefully, some manufacturers who continue to offer quality, value and an honest relationship like P&G – to help them with this task.

In the past, because most activities were local, it was more difficult for consumers to hook up to others that had similar views or values. Today though, these 'swarms' of consumers can form and have a global presence in less time than most of us drive to work. If you find yourself on the wrong side of one of their views, it can often feel like a drive-by shooting. But it doesn't have to be that way. The thing that has changed everything, of course, is the Internet, whose global connectivity has allowed people to find people and do things that just couldn't have been done in the past. Almost anyone can publish an opinion or even a book using the Internet today, whereas ten years

ago those activities would have been virtually impossible due to time, cost or distance constraints. With a computer and an Internet connection, an individual can participate in a blog or chat room that gives them the freedom to be active and passionate about the things they believe or want for their families. Consumers today are engaged in the information process, instead of feeling like they're being acted upon by it.

The net of this is that consumers want more control of their lives and, particularly, their homes. The importance of the home is growing everywhere in the world as the focal point for security/privacy, entertainment/leisure, health/nutrition, family maintenance (budgets/schedules, etc) and, increasingly, work.

1.3

So, the key question for manufacturers and retailers is how will consumers stay connected and get information about brands or services in this new environment?

It won't be like those famous lines from the 60s TV show, 'The Outer Limits' for manufacturers and retailers anymore: 'There is nothing wrong with your television set. Do not attempt to adjust the picture. We control the horizontal. We will control the vertical. For the next hour, sit quietly and we will control all that you see and hear.'

The consumer is the boss

Sooner or later, manufacturers and retailers will realise that the Internet has started to shift the balance of control of the home back to the consumer. Consumers will have increasingly more information at their disposal and their tool of choice is going to be the search engine. They're going to demand that technologies are simple to install, interoperable and work well every place in the world because people are just going to be more mobile.

Consumers will want to be in charge and connected in almost every aspect of their life. This is starting to become one of their paramount needs, and it isn't understood by manufacturers because of the vertical industry silos in which they have placed themselves and the lack of foresight in being able to offer consumers more connected solutions.

No one technology will be the answer. For the consumer, this is going to be about mixing, blending and connecting technologies. I believe there is

potential to have even higher consumer loyalty to your products in this environment if you can make it easy for consumers to be an active part of the process. It's the services and experiences that surround your brand that are probably going to be the differentiating factor between you making a sale or losing it to a competitor. Ultimately, it's the experiences that people have using an iPod that has made it so successful versus 'me, too' MP3 players. Moving to this higher level of needs is also what we are doing with many of our brands, like Pampers, Crest and Iams pet food. We call it 'Winning at the First and Second Moment of Truth.' These are the factors that cause a consumer to select our brand at the point of sale (First Moment) versus competition and then those attributes of our product that get noticed during use (Second Moment) that keeps consumers satisfied and loyal to our brands.

From the viewpoint of the connected home, if your vision as a manufacturer or retailer is that the consumer is in control and is the boss, then you have a chance to win them over and keep them. In this environment, you'll start to understand the difference between brand sell and brand information, and not fear giving consumers the latter. Not many consumers search the net for brand sell. They want information on how to solve their problems, not Madison Avenue glitter.

'To answer the dilemma of protecting consumers' privacy and providing value-added content or services shouldn't be an either/or solution. You have to do both.'

In this relationship with consumers, though, comes a responsibility and a dilemma. Does your company have a privacy policy that protects consumers? Do you allow them to opt in or out as they feel appropriate? Transparency with consumers is mandatory. You have to be a trusted supplier.

The dilemma comes from how you provide value, added content or services around your brand. How do you feel when a cookie on your computer uses your zip code to automatically supply you with the addresses of local retailers of a product you've been researching? Or, a home shopping network lets you know that the XYZ product you've bought each of the last three months has a new and improved version you might want to try? Some people see these as a value added service, others as an intrusion into their privacy.

For manufacturers and retailers, the answer to the dilemma of protecting consumers' privacy and providing value added content or services shouldn't be an either/or solution. It must be an 'and' solution. You have to do both.

Connectivity and the addressable world

The addressable home as part of an addressable world in which everything has an IP address and is accessible is the vision. As this begins to happen, cyberspace and physical space in some sense will cease to be separate worlds. Cyberspace will become an overlay to physical space. They'll become co-joined. In the home, I see this happening over the next five to ten years. It will still take a merger of technologies, though, like the Electronic Product Code (EPC), which is being worked as a globally standard, RFID tag replacement for bar codes, combined with sensors to pull it off. Temperature, location, motion and identification linked up to web services on your home computer. Things talking to things, doing work and, hopefully, improving the quality of life.

Healthcare will likely be an area where we will see the early adoption of these technologies. In the US it's estimated that around 7,000 people die each year in hospitals because they got the wrong medication or had a bad drug interaction. An EPC tag and reader system on the medication and the patient could probably save lives. These technologies would then move to the home to help improve compliance on prescription drugs and better communications with health providers.

The net of all this will most likely be an environment where the consumer feels they're more in control and where they start to make different choices around the types of products they buy. They may even make some trade-offs on quality or price for brands or services that offer this connectivity to their environment in a no-touch transparent way. People laugh when you say your washing machine is going to talk to the Internet. Perhaps, though, it will send a signal that gear #4 is about to wear out, and it will call the repairman. The auto industry is already doing this. Interestingly, the killer home application will probably be something we just can't think today, something that connects consumables with non-consumables or tracks things in your house.

I would love to have EPC chips in my wine cellar so that I would know where every bottle was located. Its vintage and contents would automatically get logged on my computer. I'd like to know about the types of products I have bought in the grocery store on my loyalty card and what's in my pantry so I could automate or speed-up my shopping trips. I'd be able to go back and link my purchases to nutritional information to help plan our meals. This vision will demand a level of connectivity in the home that's hardly being thought of today.

We've done so little research on what consumers want in this area – is it about saving time so that they'll have more leisure, is it about providing better physical and information security, or is information about health and nutrition what they'll want? Who would have thought that consumers would start to be using mobile phones the way that they are now around the world? I was at my daughter's graduation from college a month or so ago. It was in a big football stadium and 80 per cent of the kids coming down the steps and filing into their seats had a mobile phone to their ear talking to their parents in

another part of the stadium, sending pictures to boot. Ultimately, socialisation opportunities will be part of the reason why consumers will demand connectivity solutions. This exists already in our mobile mobile phone environment, and it's going to be demanded in the home environment. We've just got to start working with consumers to understand how they're going to use the technologies.

We also need to recognise that the usage and benefits are going to change as soon as consumers start to internalise these new products and services. Amazon or eBay evolved to where they are today because consumers felt part of the process. This interaction helped build loyalty and profits. Companies like these and P&G will succeed and maintain sustainability because they understand and have a dialogue with their consumers. It's that dialogue that will ensure companies don't become complacent or static with their product offerings.

Companies, however, will need robust processes to manage this innovation. So, a natural evolution and integration of your product services and experiences with a healthy understanding of how true innovation takes place, sprinkled with a sense of urgency, will be critical. If you play it safe, you're probably going to be supplanted by somebody who is faster or more innovative.

Horizontal versus vertical integration

In the past, companies felt they needed to have as much control over their product as possible. The old frame of reference was about vertical integration. Companies tried to control everything from raw materials, manufacturing, transportation, through to recycling. That was the manifesto of manufactures and retailers.

The new manifesto, however, is likely to be: how can you create 'more" value by working horizontally, across the supply chain, or, in the case of the connected home, across technologies. A lot of technology companies say even today, 'I'm a PC manufacturer,' 'I'm a hard-drive supplier', 'I'm a stereo component maker.' This probably served them well in the past when those were immature technologies, but today consumers are demanding a lot more. They want integration, simplification, compatibility, mobility, quality and value. And they don't want to have to put it all together themselves. Why have we found ourselves in this mess?

Well, in addition to the maturing nature of these markets, there has been a lack of global standards and often a reluctance of companies to work together (the loss of control issue) to form alliances. The tech bubble bust of 2000 also didn't help matters. A lot of companies are still hunkered down from that and are pretty risk-adverse.

In the end, I believe value and profits will be enhanced by companies who work collaboratively on global standards and then fashion their product differentiation around features, design, services and experiences. Competitive

advantage will increasingly come from this business model, not from proprietary technology solutions that consumers have trouble integrating.

What's a company to do?

Moving forward, it will be imperative that manufacturers and retailers do a lot more listening to consumers. Global standards are going to be a mandate, and horizontal alliances across value chains will be the norm.

In the connected home, we must see the world through the consumers' eyes of what's needed and possible, tempered with the reality of what's practical.

So, the answer to the original question of why is a CPG company thinking about consumer-oriented connecting technologies? Is because we have to.

> 'If you play it safe, you're probably going to be supplanted by someone who is faster or more innovative.'

The life-blood of P&G will continue to be trying to understand what products consumers want, making or inventing those products, and then connecting to consumers to let them know the product is available and why we believe it's better than other solutions.

The current connecting processes, as noted, have become more fragmented, with the resulting messages being diluted – not a good outcome for sellers or buyers.

The home continues to grow in importance as the focal point of most family activity. The current technology tools consumers use are generally not connected and work poorly together.

Consumers' trust quotient continues to fall with each new Enron or MCI debacle.

Content is king, and the consumer wants to be the BOSS – a powerful twosome when combined with the Internet.

In this environment, P&G believes for it to continue to be successful, it will need to work with similarly minded consumer oriented technology companies, to give consumers what they want: the right products, at the right place, at the right time, in a fully interoperable, things-talking-to-things connected home.

Taking ideas from life to create life

Paul Liao | Vice President and Chief Technology Officer, Matsushita Electric Corporation of America and President Panasonic Technologies, USA

Dr Paul Liao of Panasonic discusses digitalisation and the evolution of consumer electronics (CE), the challenge of turning the connected home into a universal norm and how technology can go beyond just solving problems toward making genuine improvements in our lifestyles

Digital technology empowers consumers

There's been fantastic progress in consumer products for the past 30 years, largely driven by technological factors. These factors include steadily improving performance of hardware and software, rapidly decreasing costs and amazing miniaturisation of components and products. This steady progress has created a continuing parade of new products making their way into our homes and lives.

However, it is not only technology that underlies the success of a product, but perhaps more importantly it is our understanding of how the technology enables the product to enhance the consumer's lifestyle. For example, in recent years we have seen consumers' horizons and expectations continually expand as a result of digital technology. Digital technology has empowered people to evolve from passive consumers of entertainment into active creators of their own personal content, from being limited to the confines of their home into members of a fully mobile society consuming content on the go.

The consumer electronics industry is at a unique point in time. Digital networking and the connected home are about to elevate the benefits of digital technology to still higher levels. However, there remain important challenges that must be addressed before these benefits can extend to all of the mass market.

Explosion of choices

In the past, limitations in existing technologies meant that the entertainment, content and information we received were all chosen for us – even spoon-fed to us – by the content provider. The tunes we listened to on the radio were determined by DJs, the songs on the records we purchased were chosen and placed there by the record producers. Everything was arranged for us, including the order in which we listened to tracks on an album, as well as the time and date of the programmes we watched on TV. All was determined by somebody else, and we passively accepted this as the nature of mass entertainment.

Today, we no longer need to be passive, but can actively shape the content that we consume. Today, digital technology permits us to choose from a wide variety of content sources and to mix and match content to satisfy our unique personal preferences. And we can enjoy that content at the time and place of our choosing. We've moved from predetermined content to something that's personal and customisable by each person – a dramatic shift in our lives from little choice to enormous choice.

However, this fantastic breadth of choice is not without its downside. For example, for some, the explosion in choice of content is creating information overload. Paradoxically we are witnessing the emergence of a new dilemma – that of presenting the confused consumer with almost too many choices. With our ability to access an increasingly wide spectrum of content from an equally rapidly increasing variety of sources, we are seeing consumers become frustrated and unable to find the content they desire. One of the major research themes for the next decade will surely be how we can help consumers cope with the ever widening scope of information and entertainment that is available for their enjoyment. We need to answer the question: 'What will be the Google of the connected home?'

Keeping it simple

Consumer electronics products have traditionally been simple and intuitive to use. Everyone knows how to turn on a TV, choose a channel with the remote control, and adjust the TV's volume. In contrast, consumers often find PCs, and their applications, a challenge to operate. The average consumer would certainly not characterise an Excel spreadsheet as completely intuitive to use, or to develop. Companies now routinely send employees to day-long or even week-long training courses to learn how to master making PowerPoint slides. As the convergence of computer technologies with consumer technologies continues, will we need to ask families to take similar courses just to operate their digital televisions or stereos? Can we avoid the kind of complex operation that consumers have come to associate with PCs?

As an example, we see the power of digital processing is already permitting consumers to perform video editing tasks with relative ease by using DVD recorder decks from several consumer electronics manufacturers. And, with the ever-increasing power of digital electronics, soon these editing capabilities will be powerful enough that consumers will be able to create sophisticated movies that might rival those of any Hollywood studio. But must that power

come at the expense of the simple and intuitive operation that consumers have come to expect of consumer electronics?

This challenge of keeping our products simple and easy-to-use is another of the major issues that our industry must address during the coming decade. And this is an issue of compelling interest, not only to the average consumer, but also to those with various physical disabilities, which might prevent them from enjoying the benefits of the connected home.

The benefits of being connected

The benefit of the connected home goes beyond providing additional vistas of choice and variety of commercially produced content. As with our DVD recorder example, digital technology empowers the consumer with the capability to create personalised content, and a home network enables a consumer to discover, access, and manipulate that content, no matter where in the home it is stored. You may, for example, have some video content stored on one digital device in your home, use the processing and editing power of another device to access it, and then view it on a third device. And with the ubiquity of mobile phones and the Internet, we are rapidly extending the concept of our 'home' to well beyond the physical boundaries of our house, even to include locations potentially anywhere in the world.

'We have come to learn that the very openness of the network is also creating new challenges'.

Already, consumers are sharing their experiences, information, photos and home movies instantaneously via the Internet. Thanks to the Internet, families once separated by vast distances are now back in contact, and sharing their life's experiences on a daily basis. My daughter and our two grandsons live in San Francisco – my wife and I live in New Jersey – and yet we daily exchange videos and photos, and not only talk to each other, but see each other via our web cameras, all in real time. It's really quite incredible.

Unfortunately, the benefits of connectivity have not yet become a reality for all consumers. In fact, the benefits have been restricted to the more advanced users of technology, those within that slice of our society that own and actively use PCs. The penetration of PCs into the American home has been relatively stable at approximately 60 per cent, and has not increased significantly for several years. Some analysts have noted that the rate of broadband penetration is also beginning to slow, a trend which could have been anticipated since nearly 40 per cent of households with PCs have broadband connections. So, to to realise the benefits of connectivity, we need to understand how to address the needs of the remaining 40 per cent of our society, those people whose lifestyles for whatever reasons do not include a PC.

Today, the appliance with the greatest household penetration is the television. In our country, there are actually more homes with televisions than with telephones. A typical American household spends eight hours per day watching television. So it's possible that we'll see television emerge, especially as a result of convergence, as the vehicle by which this 'connectedness' in the home happens. Panasonic has started incorporating the capability of Internet connectivity into its 'T-navi' digital televisions in Japan. A consumer with one of these digital TVs can already enjoy a variety of useful services that are accessible through the Internet and designed specifically for use on a television. Digital TV 'T-navi' services are beginning to spring up in the Japan market the same way that i-Mode services sprang up for Internet-enabled mobile phones. It will be interesting to see how these services develop and the role that such digital televisions play as a driver for that other 40 per cent to become 'connected.'

But the concept of T-navi connectivity is not limited to only accessing new commercial services via the Internet. Once again, personal content is expected to play a role in the popularity of this new concept. As T-navi continues to evolve, we envision that it will enable users to access the personal digital content they have created and stored in digital devices throughout the home. Such content might include digital pictures, which you, or your family, have taken and stored on some sort of memory device or perhaps on the hard drive of your PC. Or it might be digital videos previously recorded on DVD or on the hard disk in a personal video recorder. Although content may be stored in different digital devices and media throughout the home, all can be accessed by virtually any of those devices, including your T-navi television, as long as the device has been authorised to connect to your home network to access the content.

It is this vision of networking that motivated Panasonic, along with seven other consumer electronics, PC industry and mobile device companies, to work together to launch the Digital Living Network Alliance (formerly known as the Digital Home Working Group). The DLNA's focus is to create design guidelines that specify which technical standards must be implemented to ensure that digital devices can be easily connected to a home network, and easily share digital content that is stored on the network, whether the device is a PC, a mobile phone or a digital consumer electronics device. The DLNA's objective is to make it possible for consumers to purchase a digital device and to know with confidence that it will interoperate with the other digital devices and access the digital content in your home network. You can look for DLNA-certified products to reach the market in 2005.

Security

While connectivity creates tremendous opportunity to improve our lives, we have come to learn that the very openness of the network is also creating new challenges. These challenges range from network-enabled threats to our personal privacy to the misuse of networks for theft of intellectual property, including copyrighted content.

Unfortunately, all too many of us have had to cope with the disruptive effects of computer viruses, network worms, Trojan horses and other malicious software that some persons have used to disrupt our enjoyment of the benefits of connectivity. They use the very same network whose connectivity provides us with so much enjoyment to propagate their destructive code. Likewise, we have witnessed how some have misused the power of connectivity for the purposes of digital theft and piracy of intellectual property, and in some cases private, personal information.

It is essential that connected products should not cause consumers or content owners to feel unsafe. Consumers must not fear that an Internet connection will become the entry point through which predators can enter their homes. The openness and wide accessibility of the Internet must not also be allowed to become its weaknesses. No parent should have to worry about undesired porn ads. None of us should have to tolerate an endless barrage of e-mail spam. And as we begin to store more and more personal information on our home servers, we need to be assured that our home network's security will not be breached. Concern for personal privacy is one of the primary reasons why the non-connected have not bought into the value proposition that the rest of us enjoy.

These issues of security for users, content providers and services providers alike, are serious and require the concerted attention of all in our industry. Unless all parts of the value chain can be protected against the misuse of the network, the benefits of connectivity will not be realised. It is likely that we will need both technological as well as legislative solutions to properly address these issues.

Summary – Ideas for Life

At Panasonic we are focusing our efforts through a concept we call 'Ideas for Life.' The foundation of this initiative is to take ideas from life to create ideas for life. That requires that we focus on ideas that create value for consumers based on their existing lifestyle needs, and empower even more satisfying lifestyles. We are striving to understand the challenges and opportunities that the connected home can provide. We believe the connected home is an 'Idea' whose time has come, but is being held back only by the kinds of societal and technological issues discussed in this essay.

As a mnemonic to help us focus on these and other consumer issues, we use each of the letters in the word 'IDEAS':

Interoperability – so that products will transparently connect to the network and work without complex set-up and configuration.

Digital – so that consumers can benefit from the cost and performance advantages of digital electronics.

Easy to use – so that digital products will increase the enjoyment of life, and not complicate it.

Accessible – so that all members of society can benefit from our digital products and the connected home.

Safe and secure – so that consumers, content creators and owners, and service providers have confidence that their privacy, intellectual property, and services are appropriately protected against unauthorised access and use.

Konosuke Matsushita's philosophy in founding Panasonic was that the company should improve the quality of people's lives, and this accounted for his remarkable success. That kind of focus is more important than ever. We must understand how people live and how they would like to live – we need to go beyond just solving their problems and imagine what would really enhance and enrich their lifestyles. Mr Matsushita would surely approve of our efforts today to develop products that will allow all consumers, the PC-literate and the PC-allergic, to enjoy the potential benefits of the connected home.

Content vs communications

SECTION 2: CONTENT VS COMMUNICATIONS

2

Finding a voice: learning from history

Andrew Odlyzko | Director of the Interdisciplinary Digital Technology Center, and Assistant Vice President for Research, University of Minnesota, USA

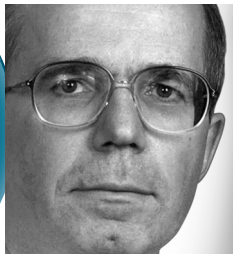
The evolution of the connected home is of vital interest to much of the technology sector. The convergence of telecom, computer and consumer electronics offers players in these areas opportunities for expanding their sales and influence, and also the threat of being marginalised. Who will be the biggest winners in the emerging contest is impossible to predict. Not only are there formidable technical challenges to overcome, but success will often depend on political manoeuvrings over standards, and, above all, on the notoriously hard to forecast decisions by consumers.

Yet there are some guidelines that can help determine who will win and who will lose. In particular, there is an abiding, widely held, and damaging misconception that clouds people's thinking about communications, and especially broadband. Companies that continue to hold on to this myth risk losing the race to build the connected home.

Subscribers to this dogma regard the Internet as first-and-foremost a content delivery system. It isn't. The Internet is primarily a tool for person-to-person communication. But policymakers, investors and telecommunications companies have too often fallen for the plausible slogan that 'content is king'. What systems and equipment providers as well as service providers in this area should worry about is giving people what they really want, which is to be connected to other people. This has direct implications for the products and services that are likely to be successful, as will be discussed towards the end of this essay.

Content – material prepared by professionals for consumption by large audiences – undoubtedly plays a big part in consumers' lives. Many businesses based on movies, book publishing, recorded music, professional sports or news dissemination are large and prosperous. And content is certainly a more glamorous business than providing 'dumb pipes'. But the truth is, content has never been as essential to consumers or as economically vital as connectivity.

To put the comparison in perspective, the annual movie theatre ticket sales in the US are under $10 billion. The telephone industry collects that much money every two weeks! Just the spending on voice services is over 50 per cent higher than all advertising outlays, so there's little point in looking to content-dependent advertising to provide the generous revenue streams that are needed to support a communications infrastructure as large as the phone system.



The primacy of connectivity over content explains why, on the Internet, it is email that is still the true 'killer app.' Ask people whether they would rather give up email or the phone, and the responses will typically be split. However, when a similar choice is offered between the web and email, there is no contest: email wins by a mile. (And this isn't just true of the home market, it's even more true for large organisations. Intranets are all the rage, but it is email that makes them truly valuable.)

The telecom hits of recent years back this up. Phenomena that have taken industry observers by surprise, such as the enthusiastic embrace of IM (Instant Messaging) on personal computers and SMS (Short Message System) text messaging on mobile phones, show the primacy of communication over content in the consumer's set of priorities. By contrast, delivering content to mobile phones via WAP (Wireless Application Protocol) has been a disappointment despite enormous industry hype and considerable marketing efforts. Providing pop videos or movie trailers for consumers to watch on 3G mobile phones has provoked a similarly underwhelming reaction from end users. What does appear to be more popular in the new generations of mobile phones is the ability to take pictures and send them to friends and family, a typical connectivity application.

Content isn't king and never has been. But the preoccupation of decision makers with content and broadcast communication is nothing new. In the early 19th century, the explicit policy of the US government was to promote wide dissemination of newspapers. They were regarded as the main tool for keeping the citizenry informed and engaged in building a unified nation. Hence newspaper distribution was subsidised from profits on letters. The policy of the US government to promote newspaper 'content' at the expense of person-to-person communication through letters arguably harmed the social and commercial development of the country by stifling circulation of the informal, non-content information that people cared about. Letters were bringing in 85 per cent of the money needed to run the postal system in 1832: The Post Office would have thrived on letters alone, but would have gone bankrupt instantly had it been forced to survive on newspaper deliveries. Thus content was king in the minds of policy-makers, but it was definitely not king in terms of what people were willing to pay for. That is similar to the current situation.

Such preoccupation with content has historically been all too common. For example, it was often thought (even by Alexander Graham Bell) that one of

the principal uses of the telephone would be in broadcasting. Several substantial experiments in delivering content over the phone were attempted in Europe and the US but in the end, the phone emerged as the prototypical example of point-to-point communication.

There was one prominent technology that initially moved from connectivity towards content, namely wireless. It started out as a point-to-point communication system, the 'wireless telegraph', but after about two decades of experimentation, it became primarily a broadcast medium based on content. Yet in the past few decades, with the development of cellular services, wireless transmission has started to move back to its roots as a point-to-point communications service and the revenues from wireless telephony now far exceed those from radio broadcasting and are even greater than those of radio and television combined.

This predominance of point-to-point communications spending is not new; it has been the historical pattern for ages. Communications is growing relative to the rest of the economy in a process that goes back centuries: as a fraction of the US economy, it has grown more than 15-fold over the past 150 years. Most of this spending is on connectivity, the standard point-to-point communications, and not for broadcast media that distribute content.

The proponents of the 'content is king' myth almost universally neglect to mention a key aspect of content, namely that it is expensive to generate. The sports stars, reporters, singers, and Hollywood actors do not work for free. Hence even if revenues from selling content are large, much of that will go to pay for content, not just for the network. On the other hand, in the 'dumb pipes' model of voice telephony, wired and wireless alike, all the money stays with the service provider.

Still, we mustn't take the argument that 'content is not king' too far. All it says is that most of the money is in point-to-point communication. It does not say that content does not dominate in volume of data: the argument is about value to customers, and not about volume. Equally, that content is not king does not mean that content is unimportant in shaping political or social views. But the entire content piece of the economy is not all that large, and its contribution to network costs is much smaller than that of point-to-point communication.

Certainly, content can be profitable. Numerous media companies are doing very well. Content can also be of value to a network, even aside from providing traffic for the network to carry. However, it is probably best to think of content as either catnip or icing on the cake; something to attract new users, or enhance user experience. That is what broadcast TV programmes do for the advertisers who pay for them. That may also have been the main role of the web in bringing more people to the Internet – essentially as bait. It is worth remembering that the most successful of the public online services,

AOL, started out as a game network. It would never have grown as large as it has if it had not changed its business model. Today, the majority of the time AOL subscribers spend online is devoted to email and chat.

By focusing attention on centralised delivery of content, the web may have led decision-makers astray and prevented a proper appreciation of the importance of (the often chaotic and generally hard to predict) point-to-point communications. Part of the problem is a kind of snobbery. Polished, glamorous, professionally produced content tends to be overrated by decision-makers while everyday gossip is downgraded. Sociability has frequently been dismissed as idle gossip, and especially in the early days of the telephone, was actively discouraged. For example, a 1909 study of telephone service commissioned by the city of Chicago advocated measured rate service as a way to reduce 'useless calls'.

'The most successful communication technologies, the mail and the telephone, reached their full potential only when they embraced sociability and those 'useless calls' as one of their main attractions.'

Yet the most successful communication technologies, the mail and the telephone, reached their full potential only when they embraced sociability and those 'useless calls' as one of their main attractions. That seemingly idle chit-chat not only provided direct revenues, but it encouraged the diffusion of the corresponding technology, and made it more useful for commercial and other applications. Such social interaction frequently functions to grease the wheels of commerce.

Not only is there a lot of money in carrying gossip, but gossip plays a crucial role in all human interactions. Yet the myth of content as king has repeatedly led telecom firms to waste huge amounts of money trying to get into the content business, even though providing pipes for connectivity has always brought much more revenue than content distribution.

What do these historical lessons tell us about the future?

The telecommunications sector has traditionally grown faster than the economy as a whole. There is no reason for this trend not to resume, once the overinvestment of the bubble years is dealt with, since we are moving towards an 'Information Society'. But we should expect a continuation of major restructuring in delivery of services as well as provision of systems, and the eventual winners are yet to be determined.

Traditional telecommunications carriers do have the technology and marketplace position to play a key role. Unfortunately they are handicapped

by their culture, which includes belief in many misleading myths, the most prominent the 'content is king' one we have been discussing. As just one example, they are neglecting voice services.

It is worth remembering that the real communications success story of the 1990s, whether measured in terms of revenue growth or number of subscribers, was not on the Internet at all. It was in wireless voice communications. But carriers are so mesmerised by data and especially by content that they are blind to what this implies. Even though voice will eventually be just one of many services delivered at low cost over broadband pipes, it will continue to be vital to consumers, and so should be improved and exploited. Note that a similar evolution has taken place with email, which continues to be the killer app of the Internet. It is offered for free, but it continues to be improved (in terms of user interface, spam filters, and so on), since it is understood to be of critical importance. Not so with voice.

And yet voice has not reached its full potential. Not only can it be integrated with various other forms of communication, but even its basic quality can be enhanced. The current 'toll quality' wireline voice standard simply does not provide very high quality. Broadband offers a way to change this easily. This is especially true in wireless telephony. The current quality of cellular voice is terrible. Many industry observers say this proves that users don't care about quality. But that is likely to be mistaken. Cellular subscribers have never had a chance to choose, and tolerated low quality in order to get mobility. But now, with the extra bandwidth that 3G offers, they can get both. Moreover, there is the opportunity for service providers to offer several levels of quality at different prices, segmenting the market.

'The main lesson to be drawn from the 'content is king' myth is that one should avoid systems designed just for content delivery.'

Such major changes could transform the way consumers think about and use their wireless connectivity at the home as well as on the move. Other substantial changes in thinking are needed, also driven by the need to make connectivity, and not content delivery, central. For instance, most broadband access links, such as cable modem and DSL ones, are designed to be asymmetrical, with higher capacity on the link to the home than to the network. Why? Because the expectation has been that these connections will be used primarily to push content to the consumer. However, since the consumer places much higher value on personal communication than on content, the case for symmetrical connections will grow far stronger and we are seeing this already in Korea, for example.

In the connected home (and home office) we can expect a growing demand for real time multimedia traffic, for applications such as video-conferencing. However, such applications are likely to be swamped by ordinary file transfers. The dominant mode of operation is likely to be fast download to local storage, fast transfer to whatever display device one wishes to use (often a mobile information appliance), and then playback. That is already the model we see emerging with appliances such as Apple's iPod MP3 player for music and the TiVo digital video recorder for television.

The presence of huge local storage capacity in local PCs or cable TV set-top boxes will make it much more attractive to send content as files, not as real time transmissions. Hard disk storage capacity is doubling each 12 to 18 months. For residential users, pictures and especially video are the leading candidates for filling those disks. Ease of use, lower cost, and instant gratification all stimulate use, and digital camera owners appear to be taking many more pictures than they ever did with regular film. The same electronic technology that is producing better disks and processors is also producing better cameras.

Most of the shots that are taken will be of very limited interest to the world at large. But many will be of intense interest to a few. For example, your mother will cherish a video clip of your newborn baby. Historical evidence strongly suggests that the high value placed by a few people on very specialised collections of bits (such as the video clips of the newborn) will in the aggregate be far more than the relatively low values placed on the professionally prepared content that does appeal to the masses.

The main lesson to be drawn from the falsity of the 'content is king' myth is not that content should be neglected. Rather, it is that one should avoid systems that are designed just for content delivery. We have many historical examples, such as the French Minitel and the American Prodigy systems, which were designed for content, yet what limited success they did achieve in the marketplace was due primarily to accidental features that subscribers could use for person-to-person connectivity. What this suggests is that systems designed for video, for example, should provide an easy way for users to load, edit, and distribute the video clips they take. In particular, no oppressive Digital Rights Management (DRM) schemes should be imposed that would interfere with such home generated material. Even for commercial content, relatively permissive schemes that allow and encourage customers to take some of the content and incorporate it into their own creations are likely to be the most successful.

It should be kept in mind that the variety of information generated by users will be growing. It is not just a matter of video clips of newborns or family picnics. There will also be security monitoring (automatic cameras at the door), healthcare applications (checking up on the elderly or infants, or keeping detailed records of heart function, for analysis by automated

systems), as well as sensors worn during sports play, to provide feedback on one's performance afterwards. Those home systems will be most successful that can handle the greatest variety of such information sources.

The chances are that the most important applications and services that emerge in the connected home will not originate with traditional service providers. In spite of many attempts, the established service providers and their suppliers have an abysmal record in innovation in user services. If anything, we should expect an even greater fraction of innovations to come from users at the edges of the network – just as email, the web, browsers, search engines, and peer-to-peer file-sharing did. The variety of services will be growing, and the ranks of potential creators of those services will also be growing. It will require ever more knowledge of what users need to take advantage of the growing opportunities, and we can't expect centralised organisations to be able to do it.

The Internet now carries and will continue to carry a spectrum of different types of service. In the past, you had on the one hand content prepared for wide distribution, such as newspapers, books, concerts and radio broadcasts. At the same time you also had one-to-one connectivity, such as the mail system or telegrams. Today we have a wealth of things in between, such as weblogs, which might be read by only person, by nobody at all, or by millions of people. Telecoms businesses can take aim at various parts of this spectrum but the most significant part will always be one-to-one connectivity: people-to-people. Content has never been king, it is not king now, and is unlikely ever to be king. Companies that understand this will have a substantial advantage in the competitive race that is just starting.

Note: This essay is based on and draws from several earlier papers by the author, in particular 'Content is not king' and 'Telecom dogmas and spectrum allocations'. Those papers provide more details, statistics, arguments, and speculations. All these papers are available on the author's home page, http://www.dtc.umn.edu/~odlyzko.

2.1

Broadband without the hype

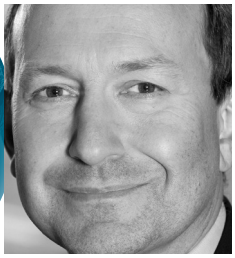
David Hulbert | President, Walt Disney Television International, UK

In some respects, broadband is a very exciting new communications medium. However, from another perspective, it is not nearly as revolutionary as some people think. It is, after all, just another way to get into the home with lots of rich content. It presents an alternative way of re-purposing existing content. It provides improved communications and sharing of information. And it spawns some interesting new application genres – just as every other new form of distribution has.

At root, what all new media do is help consumers receive and use a portfolio of services – existing content used the same way; existing content presented in a new, more usable format; adapted content the same core product, but reworked and reshaped and evolved; and, of course, some genuinely new creative product. The end result is therefore a mix of content and a mix of services. This is not necessarily a revolution – except in the minds of technologists.

From an entertainment perspective there are lots of really good ways of getting entertainment into the home already. A well-run digital satellite platform combined with a PVR, like BSkyB's, is very user-friendly for consumers. Although consumers pay a substantial amount of money every month to be a BSkyB subscriber, they appear to believe they get good value, and they generally don't churn out of the system. Likewise, cable is a very powerful technical solution to the challenge of distributing content to and between homes. So new digital and broadband services do not exist in a vacuum; they're up against existing forms of competition. And when you look at multi-channel TV you see that even in a very multi-channel-oriented home with kids, quite a large proportion of viewing is still to the boring old traditional linear channels showing traditional sorts of programming. So this isn't about revolution: it's evolution.

One reason for this is based on the economics of programme-making. There's a lot of absolute nonsense talked by technologists about how suddenly there's going to be an explosion of content. The truth is that if you spend over $1 million a minute making '*Pirates of the Caribbean*', and given that Hollywood is actually quite good at making entertaining video, on the whole it's going to be more watchable, and watched, than somebody with their own personal video recorder recording their family vacation. Just because you can do something doesn't mean people are going to watch.



There's only so much money that can be put into the content part of the new, wonderful, broadband superhighway. Revenue for video entertainment in the home arises from what people are willing to pay for DVDs and videos, how much they are prepared to watch advertising and how much the Government chooses to subsidise the industry with through licence fees or tax. In the future, revenue from advertising may decline, or it may not: video based advertising may become more powerful in the future if it can find ways to become more interactive and more targeted. However, what people will pay to subscribe for home entertainment, or to purchase it on-demand, will certainly go up. But of course there are limits – there's only a certain proportion of a person's disposable income that he or she will be willing to spend on being entertained in the home. And of course, government spending will always be constrained.

If you divide the total amount of money available by what it costs to make decent programming you end up with a limited, finite amount of programming. Unless you can find some brilliant way of making great programming much, much cheaper, this becomes a major constraint. Therefore, there's only so much programming – good programming – that can be used and repeated and watched again and again by large audiences. To some extent what you're doing is sharing out content – more content, admittedly – around more and more different ways of getting it into the home, in different forms and between different ways of using it.

All this said, I do believe that broadband is an opportunity for a creative business. Any interesting new way of getting content to consumers presents advantages and opportunities. Broadband generally happens to use a very old-established, universally available pipe into the home, it potentially reduces the cost of distribution, and increases the number of options for getting there. So of course it's good for content.

An interesting question is whether the value of broadband as a delivery system into the home is better for communications or for content. Being one-to-one, broadband is obviously very good for sharing information and for communication. In that sense it's far better than linear television, which is very bad for sharing information and content because linear TV is a one-to-many system. But if you're thinking about the specific entertainment part of it, I think it's much less revolutionary. The nice thing about a broadband system is that it can carry many services including communication, entertainment,

information, and so on. This makes it much more revolutionary for communication and information than for entertainment content.

The biggest problem with the broadband industry is that some seem to believe it has created a whole new need – for a whole new different kind of service. God waved a magic wand and he invented DSL. This was a very good thing for the people who own the twisted copper wire infrastructure, who have suddenly been given the chance to charge $10 or $15 a month from potentially every home in the country just for renting out that space that's already been built. Good for them! However, all the people who compete with each other to use the infrastructure, eg to provide 'always on' bandwidth, are in potentially commodity businesses, and the margins on these are going to be competed down. Ultimately, I suspect the margins on the infrastructure will be regulated down, too, because it's so obvious that they arise from ownership of an embedded monopoly.

And the problem with embedded monopolies – the people who work in broadband – is that none of them have really confronted how you deal with the customer interface. This goes right the way back to the problem of how you create an entertainment platform. An entertainment platform is made up of a combination of a technical way of getting stuff to people (and, sometimes, getting it back) and a load of content (much of it already very well established, like movies). In the middle, however, is a whole packaging, tiering, pricing, customer service and billing process that consumers need to be really simple and integrated and problem-solving – like BSkyB's is. One of the big problems with all these people who've got this broadband infrastructure is that they think services will just evolve naturally. They won't.

Here's a small example of the potential issues. Supposing a series of movie studios did deals with a telco to provide a video-on-demand service on broadband, but these are combined through a common customer interface. And suppose something goes wrong. Who does the consumer call? And who sends out the bills? Does Time-Warner bill? Does BT bill? Does some intermediary bill? These are all key issues. Supposing we decide we want to change the offer, and we want to sell another service, and maybe every other individual content provider that decides to do the same thing. Ultimately there has to be one integrated organisation that interfaces with the consumer and deals with and solves his problems and provides him with more value. And nobody in the broadband space, to my mind, has really got their mind around that.

Another important issue is how broadband providers interact with content providers such as the major Hollywood studios. My observation is that even consumer-oriented platforms are very bad at making content. There are some who are good at putting together premium channels, like BSkyB. There are some who are jointly owned alongside creative businesses: News Corp owns Sky Italia and it owns the Fox Studio. But in practice, I suspect that there's not

that much synergy in working together on a day-to-day basis. So it's better that each one does what he does well. If you owned Heinz and Tesco, it isn't obvious that there's much benefit in having Tesco manage your ketchup business.

Virtual integration between content providers and platforms is therefore key. Building platforms and making content is a long-term business, so typically you need long-term relationships in which you can manage the balance of power and manage the risk over time. In some sense this is a partnership, but the interaction is probably better thought of as a 'long-term commercial relationship' which gets constantly adapted (and hopefully improved) over time.

Broadband providers like BT don't automatically need content providers as long as they own the only 100 per cent access network into UK homes. Anybody who wants to go through DSL has got to go through that monopoly access. Until somebody else builds another physical pipe into the home – or until satellite becomes much more two-way/interactive – then telcos don't need anybody because they are sitting on the Panama Canal.

'No one, apart from a few techno-freaks, puts a box in a home because it's a nice box: they want to use it for something.'

However, anybody – and that includes BT – who wants to build a value-added network, is probably going to want to have some decent content at some point. And there are a range of content and content providers who have been tried and tested over time. One proven genre is live sports: premium sports services. Another is drama: movies and series. A third is children's programming: animation and other stuff, and so on. They all seem to work to persuade people to put equipment in their home on the end of a telephone line or cable line or satellite dish, and then access it and use it via PC or TV screens, then pay someone money for it, every month.

Churn is, inevitably, a major concern for all broadband and content providers alike. No one, apart from a few techno-freaks, puts a box in a home because it's a nice box; they put a box in a home because they want to use it for something. Let's address the entertainment part of that. If it's good entertainment and it works for the family then they will sign up in the first place because they want to enjoy the entertainment. The knock-on effect is that they will pay more money for it so you increase your ARPU. And if they like it, they won't cancel their subscription so you reduce churn. But if you didn't have any content you wouldn't have that problem because people wouldn't sign in the first place – apart from a few technos.

The biggest drivers of content of almost any entertainment-driven platforms are premium live sport – which in Europe means football; first-run Hollywood

movies – major investments in drama; branded channel, multiplex or VOD package offers in such areas as kids, for example the Disney Channel; adult programming – a very big driver of all new platforms; and then specific new ideas – massive multiplayer games, for example.

Disney has always been an active supporter of the VOD space. VOD movies is an area that people seem to be really excited about. If you want to watch a move in your home it's really nice to have it when you want it, to be able to stop and rewind, to have special features, to be able to access it several times, and to be able to search in a very large library in all sorts of ways. That's what VOD is about: it's what makes it attractive. And since we've got the raw content, that's good! That's why Disney's TV business is a shareholder in Videonet. And we've got small launch deals with people in the UK, in Italy, in Scandinavia, and – obviously – in the US. Plus we have a Walt Disney Internet Group whose job is to supply PC-type content – including gaming and all the rest of it – to broadband portals. These will be expanding areas of our business. These platforms and this access will grow, definitely

There are some territories where platforms have grown up – like BSkyB – who license the 'raw material' (the movies) and put together their own channels. There are some territories, very few, where an intermediary has grown up and they've been an aggregator of movies which they've then sold on to platforms – but that's fairly atypical. There are some territories where a small number of studios have got together to form critical mass, to provide their own service – central Europe, Australia and a few other places.

And there are one or two territories where studios have got together with platforms to provide the service – and, generally, that's been a very uncomfortable relationship because platforms like to get into bed with studios, but they don't respect them in the morning. Once they've got control, their incentive is to capture the value for the platform, so they are conflicted in terms of which bit of the business system they want to support. They would rather somebody else supported the creative but and they paid less for it because they collect 100 per cent of the platform profit but only 50 per cent or 30 per cent or 25 per cent of the service profit. And since they don't make movies or TV series themselves, it's not in their interests to see what they would see as a too large share leaking out to the people who actually make the movies and TV shows.

Where this leaves us strategically is an interesting question. Generally, joint ventures of platforms and content players have not worked very well for the reason that there's conflict of interest. What this means is that we're happy to licence to platforms. Although we like them to be big and successful, we worry when they become too powerful. And the biggest regulatory issue that people are not facing up to is what do you do about dominant platforms even if they got there only through being very good?

In every territory we're looking at new forms of service to get to the consumer, and broadband is definitely one of these. And there are a number of territories where – either because there isn't somebody else who's going to do it, or where we think there's an opportunity – we would, as an equity player, put together our own movie service which we would licence to a number of platforms. It might be a VOD movie service, or it might be a movie channel, or both.

I'm not dismissive of broadband, I'm realistic. I am excited, but from an entertainment point of view it's just another new, interesting way of distributing content into the home: it's not going to replace all the previously well-worked-out ways of getting consumers to enjoy content.

In the early days of the Internet people talked about a whole new form of storytelling, and they talked particularly about interactive storytelling. You can just picture it: you're watching '*Bambi*'. Bambi's mother hears this rustling in the forest and says: 'Let's flee!'. Then a shot rings out. Freeze-frame. Let's vote in the audience. 'Does Bambi's mother die?' 'Does the bullet miss?' 'Does Bambi turn on her human persecutors?' You can't tell stories like that. It's difficult enough to tell one story. Telling multiple stories at the behest of the audience is insane. Storytelling is a deep human instinct. This idea that suddenly this new medium would change a fundamental human activity – telling stories – is bizarre. And, of course, it hasn't. It may make it easier to tell certain stories, and it may make certain stories that you've told more accessible or more usable, but it isn't fundamentally going to change the nature of storytelling.

'Human beings weren't designed for a very wide bandwidth communication environment and therefore the nature of communications has increased the noise-to-signal ratio.'

But it does change the nature of communications. It clearly increases the communications bandwidth enormously in all sorts of ways: search engines reduce noise; you've got many-to-many type connections; there's enormous increase in bandwidth. I think, however, that human beings weren't designed for a very wide bandwidth communication environment and therefore the nature of communications has actually increased the noise-to-signal ratio a bit because you get more and more bad content sent around. More and more bad communication is sent around and it clogs up the network – spam being an example.

If you look at the quality of communication on Blackberries or e-mail or on the Internet there's a lot less information content per byte than there used to be. We all dump nine-tenths of the e-mails we receive immediately, so that's bandwidth that has gone to waste. And the quality of communications, to my

mind, is getting worse and worse per unit of communication. Now, the amount of communication is increasing significantly but it's a lot more of lower quality communication, in my view.

> 'People have got access to the best so they'll watch the best and only the best. And the best often happens to be a tired and trusted 'old' style of content.'

This makes it more difficult to cut through the clutter, but you can. The flip side is that people are more willing to find you. For example, the biggest blockbuster events now are probably bigger pro-rata than they ever have been because there's something of a winner-take-all factor where people are now not content with second, third and fourth best. They've got access to the best so they'll watch the best and only the best. And the best often happens to be a tried and trusted 'old' style of content, rather than a revolutionary new media genre, spawned by this broadband technology.

A paradigm shift for content distribution

Johannes Mohn | Executive Vice President, Media Technology, Bertelsmann AG, Germany

Johannes Mohn considers the changes that broadband access and home networking will have on media utilisation.

Dawn of a new era

Digitisation and the Internet have already brought many changes to all of our lives and are about to bring even more. For people in the media world who create music, produce films, publish newspapers, magazines or books, the changes might even be more imminent. The access to and distribution of media content is now entering a new phase. So far, we have been accustomed to selecting and ordering CDs, DVDs and books over the Internet, but still receiving them by post to our home. Now we cannot only select and order online, but we can also immediately receive the music file, the film or the book electronically delivered over the Internet.

The habit of accessing and receiving content online is still at the very beginning with music being the front runner. The online delivery of video and television content is even more challenging. Larger data files require better access channels to ensure consumer convenience and to maintain the quality of the product. The requirements differ depending on the application and I sometimes like to say that a consumer feels 'broadband-connected' whenever he or she doesn't experience any restrictions caused by the access channel.

Publishing products such as the e-paper, e-magazine and e-book are still in another phase. Due to smaller file sizes, the 'transport problem' is not the issue. The limiting factor is that people do not like to read on screens because the screen quality and ease of use of today's devices do not come close to printed paper.

Aiming for a new way to access and consume content more easily, raises a set of questions and requirements for all players. The hardware, software and media industries will need to cooperate closely and must face the fact that the strongest player and final decision-maker is not any of them, but the consumer.

Let devices speak to each other

En route to a connected home, which provides a seamless content usage, some obstacles must be overcome. In order to listen to music that is stored on the hard disc of the home office PC without requiring to burn a CD, you need to set up a home network that connects devices in different rooms of the

house. Some of these devices are already there, such as your TV set, your old stereo, your son's laptop – these might need some interfacing – and you will also purchase new devices, time after time. It is unlikely that you will fall in love with just one company for all of these purchases and even if so, pluralism in your family household might generate its own inertia for the choice of a brand.

Now you are left alone to integrate the new device that passed the democratic investment process into your home network. After much consultation of support websites, FAQs and hotlines you formulate a strict requirement for your next investment decision: seamless integration and easy operation.

The format war

You bought some music, downloaded it and it is sitting readily on your hard disc. It is willing to travel to your portable device, so you can take it to your car or elsewhere without any problem. But your wife's wish to have the tunes that both of you shared in earlier days available on her device, too, is denied. Not by you, you would not dare anyway, it is the war of the worlds that draws a hard line right through the center of your family circle. Due to some stylistic considerations she had to make a decision for another manufacturer device and it speaks another language – not yours.

Content owners' heartaches

Remember the good times when precious content was 'hardware protected': music pressed into the grooves of a record, videos recorded on a cassette tape and books printed on real paper. Now as these cultural treasures got digitised, they can be multiplied with just a mouseclick. Can music you downloaded be shared by anyone in your household at any time? Can your wife read the same e-book file at home while you have it with you on your portable device on a business trip? Can you finally clear out your electronic bookshelf and give the file to your friend or even sell it 'used'? New rules and business models will have to be developed to answer these questions addressing the protection of content against unauthorised copying, but yet fulfilling consumer needs.

A world without physical media?

Imagine a home without physical media. No books on the shelf, no magazines piling up on the living room side table, no newspapers in the waste paper basket. No CDs, no DVDs beside your TV set. Even if technology allowed such

a scenario, how would people think about it? Would they be ready to give up any tangible feeling by using media, any pride of ownership. Is tomorrow's birthday present an electronic file?

People will sort this out in the years to come, picking the benefits of more comfortable electronic media usage and leaving 'the old world' in its place where they want it stay.

We all will be contributing to this process and at the same time be witnesses of the possibly most dramatic change in the media world.

A broadcast strategy for an online world

Ashley Highfield | Director, BBC New Media and Technology, UK

The world has changed. Almost 50 per cent of UK homes has access to the Internet and 50 per cent of the nation also has digital TV. What we are witnessing at the moment in the UK is a tipping point: as more people have digital TV than don't, and as more homes are connected to the Internet than are not, so the rate of take-up actually increases – aided by the convergence of a number of social and technological forces. This critical phase for digital TV will take us through to the end of the analogue era which the Government is scheduling in about eight years' time. Successful media companies in this context will be those that realise the landscape has changed and that viewers want to consume media in fundamentally different and new ways – not gathered around the TV box with rapt attention.

Until now, industry giants have promoted digital TV take up by betting that the consumer wants more choice of channels and programmes – more movies, more sport. Future TV, however, is likely to be unrecognisable from today, defined not just by linear TV channels packaged and scheduled by television executives, but resembling more of a kaleidoscope: thousands of streams of content, some indistinguishable as actual channels. These streams will mix together broadcasters' content and programmes, and viewers' contributions.

At the simplest level – consumers will want to organise and re-order content the way they want it. They'll add comments to our programmes, vote on them and generally mess about with them. At another level, however, they will want to create streams of video themselves from scratch, with or without our help. At this end of the spectrum, the traditional 'monologue broadcaster'-to-'grateful-viewer' relationship will break down, and traditional advertising and subscription models will no longer be viable.

Digital TV has, until this point, been led by the commercial sector, but the next phase will see public sector services playing a far greater role. As the creative R&D for the nation, the BBC has a distinctive role to play in creating the content, services and tools which audiences want for this future TV world and which the market at the moment cannot risk providing.

Against this background, new research from the BBC has revealed four new and significant social trends that show that the way in which we consume TV is changing forever.

Firstly, consumers are taking control of their media consumption. Secondly, they increasingly want to join in and get closer to their media. Thirdly, they will want to consume more and more media simultaneously. And finally, they will want to share. Broadband, which is now growing exponentially in the UK – up 200 per cent year on year to over four million broadband subscribers – will make downloading of decent video quality worthwhile, easy and cheap via the Internet. Downloading, storing, and sharing these videos is the final piece of the jigsaw and will create a killer combination that, I believe, could undermine the existing models of pay-TV.

The BBC's new media strategy for the past five years has been based on the remit given us by the Department of Culture, Media & Sport in 1998/9 which was intentionally quite broad and based around the idea of being a trusted guide to the new digital medium; being a home for licence-fee payers on the web; and setting out to create great content to help grow reach.

2.4

Today, however, as the market is beginning to mature, our emphasis must shift to focus on how the BBC can deliver public value in a fully digital Britain, and how we can help ensure no one gets left on the wrong side of the digital divide. So the shift we're now starting on – and we are writing the strategy at the moment – is to outline the purposes of our online activities over and beyond getting people online, and which has clear benefit for the country? And what public purposes does the internet simply do better than TV or radio? So, for instance, we are looking at the democratic value of new media in the home in terms of website projects like iCAN – giving people a voice for democratic debate – against big trends such as people disengaging from national politics in favour of highly local or global issues.

From this it is probably clear that the BBC's plans for new media are in a period of profound change of emphasis. However I am in no doubt that we need to achieve a 100 per cent digital Britain – a nation connected is wealthier than a nation which is not, whether this is in terms of social capital or hard GBP. A connected nation is something we should all aspire to.

As we are universally funded through licence fee by the British public, we should therefore be universally available and, preferably, universally used. So whatever else we end up doing, underpinning all we do must be the goal of a 100 per cent digital Britain.

Now my interpretation of that – and BBC director-general Mark Thompson's interpretation of that in the BBC Charter – is not limited to digital TV: I think we're quite clear that 'digital Britain' means more than just digital linear channels. It means two-way relationships, and for us it means on-demand services: the BBC when and how our audience want it. This is what consumers increasingly want: it's a major trend. We cannot rely just on linear scheduled output, expecting people to consume our content when we want them to.

So people want more control over their media. But another important trend is that they also want to join in more with their media. In a fragmenting society, joining in with media is a substitute for community in a lot more ways than *Pop Idol* or *Fame Academy*-style voting. Our plans going forward therefore revolve around a number of big areas in the home.

One is the publishing model that we already have online, and this will continue. But we see this as complementary to our linear output: it's about consistent information to support our linear programmes. We need to be cleverer about this, and simpler, too. Sometimes we make things too complicated. The second big area is on-demand services and this is where we will be putting much of our emphasis. We believe there is often more value in using our relatively small budget to repurpose content from other media into the on-demand world. So what that means is products such as our internet Radio Player that takes radio output – programmes that might be broadcast at inconvenient times – and makes it available on-demand. And technical trials like our interactive media player (iMP) which takes TV programming and makes it available – downloadable – a week after TV transmission in exactly the same way, on demand. Then there is our Creative Archive idea which will make clips of our back-content available on-demand. Each is trying to give the consumer greater control over when and how they consumer our content.

So it looks like all homes will have mass storage, and 70-80 per cent of homes by 2015 will have broadband. But linear digital TV will still be prevalent. I don't foresee the end of digital TV or the end of linear terrestrial TV. I don't believe it's all going to be IP. The home of 2015 will have massive home storage, broadband as well as digital linear TV. We are trying to offer services that are going to make all of our output much more easily consumable in an on-demand, two-way world.

Certain rights like sport – where broadband rights are packaged and sold separately – are more problematic, of course. But with this summer's Olympics we held all rights, including broadband, and we secured these by restricting broadband distribution to the UK only using GeoIP (footnote explains). So we are able to block IP access from outside the UK. We have two ways of doing this: either we restrict the distribution to British broadband service providers only, or we block at the country level.

This technology has allowed us to start segmenting our content and offering the UK something different from what we offer elsewhere.

The big issue we have to look at, of course, is the cost of distribution. So as part of the iMP trial we are piloting Peer-to-Peer. The idea is that you could get *Top Gear*, say, from the BBC, and download it. If your next-door neighbour came to us to try and get it too we would know that you'd got it, and it would be a closer location on the Internet to get it from than us. Properly managed, this can significantly reduce the cost of distribution.

Using Peer-to-Peer in this way sounds like a rights nightmare because then, surely, everyone will copy the content. But this should not be confused with the file-sharing technology that enables people to share content at will. What we are trialling uses the benefits of Peer-to-Peer distribution while retaining control of the media being distributed. In addition, the files are encrypted, and so will be useless if your neighbours don't have the rights to watch it. At the moment they want to view the content a call-up is automatically placed to us and we can check that what they want to watch is within permissible rights window either for time, or location (that they are within the UK, for example), and so on. It's complex, but that's why we're piloting it.

Our primary motivation is to make our content available to our audience the way they want it in order to ensure the survival and relevance of the BBC in this digital age.

'I don't think we have even begun to think of the real long-term potential of digital interactive television'

Over and beyond all this, interactive TV is also hugely important. It's barely five years old, of course. But we've just got some audience numbers through that show that our interactive TV service, BBCi, has a monthly reach of over 10 million viewers in UK digital TV homes. That makes it the biggest non-terrestrial service on digital television after BBC1, BBC2, ITV1, C4 and Five. That's quite colossal. So people are clearly using it whether for the news, weather, entertainment, horoscopes, or arts programming, Wimbledon or Test the Nation. The evidence is although at the moment its bandwidth is a bit limited, Freeview has high usage within Freeview homes.

But it is only a tiny fraction of the picture at the moment, and like everything else, I don't think we've even begun to think of the real long-term potential of digital interactive television.

Making money in broadband

SECTION 3: MAKING MONEY IN BROADBAND

3

Evolution of IP enabled communications services

Forrest E Miller | Group President, External Affairs and Planning, SBC Communications Inc, USA
Jeffrey G Weber | Vice President, Product & Strategy, SBC Operations, Inc, USA

When customers think of broadband, they generally think of speed: how fast they can access the Internet. Speed is indeed a defining characteristic of broadband. But for SBC companies, speed also means how fast we can efficiently and effectively deploy broadband necessary to meet the rapidly evolving demands of the marketplace. These market demands include Internet Protocol-based video and voice which create endless possibilities for business and residential customers. And broadband – with significantly greater bandwidth that is available now – is the key.

In Summer 2004, SBC defined a strategy to drive fiber deeper into its network to power high-speed, IP-based local connections. Fiber technologies and IP-based services will enable a communications revolution, allowing consumers and businesses to experience integrated video, data and voice services beyond what can be provided over any network today.

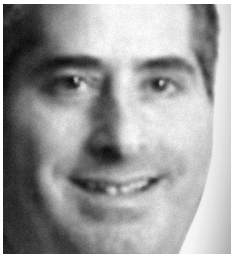
Pending successful completion of trials and favorable regulatory conditions, this strategy could result in next-generation services becoming available to millions of customers in the SBC service territory in the next five years.

In neighborhoods we presently serve, we expect to use Fiber to the Node (FTTN) technology to run fiber much deeper in our network to nodes that serve 300 to 500 homes. FTTN enables significantly higher broadband speeds than any residential service offered by a major carrier in the US today, with download speeds of 15 to 25 Mbps and upload speeds of 1 to 3 Mbps dedicated to each customer.

In most new network builds, such as developing subdivisions, we are evaluating plans to use a Fiber to the Premises (FTTP) solution.

Cost, demand, time for deployment and avoiding potential inconvenience for customers are all key factors in this decision to use FTTN for overbuilds. We've evaluated a full range of technologies and deployment scenarios and we're confident that our joint FTTN/FTTP strategy is the right solution to deliver the next generation of IP services, and to evolve our network to meet customers' communications needs.

As we launch this strategy, we're planning to take advantage of this network upgrade and related systems enhancements to improve the experience we



provide our customers. We're retooling processes to help customers more fully utilise on-line capabilities to order new service, ask for help in getting the most out of their service, and access billing information.

Today, traditional 'telephone companies' like SBC companies are competing against cable companies by offering bundles that include voice, video, data and wireless. Obviously, these services have been around for a while. What's new is the ability to not only bundle them, but to integrate them over a single platform in a way that adds value for consumers and small businesses.

Cable companies, which have offered video and high-speed internet service for years, are now starting to get into the voice business by using Voice over Internet Protocol (VoIP) – a technology that's received a lot of buzz. For the cable companies (and some others), VoIP is a tool to enter the voice business.

However, we already have a world-class, reliable voice network, so we're harnessing the power of IP to meet the feature functionality requirements of our customers, make integration across networks easier, and reduce costs.

By fully utilising the capabilities of IP, fiber, and wireless data technologies, we aim to build our presence in the marketplace with clearly differentiated product offerings which customers will regard as superior value for the money.

For example, our fiber deployment strategy when combined with switched digital video affords us the opportunity to change the way people watch and use television. The ability to make content available when a customer wants it – rather than when programmers choose to deliver it – is a critical differentiator.

SBC companies and Microsoft announced a trial in summer 2004 to test an IP-based switched television service. The goal of this trial is to enable a new type of next-generation digital video entertainment experience, offering features like high-definition programming, customizable channel line-ups, multiple viewing angles, multimedia interactive program guides, event notifications and more. IP-based television services also could eventually interact with other connected devices in the home.

Connecting homes is something at which we excel. We currently sell 3,000 wireless home network gateways a day, allowing customers to connect wirelessly to high-speed Internet access through the home.

As a further source of differentiation, we are working to develop new products using our knowledge of networks – both wireline and wireless. For example, we introduced FastForward in 2003, a special cradle from Cingular that integrates wireline and wireless services at the handset level, enabling customers to transfer calls from their Cingular wireless phone to their wireline phone. Subscribers enjoy the clarity and quality of their wireline phone while preserving their wireless minutes.

In the not-so-distant future, customers will use their wireless phone as a cordless phone in their house and a wireless phone on the road.

One day, consumers will program their DVR from their wireless phone and be able to download a new movie trailer outside the theater before they decide to buy a ticket.

These kinds of applications, facilitated by IP, represent an enormous opportunity and will continue to drive broadband and wireless growth.

Obviously, on-going development of wireless data capabilities and robust fiber deployment is essential to bringing these kinds of applications from marketing concept to robust implementation.

Several factors will influence the services consumers and businesses receive in the future. Importantly, policy makers will have a significant say in how and when these applications come to market.

It is our hope that they recognise just how fully competitive the communications market is and the utmost significance of IP platforms as enablers of new services. We are cautiously optimistic that we may be headed toward rational, market-oriented regulations that will promote investment and deployment of new capabilities.

Content providers also play a critical role. We hope to work with them to create a video marketplace that's more competitive and innovative. We believe there is a huge opportunity to create content and services that are truly interactive and extensively customized to fit user requirements.

Finally, advancements in technology – and, quite frankly, the industry's ability to embrace those changes – are essential to the development of our business. We expect that developments in compression technology, MPEG4 or Windows Media 9, will enable us to deliver multiple high-definition TV streams over our switched digital infrastructure. Our ability to deliver new, innovative services could be further enhanced by next-generation DSL technologies such as ADSL2+ or VDSL. The evolution of switched digital video platforms is also critical.

We believe the combination of regulatory certainty, access to and creative development of content, and timely application of new technologies will create unprecedented opportunities for customers everywhere.

When it comes to broadband leadership, SBC companies set the standard with DSL and we will maintain that leadership position in bringing the next generation of communications services to our customers.

This article was written as of August 2004, and SBC disclaims any obligation to update or revise statements contained in this article based on new information or otherwise.

Leaping the chasm from connection to powerful enabler

Pierre Danon | CEO, BT Retail, UK

As the broadband revolution enters a new phase of development and millions of homes get connected, we can only now start to imagine the endless possibilities of improving the quality of life of the people in those homes. The initial benefits experienced by customers of faster downloading speeds without affecting the use of their fixed line telephone now appear very modest when contrasted with the exciting and affordable new services coming on-stream today.

The customer will lead our thinking

Our customers are in the process of learning how to create a host of new experiences using the broadband ecosystem of devices and the rich array of services and applications now available. And what is more, this is not the domain of the 'technically literate' early adopters but rather increasingly the mass market of families, young single people and retired couples who have come to appreciate the fulfilment and enjoyment to be had from being connected.

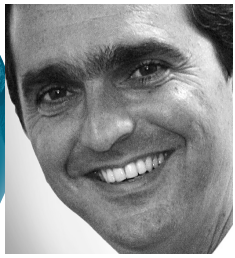
They are able to see, talk and interact with each other in a way that has simply not been possible before. What's more, they can now effortlessly reach for entertainment with an intimacy and directness that responds to their own personal mood and desires rather than having to accommodate anyone else in the household, let alone the rest of the country.

We will need to work hard to understand how our customers want to make broadband work for them so that we enrich their homes and communities. This is a phase that will be led by our customers and the economic realities of what they are prepared to pay extra for and what they are not.

However, the arrival of this new way of life is irresistible, and will not only challenge the way in which we all live, learn and work at home but will also present new challenges to businesses, including BT, as they adapt to this new order. Not since the advent of electricity has such a moment of transformation in the home presented itself.

Making broadband available is barely an issue

The UK coverage of broadband-enabled homes is already over 90 per cent (ADSL), with the ambition to reach 99 per cent by the summer of 2005. Customers are now translating that availability into active connections at a pace that has exceeded all prediction. Penetration has accelerated from two



per cent in 2001–02 to more than 15 per cent of households today. BT reached 2.7 million DSL connections in June 2004, representing an increase of 150 per cent on June 2003, and is on target to achieve five million connections by 2006. UK broadband has one of the fastest growth rates in Europe. In the fourth quarter of 2003–04 the UK grew at 32 per cent well ahead of Spain (16.2 per cent), Germany (9.3 per cent) and France (20.8 per cent).

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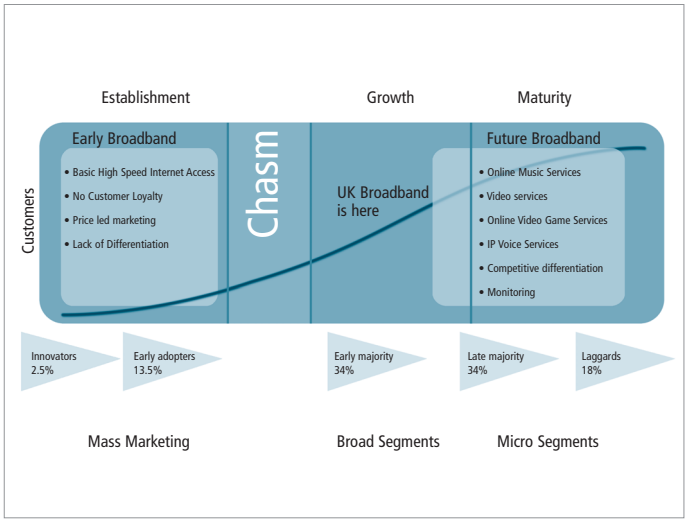
We have now reached the point in the adoption curve known as 'the chasm' – the bridge from early adopters to the early majority.



Source: Diagram – adaption from Geoffrey A Moore, Crossing the Chasm, HarperBusiness, 1991

Crossing the chasm from access to a whole new experience

What this means for us, our partners and our competitors is that we are moving from the era in which the marketing story has simply been about selling high-speed Internet access with little differentiation between brands and a fierce price battleground, to one where there is the opportunity to offer added value experiences and services on line. Our customers want more than technology and performance they want us to translate them into relevant benefits which enhance their lives.

Even the most pessimistic analyst predicts the significant growth of online entertainment in music, video and gaming and IP voice services. There is now a real opportunity for brands to stand out in the crowd through the provision

of unique content, communications and platforms and the support infrastructure of security and technical advice they require.

The ability to entertain one person at a time

Technology will make it possible to allow customers to interact through broadband on an entirely individual basis. BT is trialling Flexible Bandwidth, which will allow customers to raise their data speeds at the click of a button and to opt for an assured quality of service for the duration of time required. For our customers at home it means they can boost the level of broadband power they require, only paying for what they actually use.

Given this ability to boost the level of BT broadband in an affordable and flexible way, the challenge has then been to enable the provision of content they want to watch. BT Rich Media is the UK's first and only end-to-end modular platform solution of its type, allowing anyone from large corporate to small businesses to deliver online content to the mass market. The platform integrates with BT's Flexible Bandwidth functionality to provide customers with near DVD-like quality over broadband with assured service levels.

The platform includes the ability to store, retrieve, manage, package, sell and deliver everything from digital music and video footage to live sport and special interest content. With digital rights management (DRM) software embedded in all content, the platform will legitimise file sharing for both consumers and consumers alike. The service enables thousands of content holders to reach an audience of millions.

'Communication is the heartland of the BT brand, and broadband allows us to develop new combinations of voice, video and data to the centre of the home.'

Integrated with BT Rich Media is BT Click and Buy, which provides a platform for users to pay for Internet content. Currently serving about 150 partner sites and well over 200K customer account holders, it is well established as the leading payment solution for digital broadband content due to its range of payment methods and good customer experience.

Of course, 40 per cent of homes do not have a PC and we believe that to make broadband truly mass-market it needs to deliver video and interactive services to the television. The economics of broadcast over the broadband network do not make sense, and will never match that of normal broadband TV. We believe a dual approach which mixes broadband and broadcast entertainment seamlessly will become the prevalent solution. Customers will simply purchase a set-top box, which will enable this transition by connecting to broadband and an aerial.

BT is not a media company but we can 'enable' the entertainment industry with a complete end-to-end digital distribution platform. We are exploring with a number of key partners how to develop a new service based around a digital broadcast and broadband-driven set-top box to enhance the TV viewing experience significantly in the UK. What this means for our customers is the opportunity to create 'personal' TV consumption, which will complement and enhance existing broadcast TV at home. Ultimately we believe video will be delivered to the TV.

Personal music collections have always been an important part of many people's lives, and the number of broadband powered devices is growing. iPods can be updated across broadband making it possible to download music. Radios are now WiFi-enabled, which has prompted us to develop the Lauchcast service, allowing customers to stream their favourite music to their WiFi-enabled radio in the house.

Gaming with the rest of the world from home

The growth in computer games is well documented; however, broadband in the home has allowed the experience to go to a new level. BT has partnered with Xbox Live and PlayStation Network Gaming to enable the sharing of the broadband connection between PC and console. Players can find opponents to play anywhere in the world in real time, in game speech – adding to the intensity. Children and adults alike will always be able to find someone to play with and talk to.

Communication through sight and sound

Communication is the heartland of the BT brand, and broadband allows us to develop new combinations of voice, video and data to the centre of the home. BT Communicator embraces new technologies such as voiceover IP and link them to existing home communications. This free to download service will deliver to customers in one simple package 'one click' away from four-way Video Chat, SMS to mobiles, full Call Management, PSTN calls, online Directory Enquiries, VoIP calls, Instant Messenger and centralised Personal Address Book. First trialled very successfully in May, BT Communicator rolled out to existing Yahoo! and BT Yahoo! Broadband customers in July 2004. Initially available through the PC, Communicator has the potential to integrate with mobile devices and the TV.

Another world first in development is what we call 'Project Bluephone'. This will enable our customers to transform their mobile phone into a cheaper more reliable fixed line phone when our customers are within their home. Utilising both wireless technology and broadband, customers will simply carry on enjoying the benefits of mobility combined with quality of broadband. The creation of this wireless broadband 'zone' at home will allow customers to enjoy the best of both worlds.

Reaching for knowledge in a structured way

Our children are taught ICT at school now as part of the main curriculum and with this comes the confidence and ability to draw down information online to enhance their education and development. The Internet made it possible to get information from around the world; broadband helps to translate into an interactive experience to help us learn. The BT Learning Centre is a unique online learning service that makes available in one place the best educational content suppliers. Covering the UK national curriculum, it includes age-specific interactive learning activities, revision tools and research from nursery to adult. Over 3,500 schools are already actively promoting it to parents and teachers. Reaching for knowledge through a broadband connection is becoming a natural way to tackle homework, project work and revision.

Keeping the home secure

It is very important to ensure that the security of the home is not compromised by a broadband connection, and BT leads the field in this area. Customers can feel vulnerable to invasion by viruses or the infiltration of their data. BT seeks to protect them both through the network and the provision of individual firewall and antivirus systems. Not surprisingly we have found that there is an upsurge of demand for these services coinciding with major security scares published in the media. We believe that strong credentials such as ours in this area will be one of the key aspects affecting brand choice. The benefits of broadband are a growing magnet for our customers; however, the threat and cost of security breaches could have been a major barrier to purchase if we had not addressed it vigorously. Customers simply want the reassurance that they can participate and enjoy the benefits of broadband safely.

Monitoring your home and health

We have grown accustomed to the sight of security video cameras in shopping centres and on our streets. This technology will now be available with the use of a webcam to allow us all to check on the security of our home and dependants. Mothers wanting to check on their children when at work will be able to see what is happening on their PC. It will be possible to programme in the usual activity of elderly relations using appliances in their home, such as a kettle, so that if this fails to occur by a certain time an alarm will be triggered.

Not only will it be possible to observe and sense what is happening at home, we will also be able to monitor our health. For instance, diabetics will be able to have their readings sent back to a central database so their doctor can detect and diagnose any abnormalities. And this is only the beginning.

Support and maintenance for the 'non-technical' person

It is true to say that the innovators and early adopters in technology are usually more confident and interested than the mass market in how it all works. We realise that as penetration increases steadily we have more and

more customers who have neither the time, ability or inclination to be involved in the ongoing maintenance of their systems and devices. This starts with installation and carries on afterwards indefinitely. What is more each new level of service and device makes the home broadband ecosystem increasingly complex, and if customers are to maximise the potential of their home of possibilities they need our help.

> 'In three years' time the reality of a broadband connected home will be mainstream in the UK.'

BT Home Computing offers broadband-configured PCs through large corporates to their employees. These PCs are installed by our engineer workforce so the first step towards a home of possibilities can be taken out of the hands of a customer and provided by us. BT Remote Management System will work to allow troubleshooting and diagnosis of broadband service issues using online information fed back from a specially designed home network router installed in a customer's home.

The easiest way to connect all the various devices in the home and manage and effectively prioritise the traffic up and down the broadband pipe will be through a hub. This will normally be a router, but could be the set-top box and will act as an invisible management system.

The normality of a broadband connected home

In three years' time the reality of a broadband connected home will be mainstream in the UK. I have tried to give you some examples from services we are already making available in the market to demonstrate that we have gone beyond 'imagining' this world to actually experiencing it. The impetus that has led us to access a market of millions has allowed us not only to develop exciting new experiences for our customers but also to make the economics work so they are within reach of the majority. Life at home will never be the same again and as with electricity we come to wonder how we ever lived without broadband.

Broadband: the catalyst of integration

Howard Watson | CTO and Managing Director, Networks, Technology & IT, Telewest, UK

Demand for bandwidth is growing exponentially and expectations surrounding the next generation of digital and broadband services are growing almost as fast. Which is why Telewest believes cable – rather than other delivery platforms, such as satellite or DSL – is best positioned to be the delivery mechanism of choice for broadband users in the very near future.

Our reasoning is simple – only cable can provide the fibre-deep networks on which the broadband services of tomorrow will depend. For proof look no further than three recent trends. Demand for bandwidth is growing at a phenomenal rate as internet traffic grew by more than a thousand-fold between 1996 and 2003. In the UK the number of broadband connected homes has doubled in the last 12 months or so. As a result, networks must expand as fast to meet demand. Consumers, meanwhile, are demanding services that are increasingly personalised. This means networks delivering these services must be able to dedicate bandwidth to individual users – something cable is ideally positioned to do. Thirdly, time is the great scarcity of the 'Information Age'. Delay, in other words, the time it takes between requesting and receiving a signal, is unacceptable. So networks must be capable of delivering personalised high bandwidth needs within milli-seconds of a customer's request.

Consider the historical perspective. Cable TV networks were originally deployed in the US in the early 1950s as a means of delivering TV signals to communities with poor or no off-air TV reception. These initial systems had a relatively low bandwidth (200 MHz) and were uni-directional. As multichannel TV developed in the 1970s and 1980s, deployment in the US rapidly expanded as a means of delivering additional viewing choice to consumers. Throughout this same period, the technology also continued to develop. Two-way systems were deployed which allowed a reverse path from the customer to the operator over the same physical network. As a result, the bandwidth of networks developed from 200MHz to 500MHz increments roughly every two years up to a capability of 750Mhz in the early 1990s.

These early systems adopted what became known as trunk/feeder architecture. A coaxial feed emanated from the operator's head-end and the signal was amplified periodically by high power trunk amplifiers. Between these trunk amplifiers the signal was split a number of times and feeds taken down each street again amplified periodically by feeder amplifiers.

Upwards of 30,000 to 40,000 homes would be fed from the initial coax feed emanating from the head-end. This resulted in systems with large numbers of amplifiers, leading to high noise and interference – especially in the return path – and relatively low reliability.

A fundamental change in network architecture occurred in the early 1990s, as fibre optic technology became deployable in these networks. The use of fibre for the transmission of information originated in telephony networks in the early 1980s. These systems were digital and typically transmitted information at rates of 140 Mbps. It took a further ten years for optical laser technology to achieve the increased performance and stability characteristics required for deployment in broadband cable networks. The deployment of fibre radically changed the architecture of cable TV networks and essentially transformed them into the broadband cable networks deployed today.

> 'The rapid migration to digital delivery of broadband services we are now seeing in the UK is a major opportunity for cable. 'Broadband narrowcasting' is the future.'

Now, a single pair of fibres emanating from the head-end feed a small cluster of homes, typically around 500. The removal of the need for many amplifiers provided an improvement in resilience to noise and also in network reliability, the latter achieving the same capability as that taken for granted in telephony networks. As fortune would have it, cable TV network deployment did not commence in volume in the UK until the early 1990s. This meant that fibre-based, high bandwidth systems were deployed from the start and the expensive system upgrades undertaken by the US operators throughout the late 1990s were avoided.

Bringing the story up to date, the rapid migration to digital delivery of broadband services we are now seeing in the UK is a major opportunity for cable. 'Broadband narrowcasting' is the future, and one that cable is ideally positioned to deliver. DSL networks, for example, would need to push fibre much closer to their customers' homes to rival the benefits companies such as Telewest can already offer.

Three characteristics enable you to assess the future relevance to broadband services provision of respective delivery platforms: cable, satellite, DSL and wi-fi. The first is how close the service provider is to the customer. Consider cable and satellite and there's just no comparison. Cable networks comprise multiple fibres from one local building to clusters of 500 homes in a locality and, as a result, we physically get building infrastructure within 10km of our customers which hold content and from which these local clusters are served. Satellite, on the other hand serves exactly the same signal to a footprint of circa 22 million homes in the UK – broadcast is the only real option!

The second is bandwidth capacity. At present, DSL runs out of capability between 2 and 4 Mbps. The only way for DSL service providers to fix that is to upgrade to VDSL requiring them to drop the distance between themselves and their customer to less than 1km. The third characteristic is latency, how long it takes to get a response to a request made by a customer via broadband. The importance of distance here is critical and a fundamental law of physics and is a major drawback for satellite. Meanwhile, with set top boxes already in place, cable enjoys another benefit, the fact that the electronics to fully utilise broadband bandwidth is already within our customers' homes, making cable more capital-efficient.

'There are risks, of course. Such as the fundamental challenge facing the whole broadband industry, namely, how far ahead of customer demand should you spend the capital required to further develop and expand broadband networks.'

There are risks, of course. Such as the fundamental challenge facing the whole broadband industry, namely, how far ahead of customer demand should you spend the capital required to further develop and expand broadband networks. Since the early 2000s there has been a marked slow down in investment by all service providers. As we move away from recession, we have to match economic investment with customer take-up. Again, cable is well positioned because much of the infrastructure required is already in place.

Cable already offers the triple proposition of digital TV, telephone and high-speed internet access, you see. And customers are increasingly buying into cable because of its ability to offer all three. At Telewest alone, the proportion of customers buying all three services from a single provider has risen from 13.2 per cent in June 2003 to 24 per cent at current levels – a clear and significant head start over other service providers, such as DSL. Delivering a triple play via DSL will prove to be very difficult, especially to multiple TV sets in the home and triple play via satellite is currently not possible.

A key issue, of course, is the type of broadband services customers will enjoy in the future, and these have already evolved rapidly in recent years. Taking a mobile phone analogy, if 1G is narrowband voice in real-time; 2G is narrowband voice and data in real time; 2.5G, meanwhile, is GPRS and SMS but not in real-time and 3G offers real time, low bandwidth data. 4G, however, is just around the corner: high bandwidth, real time data with rich video content. And it won't be long before broadband-connected homes demand just that – real time video outside normal TV requirements, such as via a home PC for entertainment or education or even public service applications. Already, we're starting to see the first part of this 'S' curve approaching – primarily in relation to video content which, in itself, is now a major driver of demand for bandwidth.

Much of this is likely to be service provider-driven rather than customer-driven, at first. We will see the equivalent of the old promise of video telephony – one-to-one and one-to-two communication – starting to take off, and video messaging, as well – just as we have already seen with 3G mobile networks.

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Currently, broadband internet connection requires 3Mbps for video and 64Kbps for voice. Increasingly, however, video will be delivered via broadband to more than one TV set in the home requiring more bandwidth to become available. And there will be greater pressure to develop more bandwidth to deliver more sophisticated content, too. Today, peak time consumption is around 4Mbps; expect this to double over the next two to three years as we move into the era of the equivalent of 4G broadband content.

Also, we will see bandwidth consumption within European countries increase with the spreading adoption of HDTV – already an established feature in the marketplace within the US and Japan. At Telewest we are expecting a major acceleration of bandwidth demand driven by HDTV between 2008 and 2010. Needless to say, I've an optimistic view of demand for increased bandwidth over the next five years.

A number of key challenges face all of us. The first is the switch off of analogue TV. For us, the challenge is lessened, however, by the proportion of our customers already consuming digital TV. Currently 82 per cent of our customers take a digital TV service and we expect this to reach 100 per cent by 2006. As our customers migrate to digital this frees up analogue bandwidth we can then use for broadband needs. Speeding up this migration is key for cable, especially in the US where the penetration of in-home set top boxes lags far behind the figure for households in the UK.

Critical for the future growth of digital broadband delivery is, firstly, achieving global critical mass of digital cable bandwidth to drive down the cost. This is already happening. Consider the recent evolution of the set top box – on sale at £400 in 2001, £100 today and likely to cost £70 by the end of 2005 while its capabilities have rapidly expanded. One challenge we don't have is the

need to dig up the streets again to increase the capacity of our networks – something incumbent telcos will have to do at some point if they are to truly compete.

The second factor, key to the future cable broadband growth is ensuring the capital investment cable service providers make is incremental in terms of consumer demand for bandwidth.

Thirdly, there is the issue of just how the PC and TV will integrate – if they integrate at all – within the home. Consider the personal video recorder (PVR) – its impact has been to precipitate the further fragmentation of audiences within the typical family home. There has been a significant increase in individual viewing experiences as a result – a shift away from conventional TV viewing and towards the PC user experience.

'True, it will never be economically viable to extend the cable network into every small and remote locality. But the fact remains that cable will become the dominant delivery mechanism because of its innate advantages, and the likes of DSL and satellite will be the choice of those who can't get cable.'

Then there is the issue of just how much control people will want over the broadband content they consume. Will they really want access to a massive server and use of an enormous search engine to select what to view from every programme that has ever been made? I don't think so. There will always be a place for couch potato viewing – as opposed to planned viewing, the question is what proportion of their time viewers will spend doing each. I suspect the broadcasters' role as tailor and packager of programme content will always be a central one. I doubt any further new innovations will replace previous versions – we still read newspapers and books and listen to radio and watch TV despite now being able to use the internet.

Another challenge is the extent to which the fixed and mobile worlds will integrate. Broadband will be the catalyst to make that integration happen. Increasingly, consumers will want to receive the same sets of services in the same way via mobile and fixed lines. They will expect the transparency they already have between mobile and fixed line voice services, and which they are increasingly getting for data services.

Cable's reach will continue to grow – by necessity. In the UK we have focused so far on the 11 million homes we have already passed to get a return on the investment we have already made. But that was a strategy born of an era when the dual proposition of TV and telephony was standard. For the past

three years, however, the triple offering of TV, phone and internet has become the norm yet for two years of that period we have been in recession. Now, as we move out of the 'bubble burst' phase, we will be looking to increase the number of homes we pass on an incremental basis to move the whole cable sector forward.

True, it will never be economically viable to extend the cable network into every small and remote locality. But the fact remains that cable will become the dominant delivery mechanism because of its innate advantages, and the likes of DSL and satellite will be the choice of those who can't get cable.

Korea: hands-down winner in the world broadband race

Jong-Lok Yoon | Chief Technical Officer, Korea Telecom, Republic of Korea

Jong-Lok Yoon, CTO of KT, looks at Korea's success as a world leader in the broadband market and considers its future strategy.

The key to Korea's success

Korea has the most advanced broadband market in the world, and 11.3 million broadband subscribers representing 78 per cent of the households. What are the key factors behind Korea's broadband success? Some lessons are quite unique to Koreans – for example, urban density is very high: almost 40 per cent of the total population live in a region around the capital city Seoul, and many people live in large apartment complexes, which facilitates last-mile broadband deployment. Some people are too quick to dismiss the disparity. However, even with geographic and demographic differences, there are many valuable lessons that are very relevant to other markets around the world.

Hands-on government

Korea government's vision and willingness to set the policy to drive the vision is a major factor behind broadband success in Korea. In 1995, Korea's government set a vision to drive towards a knowledge-based economy, recognising that there are two major barriers to overcome: making sure there are sufficient investments, and strong competition in the telecom industry. The Korea government has not only deregulated the telecom industry, but also take funds raised in mobile license auctions, and uses the money to provide funding and low interest loans for a new national backbone network build-out, so that alternative providers don't have to depend on the incumbent – KT's infrastructure. The fund has also extended to addressing the issues of the lack of broadband in rural areas by committing government money to funding remote area developments

Competition and technology

Deregulation and soft loans to new SPs introduced strong competition in the telecom industry. With government's encouragement, new SPs such as Hanaro and Thrunet and cable operators were the first movers in broadband, ahead of KT, the incumbent. However, KT was able to leverage its deep pocket and last-mile advantages to take a market share lead. Currently, KT has a 50 per cent share of the broadband market, with Hanaro 26 per cent and Thrunet 11 per cent, reaming four per cent off cable operators. Strong competition not only forces down prices; more importantly it also helps foster different technology: xDSL, Metro-E, Satellite, Home LAN and HFC for

different types of premises, and accelerates adoption of advance technologies to improve BB access speed from typically 1Mbps in 2002 to 20 Mbps today. Improved speed induces more content development. And more content improves user experiences, thus attracting more users. In fact, this creates a virtuous cycle for accelerating broadband's adoption in the country.

Education and culture

Broadband technology is also being used to improve Korea's education system. In April 2004, the country's TV network began to webcast free tutorials to help students prepare for the national university entrance examinations, equivalent to SAT in the US. Typically, high-school graduates attend these tutorial classes to prepare for the testing season, which is a time of national anxiety. In the first time trial, 100,000 students participated in the webcast.

It's this kind of mentality that permeates Korean society. With 13 million of the country's 48 million citizens living in dense cities, people are constantly aware of what their neighbours or fellow subway commuters are buying. As a result, South Korea has become something of an open-air focus group for technology manufacturers, accelerating replacement cycles.

Ignite the demand

As a matter of policy, the Korean government embarked on the Project for Information Society, in which over 20,000 government agencies and 10,000 schools are to begin e-transformation including a series of e-Korea and e-government initiatives. As the government services move online, businesses or individuals who have to do business with government agencies must move online as well. These government-driven initiatives helped create a catalyst for igniting the demands for broadband throughout in the country.

Broadband demands

There are more than 28,000 Internet cafés throughout the country – almost one for every 1,700 residents. They provide inexpensive access to the Internet at about $1 USD per hour, they're usually clean and wholesome places, and are popular as a social meeting place, especially among the young for video games. Last year, Webzen invited gamers and their families to an event to help dissipate some of the negative reputation of online gaming in downtown Seoul. Around 30,000 people showed up.

Gaming and multimedia are among the main drivers of broadband demand. Over 74 per cent of BB users subscribe to audio and video content on the Web. They pay a small fee to watch TV programmes on their PC which they may have missed earlier. Gaming is Koreans' obsession for both the young and old. NCSoft, Webzen and Gravity, the leading online gaming companies in the world, are gearing up to bring their *Lord of the Rings*-type multiplayer games to a worldwide market. Webzen estimates that 40 million registrants hold temporary or recurring subscriptions for its online game with an average of 500,000 people playing it at any given time. NCSoft has over two million customers paying around $20 USD per month to subscribe to the service. Three cable TV channels are dedicated exclusively to covering tournaments and how-to shows on games.

'Gaming is Koreans' obsession for both the young and old… Three cable TV channels are dedicated exclusively to convey tournaments and how-to shows on games.'

Micro-payments, which offer more flexibility to users in how they pay, are an important catalyst for broadband content. The most popular method of payment in Korea is through pre-paid accounts that use mobile phones, which accounts for almost 50 per cent of all online transactions by value. Many people get on the subway or pay their bills in restaurants by swiping their phones through payment machines. Banks are starting to let customers transfer money between accounts using their mobile phones. ARS, a similar system to mobile but using fixed line, has 24 per cent of the share; credit card payment has 20 per cent of the share, and the remaining six per cent are having charges added to their monthly broadband bills.

Concluding thoughts

The fact that Koreans have embraced technology, along with an active national government strategy, the export-driven approach of local industries, and extensive use of broadband are the key strategies permitting the country to innovate a new wave of Internet-related technologies which will shape and solidify Korea as a technological powerhouse in export-driven consumer electronics.

China Telecom: moving forward in the value chain

Zhang Jia Hua | Managing Director, Product Development Division, China Telecommunication Corporation

Zhang Jia Hua of China Telecom discusses the opportunities for incumbent Service Providers in the consumer broadband market.

Zhang Jia Hua is managing director of Product Development Division of China Telecommunication Corporation, in charge of product planning and service creation for the group.

China Telecom

China Telecom Group Corporation is the leading service provider in China, owning two-thirds of fixed-line network assets, primarily in the 21 southern provinces and minority part of fixed line network in the North. ADSL has been the major consumer broadband offering. China Telecom's broadband customer base reached 7.5 million in 2003 and expects to reach 15 million by the end of 2004, with 100 per cent growth from last year. Broadband service has been a major revenue growth driver for the group.

The key segments of the consumer broadband market are based on their lifestyle and the way they use the Internet. They can broadly be divided into professionals, games players, online buyers and so on.

The applications that will enhance the adoption of broadband include Video-on-Demand (VOD) and online entertainment such as animated flash cartoons; these and similar applications are becoming extremely popular, though from a technological point of view, issues still exist. E-learning and virtual office applications will definitely drive the adoption. These applications impact the two most important activities in life: study and work. As there are more and more SOHOs (small offices/home offices) among high-end professionals, these two applications will become crucial and hence drive bandwidth demand.

China has its own characteristics in broadband application development as a result of its particular economical and social environment. The history of technology tells us that only those technologies that can be integrated into people's daily life will survive the ups and downs.

Consumer broadband market: strategic importance to incumbent SPs

It is a known fact that voice is on a downward trend, both in terms of MOU and revenue. We expect a decline of fixed line numbers starting from next year, as some consumers will replace fixed line telephone with mobile phone

or PAS, driven by competitive pricing. What is the future for fixed network is an inevitable question facing each incumbent. Incumbents are increasingly looking for a 'second' fixed network to secure new revenue growth.

Broadband market development has been dramatic as a result of various push and pull effects. First of all, maturity of technology has paved the way for broadband adoption. IP technology has become mature enough to support a stable core network, where QoS is achieved to maintain network quality. Compared to mobile broadband, fixed network provided higher bandwidth with better quality. At the same time, consumers are increasingly seeking different media of communications, eg video. Under these circumstances, traditional narrow band can no longer satisfy market requirements.

Government plays an important role in promoting broadband by setting targets for e-government. Broadband is naturally chosen as the national network infrastructure. Broadband services provide new opportunities for incumbents. Bundling broadband access with application and voice will compensate the downward revenue trend of pure voice services, and create new revenue.

China Telecom has always emphasised broadband access, but pure access will not in itself elevate us into the position of a world-class carrier. We have therefore decided not to sell pure access, instead aiming at enhancing our capability in selling bundled access and application services. We are already selling broadband access bundled with V-net services (a content service with video and music downloads).

The current and potential impact of consumer broadband

In terms of the radical changes in people's lifestyles, no one could possibly have imagined how dependent we have become on the Internet and just how pervasively it has transformed so many levels of our social life as a nation. More and more people are integrating the Internet and the Word Wide Web into their personal lifestyles, buying and selling on the Net, using it to communicate with their friends, to get in touch with friends with whom they have been out of touch or to find new friends and even getting married online.

The speed of broadband is vital to the Internet experience, allowing the possibility of real-time communication where only a few years ago slow

download speeds could mean that any kind of web-based transaction was as much a pain as a pleasure. Now that e-mail and e-commerce are a norm for the majority in the developed world rather than a hobby for a minority of computer geeks, mainly due to the power of broadband, online digital communication has become as indispensable to us in the 21st century as television and the automobile became in the 20th century. And we're still only in the first decade.

Broadband makes online transmission faster and enhances the performance of digital devices, such as digital camera and hand phone. It promotes and encourages new ways of creating: the Internet Revolution has – to give one obvious example – unleashed people's ability to express themselves and communicate with each other at a global level and this in turn has created further demand for technologies to enhance rapid communication such as DV, cellphones and text messaging, digital video (DV), digital cameras and recorders.

Of course this brings with it new social and ethical considerations: just as people's *physical* distance becomes less important through virtual communities, *mental* distance becomes even larger, which can be observed in, for instance, the online behaviour of teenagers which is now more individualistic than ever. In other words, far from homogenising global society, virtual communities are allowing us to explore new facets of human individuality, to express ourselves in new ways, and even to redefine the meaning of human experience.

What do broadband applications imply about future requirements?

Apart from the build-up of network capacity through the mass adoption of IP technology, IP addresses constitute a major problem in China. Currently there are not enough IP addresses for Chinese consumers and even those who have one are finding that their IP address is not flexible. China therefore needs to streamline its network resources. It is likely that certain technological breakthroughs will be needed to make consumers adopt technology faster and adapt to it more easily. Top applications bring challenges to provisioning, which needs to be real-time and seamless.

Essentially, there is a requirement for a convergence of current technologies and end-user devices. This would involve, for instance, the combining of seamless mobility, with broadband together with devices that have a more user-friendly interface. We need to discover an innovative technology to maximize delivery speed with limited capex spending. In this respect 3G (third-generation mobile services) technology can play a key role.

3G wireless networks are capable of transferring data at speeds of up to 384Kbps. Average speeds for 3G networks range between 64Kbps and 384Kbps, which is quite a jump when compared to common wireless data

speeds in the US that are often slower than a 14.4Kb modem. 3G is considered high-speed or broadband mobile Internet access, and in the future 3G networks are expected to reach speeds of more than 2Mbps. 3G technologies are turning phones and other devices into multimedia players, making it possible to download music and video clips.

> 'Virtual communities are allowing us to explore new facets of human individuality, to express ourselves in new ways and even to redifine the meaning of human experience.'

Broadband used to be a technology within the study room, but now WLAN (Wireless Local-Area Network) technology has made it expand into the living room, and virtually every corner of a family house. A technological breakthrough is required to integrate broadband enabling technology with household electronics devices. For example, remote control of air-conditioning through the Internet will be appealing for many families.

Ultimately voice and data delivery will converge and PSTN will become obsolete. However, the incumbents still carry too much of the legacy system and organisation burden, and they will not be able to have the agility and aggressiveness as challenger service providers have towards voice over broadband. Listed incumbents have a lot of pressure on profitability numbers presented to shareholders, and asset write-off has become an extremely sensitive issue.

Targeted application service: the driver for broadband adoption

The key driver will be value as perceived by the customer. This has to be built up carefully in terms of the key segments of the consumer broadband market, reflecting customers' lifestyles and habits. For example, if we know that customers like to watch cartoon movies, we can bundle a cartoon network type of online channel with access or even basic communications services.

Unlike using PSTN, consumers have a variety of usage patterns in broadband. Providing targeted broadband applications that meet customers' needs is crucial. The consumer broadband market can be classified into the following segments:

1. Mass market

People with different backgrounds have different interests. Children need distant learning programs over the Internet. This is particularly the case in Asia, where most kids enrol in supplementary lessons after school hours. Housewives love watching entertainment news and soap opera, while quite a number of male customers are sports fans. In Korea, the government provides

clear rules of what content to be broadcast over a number of time slots so that it fits the behaviour of different mass groups. As a result, the country has the highest broadband penetration rate in the world.

2. SOHO

With the adoption of broadband technology, working at home is getting more and more popular. Almost all office tasks can be fulfilled at home, via a broadband connection. Office applications fit this segment best.

3. SMB

With its large base, SMB is by far the most promising segment on which we are focusing. Especially at this stage of rapid development in China, the private sector flourishes under encouraging policies.

4. Special groups

In Chinese cities, the child is the centre of a family. There are quite a number of parents who are frequent business travellers or busy professionals who want to understand how their kids are performing in school, but don't have time to meet the teacher on a regular basis.

'Government needs to develop a detailed roadmap for a city/province to get enabled and allocate dedicated resources for these initiatives.'

In June 2004, we offered the 'Baby Online' service in Shenzhen. Video cameras and broadband connection were installed in each classroom of a local kindergarten. Parents can now view in real-time what's happening with their kids in the classroom by logging on to the school website. In addition, they can also contact the teacher in the room as soon as they feel the need to do so. On the day of the launch, there were a maximum of 500 parents online, while there were only 200 headcounts in the entire faculty. This service increased enrolment by 20 per cent. There are now already over 100 kindergartens who have signed up for this service.

This example illustrates the fact that, apart from network optimisation, the ultimate driver for an SP-customer win-win scenario is to provide applications that truly meet target customers' needs.

Three stages in technology adoption

Stage 1. Driven by technology

Consumer behaviour is driven by the availability of technology. For example, people did not even think about forwarding a call until the call forwarding function was invented through new generation of switches.

Stage 2. Driven by market demand

We are currently going through this stage. As suppliers continue to push new technologies, they will increasingly find some technologies with heavy R&D investment are not well accepted by customers. Things that are technologically viable are feasible from a business point of view. A good example of this is SMS which was technologically ready early in the 1980s, but was not popular until the mid-1990s when mobile phone penetration rates reach a sustainable scale. At that time nobody could ever imagine there would be 500 million SMS being sent every day in China.

Stage 3. Balance of market driven and technology driven

At this stage, real personalisation of end-to-end services will be achieved based on powerful segmentation.

Barriers for adoption of applications and services

The key barrier is technical maturity, delivery speed and a viable business model.

In general, the technology-centric rather than customer-centric mentality results in lack of value propositions matching customers' expectations. Service providers have yet to developed a sensible segmentation model, and hence targeted bundles with applications are not available.

Price: the most sensitive element

Price is always the most sensitive subject when a new technology is in the process of being accepted. Though cost-based pricing seems to be a reasonable strategy, it is usually not adopted during the incubation period of a technology. Pricing is based more on market balance between demand and supply and customer perception.

Price is a double-edged sword, depending on what strategies you adopt. China Telecom's operating cost is still high. If we price purely based on cost, then pricing may become a barrier for broadband adoption. What we usually do is to offer a low price in the initial stage of service acceptance. Once we've occupied the market, we will raise the fee to capitalise faster on our investment. By doing this we've set up a proper entry barrier for newcomers.

Scale: crucial for sustainability

Our experience shows that rollout of a new technology becomes sustainable business only when its penetration reaches over 30 per cent. Costs get lower substantially when a certain scale is achieved, at which point profit can be made.

Video phone services have been on the market for some time, but are still expanding at a very slow pace. It makes no sense if the party being called does not have a video phone. With small scale, equipment costs are too high for customers to adopt. We need a little more patience to observe tangible business benefit from this service.

Broadband voice calls for better market regulation

Broadband voice service has a very vague position in the Chinese market and a comprehensive and sensible regulatory system is required. We can learn from Japan's experience, where the broadband voice service is considered a telecom service, requiring telecom licence. Also BB voice can only be offered with SP's own broadband network access. This regulation clarifies service boundaries and provides business profit potential to service providers. Yahoo BB started operating broadband voice only after acquiring Japan Telecom.

In an under-developed regulatory environment, China Telecom puts its focus on technological readiness to cope with possible market change in the future.

Leveraging the ecosystem: *the* critical success factor for market success

Our strategy is to continue expanding our market share by promoting bundled services of access and application.

We have learned our lessons through the experience of failure when we tried to do everything by ourselves: we've realised that service providers should be aware of their own position in the value chain, and build up ecosystems of partners to create new business models and deliver innovative services.

Partnership should be based on the principles of risk-sharing and profit-sharing. Bundling network services, telecom services and CPE, and providing affordable integrated solutions to end customers, are going to be the key collaboration area. When market volume allows, SPs and equipment vendors can even co-operate to promote custom-built equipment, with close teamwork between R&D and go-to-market resources from both parties. Motorola recently signed a contract with 'M-zone' to provide custom-built hand-phones that meet specific billing requirement.

Value chain strategy

We must also consider the question of who will be better positioned in the value chain to take advantage of broadband. Value-added service providers (VNOs) could take control of the end customer relationship and could quickly dominate the market, while it might take incumbents like China Telecom years to do that. Currently China Telecom is trying to move forward in the value chain and get closer to customers, but it's going to take a long time. Only those who understand customers' needs – which VNOs do – will have long-term sustainability.

Government: the enabler for broadband adoption

Government is the key enabler for broadband adoption by various means. First, government provides a vision for national e-enablement. E-government is a key initiative to push for better network capability. Secondly, government can offer policies to encourage new broadband access technology and application. Thirdly, government plays the role of mediator in case of conflict,

for example, when network construction will require sufficient energy supply and will have an impact on environment. Only government has the authority to co-ordinate between various sectors and regulators.

Broadband has become the nation's number-one technology as a symbol of economic development and therefore there is now political pressure to make it happen.

The market strategy to take advantage of the broadband opportunity should be to build up sensible revenue models. An effective ecosystem of partners is a key success factor.

Beyond Broadband

SECTION 4: BEYOND BROADBAND

4

How FastWeb is setting the pace: a broadband success story

Silvio Scaglia | Founder and Chairman of e.Biscom, Italy

Silvio Scaglia, founder and chairman of Italy's e.Biscom, whose FastWeb service has grown into the No 2 broadband provider in Italy, just behind giant Telecom Italia, looks at the extraordinary success story of FastWeb's 'triple-play' service and at the future potential of broadband.

Milan: famous for football, fashion... and now fibre

Famous for football and fashion, Milan is the trend-setting capital of Italy. But we're not just talking about handbags and fabulous shoes: now it's technology that's setting the pace and nowhere more so than at e.Biscom.

The company was founded in 1999 and provides broadband TV, Internet and phone services to 417,500 homes in the main metropolitan areas of Italy (including Rome, Turin, Venice and Milan). The service is built on an IP (Internet Protocol) network that provides very high bandwidth to the home, the construction of which we part-financed with a $1.5 billion public offering in 2000.

Our investment is paying off. Consolidated revenues for January-June 2004 have reached 336 million Euro, more than 41 per cent compared to the first six months of 2003. In the last financial year we increased our customer base by 88 per cent and saw a 65 per cent rise in revenue.

A lot of this is due to the speed of the network, which is based on a powerful combination of fibre and xDSL technologies. It means we can offer our customers connection speeds of between five and ten Mbps – significantly higher than normal DSL networks. This bandwidth in turn enables us to provide a wider range of services than would otherwise be the case. We can not only tempt consumers with the 'triple play' of voice telephony, Internet and televisual content, but can also offer a range of video-on-demand, tele-surveillance, interactive TV and other services.

Our accounts are mostly individual households, connecting to the network over either high-speed DSL or 10 Mbps fibre. The DSL customers enjoy around 5/6 Mbps, which is the minimum speed required to enjoy all the broadband TV and movie services we offer (DVD quality). In fact, we won't sign up houses that – for whatever reason, perhaps their distance from the exchange – are unable to match that speed.

I'd like to attribute e-Biscom's success to ruthless business acumen – and I'll explain our strategy in more depth later – but it probably helps to set it in a wider European context. Europe is an ideal breeding ground for high-speed DSL services. EU countries were left behind in the 1980s and 90s when it came to cable operations. While US households were enjoying hundreds of cable TV channels, Europe faced serious infrastructural problems and ended up relying more on satellite than on cable. Satellite is inherently a one-way street so, as a result, there are now significantly more DSL users in Europe than in the US (20.6 million as of March 2004, with 19.4 per cent annual growth, as against 12.9 million/11.7 per cent for North America).

4.1

DSL is giving operators in Europe a new lease of life. When the Bond movie Die Another Day moved out of the theatres and onto the small screen, its European premiere was on T-Mobile's DSL service, not on satellite. In France, TPS and France Telecom have launched Maligne TV; in the UK, HomeChoice – an early entrant to the market that jumped the gun when DSL was still in its fault-prone infancy – has now returned to market with a strong triple-play proposition. In Italy, we not only deliver our own triple-play, FastWeb, but also distribute premier TV content in partnership with RAI through our RAIclick service.

Of course, we also have problems specific to Europe – our ageing urban infrastructure, for one. Sometimes these work in our favour. For example, Venice is one of the world's most beautiful and environmentally sensitive cities; aerials and satellite dishes are not the done thing. We laid our fibre in the canals and used copper DSL to the home, keeping everyone happy. In Rome, on the other hand, we couldn't dig extensively in the old city. We ended up acquiring the 70-year-old pneumatic post ducts, a unique Roman air-pressurised system that was developed to speed postal packages between down-town and local government buildings. This solution particularly appealed to me: using what must have been one of the world's first examples of a packet-switched network for today's digital equivalent!

In Milan we had to do it the old-fashioned way. We dug along 2,500 kilometres of the streets (both sides of the road), taking three years and maintaining 100 separate excavations. We had to go to great lengths to keep the sites small and fast-moving. And the result? Our annual revenue per user (ARPU) is $1,100 (ie more than 900 euros) – one of the highest of any TV, telephony or Internet supplier in the world, but of course it was worth it.

On the home front

Our business model in Milan has been rolled out over Italy and now companies from all over the world are knocking on our door. They're here not just because our headquarters are based near the world's best shops, but also because they see us as pioneers. They want to know more about our strategy. So, what is it?

Let's break down our service into its main offerings, so that we can explain the strategy behind it more clearly. FastWeb offers residential customers fixed telephony, high-speed Internet and TV services over a single connection. On the phone side, it offers all the usual value-added services (call forwarding, call waiting etc). There are numerous side-benefits, including free calls between FastWeb customers, number portability for new customers and more. On the networking side, the customer gets up to 10 Mbps and WiFi to avoid home cabling. And on the TV, you get (without, remember, any requirement for dish antennae or satellite decoders) traditional broadcast content, multicast (eg pay-per-view sports events) and unicast (video-on-demand plus interactive TV applications).

> 'Once we had the solution and knew we could address the customer, we began to benefit strategically from European anti-trust legislation.'

Finally, FastWeb's high bandwidth capacity has enabled us to introduce other video services such as VideoREC, a network personal video recorder which lets you pause live and/or record live TV, as well as a comprehensive electronic programme guide. We also offer a unique video-cam service, which enables people to use their TV as a window through which they can see the person they're talking to on the phone.

All this, you might say, sounds like strong technology – but that's all it is. What about the content? I'd like to answer that by clearly stating our strategy. Our credo is that good technology enables content distribution. We don't consider ourselves to be a media company. E-Biscom does not produce content. Our 'value added' is that we are a good carrier. The PVR function, for example, gives users the ability to record and pause live TV without having to use expensive TiVos. As far as we're concerned, producing good content is a separate business which we have decoupled from our own. This makes our business model very different from a cable television model. What we are trying to do is build another model, more Internet-like but at the same time providing entertainment that you can watch on TV. Our focus is on the quality of that distribution network.

Signing the stars

The key, however, is that quality and assurance of value-added distribution gives us the lever to acquire and deliver the content our consumers demand.

Take football viewers, for example. They are a very picky lot: they want very high broadcast quality and as much choice as possible. This important market sector is an ideal example of how good technology can open up a content market. We now offer live broadcasts of all football matches where Sky Italia owns the rights.

Focusing on technology helps us to acquire content. That's important because our research shows that the domestic market is pretty evenly split: half are driven by TV and VOD, the other half want communications and the Internet. In the beginning, we found that most of our customers were signing up because of our communications offering. But as the quality of our service has enabled us to sign more content, an increasing number are coming to us for the programming. Content is important to drive penetration.

e-Biscom is now strategically positioned as a carrier. We carry other people's content: RAI, Media Sat, the BBC, Discovery, MTV, Nickelodeon and CNN, among others. We carry video-on-demand, distributing catalogue from leading content producers. We have negotiated rights with Universal Studios, Twentieth Century Fox, Dreamworks, United Features and more. This wasn't easy – in fact, the first contract with Hollywood took more than a year to complete – but without our focus on the best enabling technology, we would not have had a platform to negotiate from.

Once we had the solution and knew we could address the customer, we began to benefit strategically from European anti-trust legislation. For example, Sky Italia used to have a monopoly with its content and distribution. It has 2.5 million subscribers paying between $27 and $68 a month for satellite TV only. The regulators, fearing a Murdoch monopoly of satellite television in Italy, ordered Sky Italia to share its football rights with e.Biscom's service. We can now show a selection of Serie A and B matches available over DSL as well as fibre-optic networks.

At the same time that we were launching our live-TV service over our high-speed Internet connection (broadcasting more than 120 live channels), the regulators were insisting on 'best practice' for all Sky Italia's premium content – which now has to be offered at wholesale to other pay-TV distributors in Italy. Our technology was ready and as a result we are, at the time of writing, the only company in Italy taking advantage of this break. And we needed to, since as a carrier we need a broad spectrum of content to keep our residential clients happy.

Looking to the future

The e.Biscom service is evolving. Until now, we have connected the television in the home to our network to enable video and TV on demand. We still need to link in the stereo and other home appliances. Wi-fi is opening up many new opportunities in the home: new devices that can be connected up and will be able to receive content directly from the network. We've all seen the success of iTunes, and we expect to develop a host of new applications, not just in the music and entertainment area but also in security surveillance, child monitoring and other areas.

We have to remember, also, that our business is based on substitution. We can't ask people to pay more than they are already. Instead, we have to rob Peter to pay Paul. We just have to make sure that we're on Paul's side! We have concatenated the user's different telephone, Internet and Pay-TV bills into a single account, with us. Subscribers typically sign up to a $90 package per month of unlimited Internet and phone calls plus a variety of TV channels. A residential user pays $105 a month for unlimited phone and Internet service and up to $100 dollars for 80 channels of TV. And then there are the 4,500 movies to watch (for between $3.50 and $7 each).

So what are the problems? Actually, it's our biggest asset that is also the biggest problem: our technology. There is still a perceived difficulty when it comes to techno-services and this perception is a major barrier to adoption. New technology must be 'plug and play'. Our television service is a success because viewers don't have to bother about the computer or the network; it's child's play. A complete computer illiterate could still use our TV-on-demand service without any difficulty whatsoever. But we have to work hard to maintain this level of simplicity for our services in future: our new music and security services have to be child's play too. And we have to make sure that we provide proper customer care for those few occasions when people still (and they always will) have problems.

When most people think of Italian society, they think of pasta, pizza and AC Milan – not technology. Italy has always been a late starter when it comes to gizmos, but we're very fast at catching up. Check out the history of mobile phone usage: Italy was slow off the block, but within four years its penetration rate was (together with Finland) the highest in Europe. Something similar is happening with broadband. In the last quarter of our financial year, Italy had its highest growth rate in broadband to date. We now trail only a few tech-fanatic outposts such as Sweden and Japan in fibre to the home.

We expect steady growth across the board, although different sectors tend to develop at different speeds. For example, we normally connect all the schools in the areas that we serve, for free. Disappointingly, nothing much has been gained from this as yet. On the other hand, the private sector looks very promising. In private hospitals, for example, the clinics are starting to connect to the doctors at home. The latter are using digital diagnostic tools and

conferring with colleagues at a distance (who may be at home themselves, or in other hospitals). Patient care is improved with easier access to consultants, even if they are not locally available.

Italy is getting the technology today, but it's going to be another five or six years before we see real social change, and before people feel completely comfortable with the new tools that we can provide them with. Healthcare, education, and lifelong learning are all going to benefit from networked conferencing. We're already getting a taste of this internally at e.Biscom, where we now hold most of our meetings over the video-conferencing network.

'Government needs to become more innovative, to become more of a risk-taker. It would be an enormous incentive to our industry to keep ahead.'

To see the technology fully exploited, however, we need to see the government pay more attention to promoting innovation. Governments are big spenders, in administration, education, health and the military. Personally, I feel that they tend to take the safe bet too often, investing in solutions that are already proven. This is not always best for the country. Government needs to become more innovative, to become more of a risk-taker. It might cost a bit more than the conventional approach, but it would be an enormous incentive to our industry to keep ahead.

And we do need to keep ahead because, at the end of the day, a technical society is a more egalitarian society. When I was 18, I lived in Novara, a little town 50 kilometres outside Milan. In Novara it was impossible to buy any English newspapers; you had to come into Milan to find that sort of thing. Now, through the Internet, you can find whatever information you need, in any language. This is real social change, awarding privileges not just to people in the right place and with the right education, but to everyone.

Surviving as a winner in Japan: Yahoo! BB's strategy for becoming number one

Keiichi Makizono | Head General Manager, Main Technology Division, Softbank BB

Keiichi Makizono considers Yahoo! BB's position in Japan's broadband market and discusses some of the issues involved in becoming a major player in broadband-based TV.

From narrowband to broadband

People tend to start Internet-based businesses using models that don't take into account the unique aspects of the Internet. Such enterprises are difficult because they require both the necessary infrastructure and a pre-established client list. That's how Son Masayoshi defined Internet business a few years ago, when it all started. Take, for example, someone who used the Internet to start a business just because it was available. Building a business on such an attitude was only possible in a narrowband context. As soon as you introduce the concept of broadband into such a business, the narrowband-based business model would collapse.

So, how would the clients demand change in the transition from narrowband to broadband? In a broadband setting, the client would be much more demanding regarding the quality of the content, while the quality of the infrastructure will now be a crucial element. Attempting to create a business solely by using various classical applications, for example running a business with ASP as the sole tool and without maintaining the quality of infrastructure, will definitely not lead to a service with suitable quality of content.

Of the ongoing Internet businesses where ASP is still holding on, none exploits the capacities offered by broadband-based business models. This is simply because broadband has not yet acquired both the infrastructure and the clients. In fact, no one has both yet. People have generally been saying that the advent of broadband would bring new types of services radically different from the conventional ones, but this presumes that broadband is readily available. However, at the moment we remain the sole provider in Japan of 'real' broadband. Furthermore, if a transfer speed of 100 Mbps were to be announced, this wouldn't guarantee maintaining such quality.

Maintaining quality across the communication chain

Now, let's divide the market into three business categories: the wholesale dealer, the ISP and companies providing application services. To date, there has been no cohesion or intercommunication between those three types of service providers, and that precludes offering broadband-based services. The voice service, for example, is a very important area since clients expect voice

to offer excellent quality. Hence, it can't be an Internet product of the conventional type, where the level of service required amounted to: 'It doesn't matter much if the connection drops from time to time.'

What we've aimed at is a world where quality is maintained throughout the communication chain, from the vocal signal sources from the consumer's telephone set to the one at the other end, passing through the CA voice control, so that the service maintains the share of four million users by providing voice service in an end-to-end fashion, from the infrastructure to cover the high-touch aspect, while also offering the prerequisite (peripheral) modem to run the service. Other VoIP providers comprise a company controlling voice, another providing Internet services, an access provider and a company providing modems: a heterogeneous system unable to ensure integrated product quality management. But in building an end-to-end network infrastructure with a conceptual consistency to maintain a QOS and obtain a satisfactory product quality, which is possible for a small-scale business, there are two problems.

The first is the design. Any company has the technical ability, but designing a product requires a policy, which differs from one company to another. As you can see from the disparity in Japanese SIP protocols for VoIP, you can't possibly establish an integrated policy on every single point and between several different partner companies. This means you need to set up an integrative policy, which is a hard job.

The second point is the operation. Let's say you built a network based on a given policy. Although you may think the quality will be maintained as far as the policy is respected by all companies participating in the business, other problems arise as soon as you start to operate. The problem is how to achieve a coherent cooperation between different companies. From the client's standpoint, a single contract is a prerequisite. In the case of Flet's [brand name for fixed communication fee IP access service provided by NTT East and NTT West], there are two contracts, so that where there's a problem, each contractor may tell the client to refer to the other one. The clients are still victims of both contractors saying 'No, the problem is not in our jurisdiction, we can't be responsible for it.'

Even if you set forth an integrated, single contract with a centralised contact for clients, the problem cannot be solved as long as there's no integrated

policy for operation. Therefore, design problems are encountered that mean the job wasn't done properly. Moreover, even if the problem is solved to enable the operation to start, it doesn't mean that the system will work on a large scale with millions of users. As far as an infrastructure status is not capable of providing an integrated service, all efforts exerted for the initiation of a broadband service using such an infrastructure will be in vain.

That's not all. The next step will be, 'The problems with voice are now solved, we are providing services satisfactorily, so what shall we do now?' It's only at that point that a discussion arises as to what application service should be offered to clients. As in any other business, the consumer business usually starts by setting up a communication system. Subsequently the telephone services are set up and then transmission of images. Now it's time to develop this into entertainment services. The question to be addressed is how to clear each of these steps. The amount of money a client is ready to spend on 'entertainment' is predetermined by the number of consumers, ie the market size is predetermined. The most important thing is how to provide services within a market of a given size.

Business models

Some companies think of providing expensive but high-quality services, which differs from the strategy adopted by Yahoo! BB. This isn't an area in which we specialise, but where others may excel. However, we'd really like to do the business if the service is attractive for customers when they consider how much they've paid for it and tangibly feel that it's better compared to the existing services. And we do want to get into whatever's better than currently available services. By 'better' I don't just mean price but the contents of the service being offered. In practical terms, so-called broadcasting used to be free of charge. The pricing system was different. The money came from companies, not the audience. This model has stood since the broadcasting system brought a situation where you may have a huge amount of potential clients. You can establish this kind of system if you have a large audience, after which you may ask for money from companies willing to be in on the venture.

Therefore, you have to capture a large audience and create a condition where you may offer services. Now, there's an essential concept, which can be summarised as 'what to do to make clients willing to contract our services', and in the example of an equivalent to television broadcasting, we provide the service as a freebie, because even a TV station must invest in equipment, production fees, or other things that cost money, while they're not getting these fees back from the audience directly. So if we can only offer an equivalent to the readily available TV, we just do it for free. Then, once we get an audience or users of several millions, we ask for money from the companies willing to use the media. SKY Perfect TV asks for money from the audience. If you do the same thing they do and say to the clients, 'Let's do it broadband,' the clients will not jump at what you're proposing right away. If you propose a similar service, you must offer an added value to the product

you want to sell. It's a hard task and the sales and marketing management budget will be costly.

The service at our competitors is, in principle, free, while ours is subject to costs inherent to broadband services, and we can't possibly be the winner if we do the same as they do. Even if you classify the activities under the keyword 'broadcasting', it's useless to do the same thing your competitor's already doing. You can find other key advantage points, such as offering contents the competitor doesn't. It seems simple at first glance, but offering variegated content implies how much more money you have compared with the competitor.

'What we have, and others can't offer, in our respective value chain, is bi-directional communication.'

Another advantage of broadband – and this is my technical engineering side speaking – is to do what broadcasting cannot. You may then have a commercial appeal with the add-ons, which will be leading to VOD. However, what is most important in VOD? Simply being a bi-directional communication system. There used to be a bi-directional communication using telephone line at SKY Perfect, but the telephone line is technically limited. So, what we do have, and they can't offer, in our respective value chain, is bi-directional communication. The keyword VOD will only emerge when you wonder how you might offer menus different from those of your competitors. For example, what will you do when you get the audience? Our main service is to be a portal site and an advertisement medium that is attractive enough for companies to pay us a fee.

TV is an attractive advertisement media but can't draw clients as a portal site. Internet is an attractive portal site but fails to be an attractive advertisement medium. The only area where you can fuse these two aspects is image/video services, or VOD services. So, in video, we're thinking how we can build it up as a fusion between a portal site and an advertisement medium.

In terms of business models, we don't in principle deny the TV-type business model so we can take whatever of value may be available and assimilate positive elements of current systems such as SKY Perfect TV. The problem is to find the best mix to generate as much profits as possible. I'm thinking of pay-contents broadcasting companies, and for VOD, Tsutaya, a video/DVD rental company. We plan to introduce the Tsutaya model and for SKY Perfect, it will be the usual private broadcasting business model. Tsutaya. SKY Perfect and terrestrial stations are on the broadcasting side, while we're on the contents side of the business. SKY Perfect, from the client's standpoint, is pay-TV.

Along with such offers, you have the ground stations based on an advertisement fee system behind the screen. While Tsutaya (VOD) and SKY Perfect raise money from the audience itself, they have almost no income from advertisements, including those of client companies. In itself the web raises almost no money from users at all, but as a web portal which can be an advertisement medium – we can generate income from companies paying for their ads. The only way to stay alive and deal with both aspects all the while is to go broadband. Our target is the number of clients we will get. You can't generate money without a large audience.

'If you're to cut costs, the number of customers is the only option you're left with. You have to have many users or you won't succeed.'

As a comparison, the FastWeb model, based in Milan, is a system based on a model where you get the money from the audience (VOD, Pay-TV). Europeans are careful in keeping their profit margin so they tend to prefer a system where you can run your business model based on a small number of clients, or a business based on clients who are richer than the so-called middle class and are ready to pay for the convenience offered by a service. However, that isn't a suitable model for us. We're aiming to be number one in a market composed of a safe-value, middle-class population with money to spend.

The problem is, though, that our technology is a little backward in terms of current demand. We match the level reached by Cisco products. On other points, we're still technologically backward, and taking broadcasting as a keyword, the market trend is towards airborne or cable. Take the chipsets: you have H.264, VC-9 or whatever, but when it comes to knowing what are the key features and which would be the cheapest and fastest, it all depends on how many units one sells to companies such as those in the cable business. We, on our part, need to discuss how to integrate those chipsets in a broadband setting.

A major trend is video and image, and Comcast reaches some 24 million households in the US. Japan has Comcast, Time-Warner and Cox, which represent in themselves quite a large proportion of the audience. So the global investment will go to the cable companies because of the logic of the numbers, which puts broadband broadcasting in a difficult position. We in the Internet business have a number of clients and audience matching the sum of several overseas cable operators, which is quite an attractive number and if this number is really a target for broadcasting, business discussions should go smoothly. Technologies notwithstanding, discussions on contents are after all a matter of numbers. If you're to cut costs, the number, of customers is the only option you're left with. You have to have many users or you won't succeed.

Yahoo! BB and NTT

Historically we advertised Yahoo! Broadband as a brand name on a very large scale, and that made the term 'broadband' a very catchy expression among the Japanese public, which resulting in our acquiring clients very rapidly. Because of that, we saw NTT decrease their Flet's subscription fee. Yahoo's move might have been somewhat unexpected for NTT; the drastic action taken by NTT was also unexpected for Yahoo!.

To continue to increase the number of clients, we need to implement further 'killer' contents. Offering novel entertainment differing from what people are currently enjoying is very difficult, so the important thing is to how we can draw the public's attention to existing entertainment. As to why the public is enjoying entertainment, when it comes to broadband, 'you do it home because it's hard to do it outside' and most of the entertainments which people enjoy are at home. You ask the clients to let you know the money they spend for leisure, and think of how to get income from other sources.

Regarding the NTT logic, let's imagine that NTT has become the number one company in Japan. What would they do? If they were a manufacturer, they couldn't just stop progressing, so they'd have to make new products and switch the client population to raise profit. However, the NTT model includes an everlasting fixed-type income, so they'd attempt to freeze trends. Increasing profit by implementing something other than what they are already doing is not their primary concern, because they already have a comfortable sales figure. When they implement something new, the sales figure drops. If I were in their place, I would definitely adopt stalling as strategy. Nothing to worry about, you only have to go to Tsutaya. NTT East will see its fixed income decreasing dramatically, because all voice users will go to VoIP. When you think about it, you'd better forget about doing novel things and going easy with what you have. This would be the first thing I'd say if I were NTT.

Market strategy

In our strategy to increase Yahoo! BB's four million users, marketing techniques such as distributing red bags at railway stations have remained quite traditional. But when we distribute freebies, we don't just hand them to people. When you're on the receiving end, you might think, 'Hey, look what they're doing,' but on our part, we're thinking of the merchandise flow or the write-offs. But we couldn't have reached our current figure without adopting such a strategy.

Novelty marketing is a hard job. It was possible because of the initial business plan. In this model you first get a certain number of users, then you implement something. If you try to run your business solely on broadband, you fail. Imagine you get the number and introduce a new technology. The introduction of new technology is not cost-efficient. But, the initial business model acquires a base user number. We do want the number of users to increase, and if new technologies become available, we make the transition

to these new technologies. The critical thing is what we do after we have acquired such a base to stand on, so we do things like the red bag campaign.

Apart from our salespeople who are planning and implementing sales activities, our current efforts are necessarily focused on the technical aspects – how to build it. What we're doing now has more of a test aspect to it, so we're thinking about a way to make it a hit. In the early days, the BBTV service, for example, didn't differ much from the FastWeb model. When it comes to how we can adapt it to the model Yahoo BB really aims at, neither current technology nor our current method is suitable.

Technically speaking, the chips are still expensive and because it's based on the logic of the numbers, chips come first. To date, technologies were backward so the chips were only provided on a DSP basis, but now that the technology is catching up and the project is being consolidated, we'll move to an ASIC basis. So, the logic of the numbers that wouldn't fit with DSP will stand with ASIC. The more you manufacture, the closer their price is to nothing. We have to take advantage of that, and for the rest, we're around here in the running. You not only have our current model but also we're trying to build up something we can do which will make the client happier.

It's a question of what we can achieve on a software basis, of functionality and client's usability. If the client doesn't find it easy to use, they won't use it. So we're thinking of how the clients will fully use our products. As you build it up the price gets cheaper, and as you need the number, you can add more contents. As a distinctive feature, we can offer the clients a means to show what they want to show, and this is the most attractive point. What we're offering is things that people are talking about. Shopping, ads – but doing it with animations – wouldn't it be nice if we can show ads simultaneously with an ongoing TV programme? These are things that people are talking about, but to make it real for clients, the only means capable of doing it is on a PC, although no one watches those things on a PC. So if you want to implement it on TV, you need something more.

We can increase the number of clients by pricing, by the sales method, or having what the client really wants: the number will not increase without them. FastWeb uses a device like a proprietary set-top box: but making it intelligent will make it hard to sell in large quantities, so the functions covered by the set-top box must be kept at a minimum. Otherwise, it's all about what you add to the upper layer, the application layer and resolve the problem on a network basis as far as possible.

From the client's standpoint, they have none of this heavy-duty, high-tech apparatus, but something that's basically connected to a network. There's a dream device that offers minimum control but the usability is in fact very rich. If we did that, we'd be challenging Sony or Matsushita or others who sell appliances. It's OK for them as it's a PC and in this respect they've been quite

clever. It's illegal to copy a programme. The decision about copying or not is up to each individual, but if they matter-of-factly provide the means to copy programmes, providers run the risk of being sued. But when it's a PC, it's like an extraterritorial sanctuary. Sony produces various devices allowing copying, but the broadcasting industry and private TV stations don't get angry. Yet the moment you try to do the same thing with a set-top box, private stations will attack you vigorously. They sue you.

> 'It's all about what you add to the upper layer, the application layer and resolve the problem on a network basis as far as possible.'

The only difference is where you store the programme. Is it stored in the PC or on the Internet? Recording a TV programme is technically easy. Recording a baseball game at the office, downloading it back home, then watching it is technically easy. You do it with a PC and no one scowls at you, but you provide such a service on the Internet and the law gets angry. Since it's related to intellectual property law, the Ministry of Education and Science sees it as a problem.

We're planning a service similar to FastWeb's, which allows you to record a programme on a data centre. You can control it from elsewhere and watch it when you're home; you can keep your programmes until the allocated recording data space is full and you can then increase your data space as much as you want, as long as you pay for it. The problem is how you can convince people that it's quite natural. We have some awkward restrictions in Japan that interfere with usability, mainly to protect the broadcasting industry. It's technically possible for us to broadcast private TV station programmes via broadband, and if we do, stations making their own contents will stand still, whereas local relay stations may all go bankrupt, and that's the problem as they see it. They are investing in digital ground-based stations and raising lots of antennae.

So we have the Competitor, the Customer, the Company, the Channel and C for Control. In Yahoo! BB's case, the way we deal with that control is one of the critical points. We have been fighting against it from the very start and it's difficult. Technologies such as the Internet or computer technologies are areas where tasks and labour are quite divided, horizontally and could be qualified as universal and globalised, whereas broadcasting and contents – and this is true in all countries – are a field where public restriction is very strict. As the technologies have been fused, we are currently going in that direction. A non-technical barrier is much more problematical, but we have to break through.

Differences between countries in their restrictions regarding broadband are vast. A peculiar case is the security industry. Take Baltimore Technologies in Ireland. The reason why Baltimore Technologies has grown so large is that Ireland is the only country without code export restrictions. They could work freely. Codes are used in military technologies, so countries including Japan usually have lot of export restrictions. The US is a gigantic market by itself, and has many in-house military technologies, so the restrictions aren't so bad. Now, when we wonder 'why Ireland?' it's because of the non-restrictive background. At the other extreme is a country such as Myanmar, which is worse than China. In the first place, you cannot get connected. The sites are very limited and you have almost no access to the Internet. That's the government restriction of Myanmar, where a military government is in control of 50 or so ethnic minorities.

'The wholesale market is fundamentally an aggressive market, and because wholesale dealers offer their services to various providers, they are concentrating customers at some point.'

Winning out in the broadband market

Thinking about fixed and mobile communication suppliers, cable TV, contents providers or other emerging businesses, the question is who might be the winner in the broadband market. For Yahoo!'s strategy governmental restriction is a major hurdle. As an infrastructure merchant, I have the infrastructure as a foundation, for which I have the clients – and when you have no more clients, the business model doesn't work any more. So having no more clients is my greatest concern.

Talking about the pace of providing new services the clients want, we're quite competitive and advanced. However, if some company that is equally aware of the importance of infrastructure comes in to snatch our market before our modelling is feasible and established and if they adopt a strategy similar to ours with a large budget, that would be a hard blow for us. I don't know whether there's actually a company ready to go into it, however.

Possibly NTT might do it and maybe with its big money it might offer B Flet's 100 Mbs at 1,000 Yen, but I don't think it would go that far. NTT's strategy is basically a targeted attack; in other words it will only operate an offensive move in broadband access, and since most of the clients are not so sophisticated, such a percentage of the clients may be absorbed by B Flet's. This is why those who have massive financial power like NTT may say: 'B Flet's cannot broadcast properly so let's build a network that clears B Flet's technical problems and offer ADSL through highly reliable optical cables.' Offering something else from B Flet's. If they evaluate these points and actually decide to implement such a project, that would be a very powerful enterprise.

The wholesale market is fundamentally an aggregative market, and because wholesale dealers offer their services to various providers, they are concentrating customers at some point. Multicasting serves millions of users, so if they concentrate users, the system is not offering multicast any more. The advantage of multicast is that a broadcasting programme may be split at a point close to the user's location. So if the broadcasting programmes come in, and the multicast has to do its best to disperse the programmes where there's concentration, you don't have the advantages of multicast. It's no longer a broadcast.

We have many users per station. Let's say you have ten of thousands of users per prefecture. Usually, if you broadcast like that, a programme is copied here and you'll only be using 4 Mbps. If you go further down and copy it here, it's 4Mbps, too, all the same. So you have a whole lot of 4Mbps. In the case of Flet's, they're concentrating them in some stations per prefecture, and they reach the users. They have to provide copy for each and every user at a prefecture level. Then there will be a traffic bottleneck in this machine. What sort of capacity is actually assigned to this machine? In the order of several 10 kbps per user, even at B Flet's. Therefore, as soon as all users start to watch at 4Mbps, a topological bottleneck occurs. This is why such systems definitely cannot provide actual broadcasting services. They didn't set up a network that takes into account broadcasting from the start. It was simply based on Internet access, with a virtual speed and they're still doing that now. That's why they can't broadcast.

It will be a real threat if they wipe out the current system and lay an optical one. I've talked with many worldwide ISPs, but no one has a network able to broadcast properly except for Korea and the rest is FastWeb, although that's small. Korea thought of it to that extent. Even the government policy in Korea integrates that aspect. I talked with BT, France Telecom and many others, but none of them got it. So incumbents in Europe are just not up to it and most of them are at the same level as NTT. In some cases they don't even have a broadcasting strategy, and aren't thinking that far ahead yet. People in the Internet business mention broadcasting as a keyword, but in our case when we established our vision towards broadcasting, we designed the network infrastructure with broadcasting in mind.

Regarding the communications industry, they saw that something called the Internet came out, something called IP came out, too, and it seemed like they would become mainstream quickly, so what could they do with their existing network? Then they said: 'Maybe we can use broadcasting' – the keyword – but they're now burdened by what they already have. Maybe they don't have any integrated future business scope for networking. The feeling I had when I talked with France Telecom or BT is that they're just like NTT, which will never want to make the effort to sell high-speed lines at a low price under the keyword 'broadband'. They are dealing with Mbps ATM at several hundred thousand. They won't even think of going into broadband 45 Mbps. My

feeling is 'Well, that's NTT...' Then there are those who secured income from the existing system. This is probably why only some obscure, emerging companies go into broadcasting.

The future for Yahoo! BB

The sources of broadband business profit for Yahoo! are not in providing access. We have fundamentally two sources: pay-contents and income from advertising. For the pay-contents, we have to clear the restriction problem, establish usability and offer the consumer a new apparatus or business which is more attractive than what's already available. It's consumer business, and since there's a limit to the consumer's budget, we must offer the best service to get the share. As such business becomes more attractive and we may then increase the number of customers. Instead of gathering customers by force like a bulldozer, we may efficiently get customers by the pull of marketing if we can increase the attractiveness of our contents.

With a large number of customers, we can generate income from a scheme like the ones adopted by broadcasting stations or what we may call a large-scale entertainment business, a combination of contents or BMG on Internet. Private stations like Fuji TV or other broadcasting companies are doing that. In fact, broadcasting industries are in the same business field as ours. The difference is that they tie-up with contents-making companies to create contents according to their own plans. We'll have to go that far at some point to stay alive. It's not creating contents *per se*, but being a contents aggregator and defining specs. I'd rather call it a planner. Maybe such a role is already there for the ads in the portal business, and big advertising agencies like Dentsu or Hakuhodo are not creating contents by themselves but are using subcontractors. They are generating big profits out of it. Our new head office is just next door to Dentsu, so we have to be nice to them! And we have to learn strategies from them.

BT and France Telecom have enough money not to think about such a vision. In a way, their area-based name value and reliability bring them money, which means they have revenue from other sources. While Yahoo! BB's business mainly looks forward to surviving as a winner in Japan, it is possible that we may broaden our activities worldwide. But it's still very early days to be thinking of that.

4.2

Beyond broadband access: KT's broadband Internet service

Sanghoon Lee | Executive Vice President, Network Group, Korea Telecom, Republic of Korea

Sanghoon Lee, Executive Vice President, Network Group, KT looks at Korea's success as world leader in the broadband market and considers their future strategy.

Broadband Internet in Korea

Since the introduction of the broadband Internet service in Korea in the late 1990s, Korea has seen a rapid increase in broadband Internet subscribers. As of the end of 2003, the number of broadband Internet subscribers exceeded 11 million, which indicates the ubiquity of the service in Korea. Even though the business has served as a new cash cow for telcos, the broadband Internet market in Korea is now showing signs of saturation. To meet the goal of finding another major revenue stream, Korea Telecom (KT) is now taking a strategic direction to generate a mass market based on the Internet broadband infrastructure and its customer base. Termed 'Beyond Broadband', the direction is heading towards creating a new mass market in the area of application and value-added services.

I will now describe the rationale, concept and direction of the Beyond Broadband strategy. First, the status of broadband Internet business in Korea is given, followed by a description of the Beyond Broadband strategy. Then, key features to realise the goal are identified, along with considerations in implementing them.

According to the Korea Network Information Center (KRNIC), the number of high-speed Internet connections in Korea, based mainly on digital subscriber line (xDSL) and cable television (CATV), surpassed 11 million by the end of 2003. This number corresponds to approximately 73 per cent of the total Korean households and nearly coincides with the 80 per cent penetration of personal computers. Out of these 11 million users, KT alone serves 5.6 million xDSL subscribers, including 1.4 million users, subscribing to very high data rate DSL (VDSL) services.

Korea Telecom started the broadband Internet business in 1999. For KT, the decision was very timely because, like other incumbent local-exchange carriers (ILECs) in the world, the company was experiencing revenue saturation in traditional cash-cow services such as the public switched telephone network (PSTN) and leased-line business. The aggressive and massive deployment of broadband Internet infrastructure has created another cash cow that kept KT's revenue curve continuously increasing, even when major telcos in the world were experiencing difficulties in maintaining their revenue curves.

Changing lifestyle

The widespread availability of broadband Internet is now affecting every aspect of daily life. The number of weekly hours spent on the Internet is reaching 13.47 hours on average, which is comparable to the time people have spent on TV. As of December 2002, 71.9 per cent of Internet users are using the Internet daily. These figures show that the Internet, mostly accessed via PC and laptop computers, is becoming an essential component of everyday life in Korea.

As the usage of broadband Internet grows in people's lives, a significant portion of offline activities has been shifted to online activities. More than 30 per cent of banking transactions, 50 per cent of stock trading, and 17 per cent of total commerce transactions are now being conducted online. Another interesting fact in Korea is that the wide availability of broadband Internet has resulted in a game market that is different from the typical market structure where the console game market is usually larger than the online game market. Instead of buying a game console, Korean users download game software from the Internet and enjoy multi-player online games. The result is that the online game market is more than twice as large as the offline game market.

KT and KTF held 'Premier League', the largest Korean online game tournament, through five regional tours and broadcasted live to the public through the airwave, cable TV and the Internet. These kinds of events are very popular among the younger generation and broadcasts constantly target these audiences.

At the final match, the convention hall was overflowing with excitement and more than 15,000 game fans gathered to cheer the champion, who would win up to $25,000. Twenty players were competing for the championship.

This may seem somewhat unusual to those who think of the online game as a time-killing activity. However, this example shows how an online activity can create another offline activity. In fact, we believe a proper combination of online and offline activities can possibly generate another market opportunity.

Two sides of broadband Internet business in Korea

So far, I have described the success of broadband Internet business in Korea. From the business point of view, however, the wide penetration of broadband Internet in Korea has both its bright and dark sides. The dark side is that the

wired broadband market in Korea is becoming saturated and fierce competition is still waiting ahead. Since the service has a flat rate, revenue from broadband Internet business has its limitations while network operators have to invest continuously on the network to accommodate the increasing traffic, which is doubling every year. Also, the competition in the market has forced network operators to invest continuously to increase service quality. For example, the average measured download speed of KT's broadband Internet service, under the brand name Megapass™, is now reaching around 4.5 Mbps, which is much higher than that of typical broadband services in the world. This speed is made possible through the efforts of network operators to meet ever-increasing customer requirements for bandwidth.

Looking at the bright side, though, the same high-quality network infrastructure and large customer base can be the basis for creating a new mass market. Specifically, the infrastructure and customer base enable new business opportunities in application and value-added service areas, which used to be a niche market.

The pros and cons of broadband Internet business in Korea are summarised as follows:

Opportunities

1. Broadband has established
   - high-quality infrastructure
   - a large customer base
2. Opportunities in application and value-added services

Threats

1. Revenue: saturating market with flat rate
2. Expenditure: increasing CAPEX/OPEX due to doubling traffic
3. High customer expectation level:
   - average ~4.5Mbps bandwidth per customer
   - customer sensitivity to network quality

How the Internet is currently being used

Although broadband Internet is almost universally available in Korea, creating a mass market over the Internet does not come easy. For example, a recent survey on Internet usage shows that the main Internet applications in Korea are still web surfing, e-mail, games and chatting at home. This shows that even though broadband Internet connectivity has become nearly universal for every household in Korea, applications are still limited to best-effort, data/control/file-oriented, and store-and-forward applications, only at a faster speed. This is in contrast to previous predictions on the wide penetration of multimedia entertainment and communication applications, such as Internet broadcasting, video on demand (VoD), voice over Internet protocol (VoIP), and

multimedia conferencing. That users are mainly using PCs at home also means a limitation in location, time-of-day and terminal in using the Internet. In short, today's broadband Internet service is limited to the specific location (ie at home), time of the day (ie after school or work), a terminal (ie PC), and applications (best-effort applications). Therefore, the next natural step for the evolution of broadband Internet will be in overcoming these limitations and providing services that will be considered highly necessary parts of one's daily life and work activities, similar to the case with TV and cell phones.

Beyond Broadband strategy

The Beyond Broadband strategy follows this direction and focuses on providing quality life/work services over the common Internet protocol (IP) network infrastructure. Also, through the introduction of wireless/mobile access services, the services will be available to a variety of terminal types at anytime and anywhere.

For the last five years, analysts of the telecommunication market have been constantly stressing the business side of the application and value-added service. In particular, it has been predicted that the proliferation of digital contents, combined with broadband network capability, will create a mass market for contents, such as broadcasting and on-demand video. To create a sizeable mass market in the area of application and value-added services, network operators need to cover not only professionally produced contents, such as broadcasting and movies-on-demand, but also other areas such as 'personally produced' contents, high-quality multimedia conferencing, networked computing, home/office control, and so on. Specifically, additional focus should be drawn to communication services. Network operators have long been in this communication business and have acquired enough expertise throughout the whole business cycle. Furthermore, communication services have an N-to-N relationship that has the potential to increase the revenue by the square of the number of customers compared to the 1-to-N relationship of content services. To overcome the limitations of current communication service offerings based on the best-effort network, network operators need to enhance the quality of the network not only to increase the bandwidth but also provide QoS guarantees and high service availability. Based on these network capabilities, we believe new types of service will appear as well as those conventionally foreseen services, such as high-quality VoD, video telephony/conferencing, and interactive learning.

That tomorrow's network supports quality media applications as well as data application means the network itself should be different from what it used to be. For example, a typical MPEG-2 high-definition video stream consumes around 20 Mbps, which is difficult to provide over the current broadband Internet capability. Additionally, the provisioning of quality media applications needs more than the best-effort transport capability of the Internet. For example, the media information flow among certain endpoints in a videoconference should be given a guarantee of service quality. These are

examples of features that should be supported by next-generation networks and services. The next section describes features of Beyond Broadband access in more detail.

Features and directions

Next-generation broadband services are 'end-to-end' in nature. Considering that network operators have provided only 'access' to the Internet so far, providing these end-to-end services is a totally different business from the current broadband Internet access business. Also, next-generation broadband business should support both best-effort and QoS services. This means the network and its control mechanism should be different from the existing best-effort networking architecture. Principally, the future network should support significantly wider bandwidth and should contain to elaborate network resource control capabilities to meet future quality of service (QoS) requirements. All these show that the Beyond Broadband access is not simply about adding application service features onto the existing IP infrastructure but rather about providing differentiated services over differentiated networking architecture. Compared to the fact that a key feature of current broadband Internet business is bandwidth, the key features of Beyond Broadband access include ubiquity, convergence and handiness.

1. Bandwidth

To meet the goal of next-generation broadband services, the required bandwidth can range from tens of megabits per second to 100 Mbps depending on the quality requirements for multimedia streams.

For instance, KT is taking a phased approach in providing the required bandwidth for next-generation applications. Currently, VDSL and Ethernet-based fibre-to-the-curb (FTTC) services are being offered to major buildings and apartments. The same technology is also used for providing FTTC services in non-apartment housing areas. The ultimate goal is to provide a dedicated 100 Mbps per household, which requires fibre-to-the-home (FTTH) deployments. To meet this goal, KT is involved in the development and evaluation of both Ethernet and wavelength division multiplexing (WDM)-based passive optical network (PON) technologies. WDM–PON technology is already being deployed in FTTC trial service, and practical ways to bring dedicated 100 Mbps lambda to each home are currently being tested. The focus on bandwidth is to reduce capital expenditures (CapEx) and operational expenditures (OpEx) to the level where the service can make business sense when offered with high-quality multimedia applications. Table 1 summarises the main features in the evolution of bandwidth.

Evolving access bandwidth

	Past	Present	Future	
Fixed	PSTN Modem ISDN	ADSL VDSL 1–8 Mbps 20~25 Mbps Megapass™: average ~4.5 Mbps	FTTH 100+ Mbps	
WLAN	IEEE802.11 1 + Mbps	IEEE802.11b 11 Mbps per AP	IEEE802.11a (5 GHz) IEEE802.11g (2.4 GHz) 54 Mbps per AP	Portable Internet (2.3 G) ~1 Mbps per device
Mobile	PCS (IS-95A) IS-95B 14.4 kbps 64 kbps	CDMA2000 1X EV-DO 1X 144 kbps 2.4 Mbps shared	1X EV-DV 31 Mbps shared W-CDMA 384+ kbps	

* Megapass is an umbrella brand for KT's broadband Internet service.

2. Ubiquity

The vision of ubiquity in Internet access becomes another hurdle to overcome for widespread increase in Beyond Broadband access. Currently, users are restricted to fixed Internet connections, with additional freedom through the wireless local-area network (LAN) services in hotspots, home and office. For wider area mobility, customers rely on cellular communication technology, eg, CDMA1x EVDO or 3G technology. However, the relatively low data rate and higher pricing structure for cellular technology have been the obstacles for widespread use of mobile Internet. On the other hand, Wi-Fi technology covers only a small area (hotspot) while providing higher speed at an affordable price. This calls for another technology that can fill in the gap between cellular and WLAN services. KT has therefore introduced a bridge between fixed/WLAN Internet and cellular data service. Under the name Portable Internet, the 2.3 GHz-based wireless Internet service aims to provide broadband connectivity of 1 Mbps to each user in metropolitan areas at an affordable price.

3. Personalisation

The current broadband network was designed simply to route packets from the source to the destination. However, as network capability moves beyond simple best-effort packet delivery, the demand for the network to have intelligence rises in order to adapt to different customers and environments.

An example is 'personalisation'. Current broadband Internet business is site-based in that it provides Internet connectivity to a certain site and does not care who uses the network. However, the network needs to know 'who' is using the network and services when it comes to providing application or value-added services. For example, the content filtering service keeps children from accessing harmful sites. Without personalisation, the service applies to all users in the customer household. With personalisation, the network can configure itself so that the service applies only when children log into the

network. The personalised network login can further enhance customer convenience by providing single sign-on access to every affiliated application service provider. In this setup, the user only needs to log into the network once and later access to KT-affiliated sites is allowed without further login processes. In summary, the main features of personalisation are as follows:

- personalised value-added and application services;
- site authentication and personal authentication;
- single sign-on between network login and application login;
- customer profile-based network setup.

4. Convergence

Customers and service providers interpret convergence differently. From the customer's viewpoint, convergence refers to the convenience of using multiple services through a single interface or terminal device. A typical example is the triple-play service where Internet, voice, and media services are provided through a set-top box. From the service provider's view, the convergence means the ability to provide multiple services in the most cost-effective way and to become competitive by providing multiple services to the customer. This includes fixed-wireless convergence, convergence between telecommunication and broadcasting, and convergence between telecommunication and finance. As the market gets more competitive, we expect that diverse forms of convergence services will appear.

5. Ease of use

Probably the most important features to be supported in the future will be 'easy-to-use' services. Important measures are easy access to services, simple and intuitive user interfaces, and so on. Compared to traditional service terminals, such as the telephone, cell phone, and TV, current PCs and notebooks are too difficult to use in terms of booting time, complex user interfaces, and lack of portability. Therefore, we expect that future terminal user interfaces will be in the form of appliances rather than all-you-can-do devices, such as the PC. In this scenario, the critical factor is to hide complex detail behind the terminal and to provide a simple yet comprehensive interface to the customer. In summary, the main features of ease of use are as follows:

- easily accessible service through various terminals;
- easy, simple, intuitive, consistent user interface;
- from general purpose PC to appliance-type terminals;
- portable, carriable terminal.

6. The next generation network (NGN)

The architecture for the next generation network has been in place for more than a decade. Five years ago, it was called the 'vision of the future', but it's essentially the same schematic concept. Differences are that older schemes were based either on the integrated services digital network (ISDN) or asynchronous transfer mode (ATM) network while the current scheme is

based on the 'all-IP' networks. Another difference is that the current one focuses on fixed-wireless integration. However, the motivation has always been the same: to have a common infrastructure that can accommodate newly emerging services in a timely and cost-efficient way.

One of the reasons that this has remained as a vision during the last decade could be that there was no real demand for the architecture. However, Internet broadband access is approaching revenue saturation, and telcos and related service providers are beginning to seek the next generation growth engine.

7. The next generation network: from vision to reality

To meet the goal of the next-generation network, Korea has started the Broadband Convergence Network (BcN) initiative. The BcN initiative is a national project that focuses on building a network infrastructure for providing high-quality broadband multimedia services: integrating telecom, broadcasting, and Internet seamlessly anywhere and any time with any device.

It is my understanding that similar activities on the next-generation network are also taking place in other countries. Considering that these activities share the same rationale and concept, it becomes more and more important for related visionaries and realists to get together and come up with a common architecture and services. I believe this will reduce trial-and-errors and bring 'tomorrow' much closer.

Summary

I have briefly described the broadband Internet business in Korea and the need to find new business areas based on the current broadband network infrastructure and its customer base. I have also shown features that tomorrow's network and service systems should support. The presented concept is not just a vision; efforts to realise the vision are now being pursued under the BcN initiative at KT.

Besides this, I would like to emphasise that players in this field should always seek services that pay off and perform trials to verify the market. Last but not least, there are regulatory issues such as service bundling that should be explored. Judging from the fact that the convergence of multiple services and networks is a natural direction of business evolution, KT believes that collaborative work among related parties plays an important role in making this work for customers, service providers and equipment vendors.

Frequency: the most important resource for NTT DoCoMo

Kei-ichi Enoki | Executive Vice-President, Managing Director, i-mode Business, NTT DoCoMo, Japan

Kei-ichi Enoki of NTT DoCoMo looks at the trends in the mobile phone industry in Japan and how the key to the future development of broadband's relationship with mobile phone technology is complementarity.

DoCoMo's FOMA[1] services

1. Freedom of mobile multimedia access.

FOMA currently has five million subscribers. DoCoMo mobile phones have around 47 million, which means FOMA has reached a 10 per cent share. Regarding market response, 3G, which is FOMA, is becoming more popular than 2G, particularly among young people. As in any other country, Japanese consumer broadband, targeting individuals rather than business-to-business, looks for an information-aware public, which means young people in their twenties and late teens. The fact that this age group is really jumping on DoCoMo's 900i series is a good sign.

The most important resource for us is frequency; there may be frequency problems in the future, but there's currently a good trend in business terms. We started FOMA three years ago in October 2001. When I started working for DoCoMo, the transition from 1G to 2G, and from analogue to digital, also took 2–3 years. It requires tasks such as network coverage servicing or adjusting software such as debugging network terminals or software. Tuning takes time. The mobile telephone handset in the early stage tends to be large in size because of the various components it must integrate, such as LSI, or it tends to have a short battery storing charge time. Clearing these disadvantages takes 2–3 years. The 900i we put on the market this spring has reached the level of 2G in terms of basic performance such as the telephone.

i-mode and i-motion

According to our business plan, the provisional figure for March 2005 is 10 million. Two years from now, G3 and G2 will be at 50 per cent each, ie 25 million. The sales of such a product, as we saw during the transition from analogue to digital, may increase exponentially. 3G is a wireless broadband consisting of a packet system like the i-mode, but with a total packet per user reaching 20 times that of i-mode. Currently, PDC is at 200 packets of 128b, representing 25–30kb. FOMA is at 4000 packets, so it's 20 times that of i-mode (ie roughly 200 packets x 128). This is a dramatic increase, as you can see in ADSL vs telephone lines in fixed networks. This involves i-motion, a download-type video application handling MPEG4. You may also send mail with an attached video, or leave the video on the web, then download and view it. The current upper limit for a download is 300kb.

Following the historical process

To attract the public initially, you follow the historical process through which broadband broadcasting and video came. The day we reach 10–20 million, the percentage of pornographic content will probably decrease, but in terms of i-motion it will continue to proliferate. An MPEG4 of 300kb takes 30 seconds when you play the video, so it's rather short. Some mobile phones can play several clips consecutively, say, ten videos. This is a function the mobile handset has, so you can download several clips of 30 seconds and play them consecutively, totalling five minutes.

Young staff at Service Planning came up with the idea. The obvious question is the feasibility regarding marketing, product planning and engineering. Imagine a middle-aged father, no longer allowed to smoke in his home, going to his car, starting the engine, turning on the air conditioning and downloading videos to watch while he's smoking in the car. Broadband is an area where the way the contents are expressed is simply changing following technological advances, and this is just a matter of following the steps of a continuing process where we've come from text to still image to black and white TV then colour TV; colour GIF evolved to JPEG, then to i-motion, so clients feel comfortable despite the changes. The process is similar to reading comics, then watching animations on TV or watching movies so clients don't feel any discomfort about going broadband. The problem is the communication cost. The reason why the product was out and obtained as many clients is that we've introduced a flat-rate system communication fee for i-modes. If we didn't, we couldn't have had a large difference compared to before.

The flat-rate system

We charge 3,900 Yen for the service. You have to subscribe to the audio service (conventional mobile telephone service) and when you subscribe to an audio costing roughly 10,000 Yen, you have unlimited access to packets, ie i-mode access. I was originally against introducing the flat-rate system. The difference between wired and wireless broadband is that the bandwidth is virtually unlimited in fixed broadband because you only have to add cables to increase it. In wired broadband, the limit is the diameter of the earthenware piping. Even when you want to evolve to optic fibre you have to change the connecting device at both ends. Wireless relies heavily on frequencies; we don't have much allocated for our use and the allocation changes every ten years. Frequency is a precious resource. To change frequency allocations, you

have to take frequencies from those in use by microwaves, military or TV or other institutions and industries which have already invested in equipment and infrastructure for a given number of allocated frequencies. It takes 5–10 years to reassign them and is costly, so you have to allocate frequencies thinking ten years in advance, but no one can see that far ahead.

No one predicted how far the mobile phone business would go. If someone had, big companies like Sony or Toyota would have invested a 51 per cent share in Vodafone or TU-KA or KDDI. If someone could have predicted today's sales figure – a market size of about 10,000 billion Yen, and our share is roughly 5,000 billion – any CEO would have borrowed money to invest in mobile phones. Yet, a decade ago, everybody was sceptical about it, so they only invested a bit, then sold, then bought again, until it became the way it is now.

> 'Mobile phones are a very potent consumer product because they're always close to people. People don't walk around with PCs.'

This means the government, or a government official, decides frequency allocations by ITU, who can't possibly foresee such future development when even professionals in finance and markets couldn't. Considering that the number of frequencies for mobile communication may turn out to be relatively smaller compared with what was initially planned, and thinking of how to survive in that case, I didn't like the idea of a flat rate system and was against opting for it. However, au/KDDI introduced a flat rate. Their strategy was obvious: They wanted to take our high-end users who spend lots of money for PDC by offering them a flat rate system.

This isn't just a matter of taking the i-mode part, but everything that goes with it, namely audio and monthly subscription fees, which was a hard blow for us. Our sales would have plunged. So we said, if they want a fight, they'll get it, and we introduced the flat rate. On the other hand, we did our calculations and pricing. If everyone goes into it, the frequency will be filled up and cause problems for us, so we planned to stop people from leaving and we thought about what group of subscribers would change. We did that after au, so in theory we had a more reliable marketing projection. But we introduced it quickly, as soon as au announced it and hadn't sold much of their product. Maybe au opened a Pandora's Box and shouldn't have offered pornographic sites at a flat rate. However, it did accelerate the transition to broadband. The question remains whether people are willing to watch content on a very small screen. Clients must be using a mobile phone differently from a PC or TV. I thought for a long time that multiple functional devices should be used on a TPO basis rather than concentrating all functions in one communication device such as a mobile phone, PDA or PC. Using several devices on a TPO basis is what I believe in.

Complementarity is the aim

The Internet business scene is similar to retail: a shop's where you buy physically tangible items, whereas the Internet is where you buy digital signals, or information, by using various devices. The only difference between retail and the Internet is whether what you sell is digital contents or physical objects. To buy something, would you only go to one shop, whether it's the supermarket or convenience store? Don't you also go to department stores or speciality shops? It depends on what you want to buy. To buy Christmas presents you go to a department store; for a suit you go to a tailor; and for bits and pieces, you go to the convenience store, whereas you may go to supermarkets for a week's shopping. People choose different ways of accessing the Internet, with their mobile phone, PC and maybe in future TV set according to their needs. In this context, mobile phone broadband has a weakness in requiring frequencies and it's costly compared with today's ADSL.

On the other hand, mobile phones are a very potent consumer product because they're always close to people. People don't walk around with PCs. So, we have to promote this consumer product aspect, appeal to what characterises your product, ensure a market for it, and then go for the broadband aspect by tying it up with the PC. As a result, people would have them both, a mobile phone and PC in a perfect complementary relationship. There will, of course, be something of a dog-eat-dog situation, fighting over the market, but complementarity is the aim. Today, you can do home shopping with your mobile phone, and digital contents can be downloaded with it; you can download to it from a PC and use it like an iPod. Many combinations may be exploited.

Miniaturisation and motivation

We sold Motorola's and Nokia's mobile-phone handsets in Japan under DoCoMo brand and they didn't sell well. They were too large, which meant they didn't make their product for Japan, but looked as if they had adapted whatever they were selling elsewhere in the world by cramming in what was necessary for them to work in Japan. That's when I heard the size argument. They said things like Europeans are bigger – some are over two metres high, so their fingers are bigger and they can't possibly use keys so small. However, the best-selling high-end models in Europe are very small ones, like Sony's Premini, smaller than normal even in Japan and much smaller than our 900i. However, they're expensive and people use them as high-end mobile phones. So the size argument was given by those who'd never used them. A mobile phone must be small in size and light in weight.

Another factor is how motivated each individual user is. Do they want to use the functions the mobile phone offers? My wife didn't know how to use her mobile phone properly until five years ago. She was able to use a fixed telephone, but when it came to the mobile phone she couldn't press all the digits of a phone number. So I used to press the number for her; once the other person was on the line, I handed her the phone; once the conversation was

over, she handed it back to me without pressing the off-button. I was even turning the power off for her, so don't even think about her texting and e-mailing on her mobile phone. Then, our daughter left home for university. By some miracle, my wife learnt how to compose mails in half a day! She also learnt the characters on the keyboard. She got over the confusing and annoying mobile phone key handling because she had a strong desire to communicate with her daughter. So, that's what I think of the keystroke problem.

People in their 60s or 70s access stock exchange sites using their mobile phone. When you're 60–70, you're eyesight's deteriorating. And these people watch those small numbers on the screen for the sake of the stock exchange. Whether it's greed or a hobby, it helps them overcome the handling problem. This is even truer for the younger generation who want to buy things, get information, watch pornography and so on, so they overcome handling problems. To disseminate it across generations, we need to set up some stimulus or something that raises their awareness.

Future trends

The most important things brought by the transition to 3G, then to 4G, are that you will increase efficiency in frequency usage and decrease the cost per bit. This is why we introduce new technologies, not for the sake of broadband. Such transitions naturally mean allowing a larger data flow, so that it will become more attractive to clients, and the passage from still to animated image is a typical one, because they may download large files at a reasonable price, and that's all. There will be a minor relaxation of regulations on frequency range, so we may have access to more of the market but the pricing will be difficult. We have to guess how much money consumers would want to put into our services. You lose money if you set your price too low, while people won't bite on your product if you set it too high.

DoCoMo will exert some governance within the eco-system and maintain a profitable market as a whole to increase the demand or protect our share in the market in the age of broadband and this won't change, although we won't be the only ones to profit. If we maintain a system where those who made efforts or who found the best-selling product profit, as in the connection of mobile phones to external devices, our profit can't be large. On the other hand, we still have to think about how to increase the yield and that's the hardest part. The churn rate will decrease. If we can find such a service, we'd like to position it using DoCoMo's mobile phones. If we do that, we won't be able to change it any more, which is why I see it not as increasing sales but as reducing losses.

The most important thing is content, fundamentally. Techniques to display content basically come from the Internet. Therefore, speaking about technology, we will introduce Internet technologies that have become *de facto* if we can adapt them for mobile phones. The competition will be on the application layer. The bearer itself changes every 10–15 years, like 1G,

analogue, 2G, digital, 3G, so 4G will only come in about ten years from now, meaning the bearer will not be changing much. What the users see at the end is not the bearer but what is borne by the application layer. We'll therefore study the Internet thoroughly and use whatever we can. This is our fundamental attitude, and as we know the mobile phone market best, we will only have to introduce what we consider suitable for it.

'You lose money if you set your price too low, while people won't bite on your product if you set it too high.'

Push-to-Talk

In mobile phones, the Push-to-Talk (PTT) walkie-talkie type phone is going strong in the US. It's like Citizen Band radio. I don't know if Japan is ready to accept such a system, it may take some time. We can certainly manufacture it, but that's not the area I'm interested in. What I see is the idea of making a business out of it, for which I'm also interested in fixed bundle. KDDI will probably launch it. We are NTT, so we can't work for both NTT East and NTT West, because if we do, the Ministry of Justice will pick on us for monopolising the market. Rather than service, fixed bundle will be applied on the rates. As the consumer market is limited, this is important. How to manage such bundles is a big problem. In Japan, if Yahoo!, which is Softbank, obtains radio frequencies and goes into the mobile phone business, Mr Son (CEO, Yahoo! BB) allegedly said that he'll do it even if he dies for it. I'm curious about the outcome of Yahoo! BB coming to the mobile communication market, particularly Yahoo! BB being installed in homes. We're trying to imagine all sorts of situations deriving from Yahoo!'s arrival, but it's hard to reach a conclusion.

Push-to-Talk looks interesting. I still don't know if I should call it a threat, but I'm watching to see what would become of mobile phones with an integrated TV and radio. A combination of communication and broadcasting. Apart from transfer to a PC via the Internet, you have a screen on your phone and when you put in an aerial you have a TV set. A kind of digital radio and TV. I'm wondering which business model I can use. TV stations are interested in it. If a mobile phone turns out to be a TV, broadcasting stations will gain 40 million receivers without doing anything or spending any money. But we, on our part, do spend money to sell these phones. Moreover, if people spend more time watching TV than making calls or accessing i-mode, the yield-decreasing factor will be stronger than its merits. People watching TV on their mobile phones don't bring us any money.

Someone could watch TV and wish to record a programme it somewhere like a data terminal, then view it later anywhere, any time. You already have FM radios where you can search for information on the music you're listening to and download it if you like it, but is it profitable? For consumers, the mobile phone system is something to be exploited. We now have a sales figure of 500 billion Yen with 100 billion Yen operating profit, ranking second after Toyota, so it's an attractive business. This is why broadcasting people or Softbank, or those in the fixed phone business are trying to establish themselves in the mobile phone market. We have to be careful when we work together with them. You don't have to reject all proposals, but you have to make a selection, otherwise they may cause you a lot of damage.

'Fixed broadband represents an increase in speed, but the flat rate is much more meaningful. Rather than high speed, people seem to find more value in the possibility of remaining connected all the time.'

The problem of frequency allocation

If we're not careful with them, someone may snatch part of our profit. It's a big risk. Look at KDDI. Now au is becoming the main body and the fixed-phone business is collapsing. Although DoCoMo and NTT are not like that, we do have a relationship like that between KDDI and au, but in fact DoCoMo is generating most of the yield between the two. The fundamental architecture of operators having both fixed and mobile telephone networks consists nowadays invariably in getting the yield from wireless, and the problem is how to protect the yield from the most profitable side of their businesses, namely mobile phones. Others will try to come and have their share.

There's a limiting factor, which is the number of frequencies available. It's a barrier for newcomers, but also a weakness when we wish to expand our business. I'd like to say to all potential newcomers: leave us alone – let us get on with our wireless business and we'll be glad. We need to search for a new use for mobile phones. Business is either B to B or B to C. Mobile phones are a typical B to C business, which is consolidated by assisting person-to-person interactions. This is why mobile phones are the tool closest to the consumer market. It may have repercussions in areas, such as retail or possibly medical. They are not unlimited in number, but you still have markets that are not completely closed for us.

In terms of yield, people tend to think that broadband is necessarily a flat rate which is already here. I wish it were on a metered rate. Fixed broadband represents an increase in speed, but the flat rate is much more meaningful. Rather than high speed, people seem to find more value in the possibility of remaining connected all the time, offered by the flat-rate system.

3G – the cutting edge

For people in Europe or North America, Japan, with its i-mode, is advanced, and 3G is the cutting edge. Apart from these, you have the usage and position of mobile-phones in the consumer market. Notwithstanding impacts on mobile phone operators, there are many players involved in the consumer market, such as retail businesses. The consequence of such an impact will probably be tangible in Japan; therefore, for people in other industries, it may be useful to watch the dynamics of the consumer market with regards to mobile phones. I believe mobile phones like i-mode will become prevalent.

The broadband revolution: translating vision into action

Tim Kelly | Head of the Strategy and Policy Unit (SPU),
International Telecommunication Union, Switzerland

Tim Kelly, Head of the Strategy and Policy Unit (SPU) at the ITU, looks at the spread of broadband technology globally and points out how, in Asia, countries such as Korea and Japan are translating vision into action.

The SPU

The SPU is a unit within the Office of the Secretary General in the International Telecommunication Union (ITU). Founded in 1865 to promote global telecommunications development, ITU is the oldest of all intergovernmental organisations. ITU's mission is to extend the benefits of telecommunications technologies to all citizens of the world. It does this through three main activities: *telecommunications development*, concerned with extending universal service and access; *telecommunication standardisation*, developing and promoting technical standards ('Recommendations'), interconnection and operability between different systems; and *radio-communications*, helping to coordinate the way in which the civil radio frequency spectrum is used. Within ITU, SPU acts as a think-tank, with specific responsibility for issues that cut across the work of the three sectors.

The ITU

ITU's membership includes 189 member states – virtually every country in the world is a member – and around 700 different Sector Members, or private companies, such as Cisco. The private sector has participated in the ITU's work right from the beginning, and the sector members carry out much of the ITU's work, especially in the field of standardisation. The ITU's structure is unique among intergovernmental organisations in that it is based on a partnership between the private and public sectors.

Data collection and analysis is an important part of ITU's work and, in 2004, ITU will be releaseding the sixth edition in its series of Internet Reports, this year looking at 'The Portable Internet'. The report looks at the way in which high-speed Internet access can be provided using wireless transmission, for instance using technologies such as WiMax. ITU also organises meetings and workshops, as well as TELECOM exhibitions and forums. ITU also assists in the development of technical standards. For instance, the Digital Subscriber Line (DSL) series of technologies were developed within ITU-T study groups, making available increasingly higher speeds for Internet access to residential consumers. ITU also works to ensure the interoperability, security and seamless inter-working of different technologies. In all these ways – through data collection, workshops, country case studies and standardisation etc –

ITU is helping promote the development of telecommunication technologies, including broadband, throughout the world.

Korea's broadband success

ITU recently published a series of case studies of broadband development worldwide, including the cases of Canada, Iceland, Japan, Korea and Hong Kong, China[1] in order to understand better the factors that lead to a successful take-up of broadband. For many years, the leading economy worldwide in terms of broadband penetration has been the Republic of Korea (see Figure 1). Around three-quarters of Korea's households had broadband installed by the end of 2003, with many of them having a choice between DSL (at different speeds, up to 40 Mbit/ps), cable modems, metro Ethernet, fixed-wireless or satellite. Competition among technologies (inter-modal competition) is a key element in Korea's success.

1. See 'Broadband Korea: Internet Case Study', March 2003, available online at: www.itu.int/casestudies.

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Worldwide, the broadband market stands at about 150 million subscribers in mid-2004, or around one in every five Internet users. Korea is leading the way worldwide, but other Asian economies, such as Hong Kong and Japan, are catching up fast.

Top 15 broadband economies worldwide

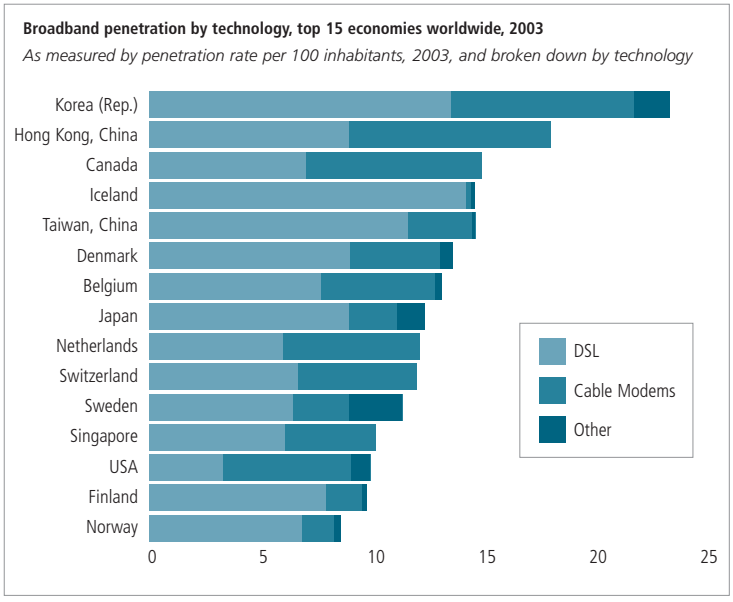

Figure 1.
Source: ITU World Telecommunication Indicators Database, OECD.

Just under half of all the world's broadband users are in the Asia/Pacific region. Elsewhere, Canada also has an active broadband policy with almost twice the level of penetration of the USA. Canada has been particularly successful in promoting broadband in rural areas and through community initiatives. Within Europe, broadband has lagged behind Asia and North America, but in the last two years there has been a rapid take-up in economies like Germany, France and the UK, following the adoption of policies that favour the unbundling of the local loop and consequent price reductions. The United Kingdom, for instance, which until recently did not feature among the top broadband economies, is now one of the fastest growing, with around 200,000 new subscribers being added each month during 2003.

There were a number of reasons why broadband took off in Korea. The regulatory environment, in particular encouraging competition between different types of technology (cable, DSL etc), was very important, as was the emergence of a well-funded second domestic fixed-line operator (Hanaro Telecom) to compete with the incumbent (KT). A second advantage Korea had is the tradition of emphasising education as being an important family investment. Some Korean families spend up to a third of their income on education, so it was relatively easy for children to persuade their parents of the need to invest in broadband in order for them to keep up with their peers at school (as well as, of course, for playing games!).

A third thing policy initiative that the Korean government did, which was relatively cost-free but remarkably effective, was to provide a grading system for apartment blocks, giving them one, two or three stars, according to how well they were equipped to provide high-speed Internet access. By creating competition among constructors and owners of apartment blocks, as well as building awareness among users, this simple step helped the market to flourish. Finally the Korea market has prospered by recycling the money raised through auctioning 3G mobile licences. As in the rest of Europe, Korea auctioned the licences for 3G and raised around two-and-a-half billion US dollars in the process. But rather than using that to pay off government debt, as has happened in Europe, the Korean government invested the profits from the 3G auctions in IT training programmes for users, and support for entrepreneurs. Thus, the money that was 'extracted' from the ICT sector, through the auction process, was reinvested in the ICT sector, providing a relatively cost-free way for the Korean government to promote broadband and ICT more generally.

Lessons for the rest of the world

The lessons from Asia may well be uncomfortable ones for the rest of the world. Most European countries have followed the United States in taking a hands-off approach, assuming that it's the role of the market to provide broadband, which of course, it is. But that is not the whole story. Until recently, incumbent European public telecommunication operators (PTOs), such as France Telecom, British Telecom, Deutsche Telekom, have had a vested

interest in promoting alternatives to broadband. For instance, until recently, Deutsche Telekom and France Telecom were promoting ISDN (Integrated Services Digital Networks) as their preferred solution. But ISDN only offers speeds of up to 128 kilobytes per secondkbit/s for residential users, and is priced on the basis of dial-up usage rather than the flat-rate 'always-on' tariffs which have provide popular for DSL. Other European PTOs have been more concerned to protect their lucrative businesses in services to business – for instance leased lines and private networks – and so have been reluctant to offer DSL to the corporate market for fear of undercutting this revenue stream. When the incumbent operators see no interest to promote a particular technology, a hands-off approach is unlikely to get things moving.

In the United States and New Zealand, there has been a reluctance to mandate unbundling of the local loop, for fear that this would act as a disincentive to investment. But this has tended to strengthen the entrenched position of the local incumbents. Competitive Local Exchange Carriers (CLECs) have generally struggled. In other countries, like South African or Brazil, incumbent fixed-line operators have continued to benefit from legal monopolies for fixed-line services long after they were abolished elsewhere.

'For the moment, broadband within most of Europe remains at a price that is relatively high compared with the pioneering companies in Asia.'

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On the other hand, in many Asian countries, viable second fixed-line operators have emerged. In Korea, for instance, Hanaro Telecom has played a very important role in competing with KT. Similarly, Yahoo! BB has been pushing NTT in Japan. In general, strong second fixed-line operators have been rare elsewhere. Investors have found it more profitable to invest in mobile services, so there's been a lack of investment in fixed-line infrastructure, in particular in the local loop. In the last few years, however, regulators have taken a more interventionist approach, for instance in obliging the unbundling of the local loop, or setting prices for wholesale interconnect, at which incumbent operators are obliged to inter-connect with other operators. As these policies have taken effect, and as incumbents have reoriented their strategies to promote broadband, we have begun to see a much more dynamic broadband environment emerging, for instance in Europe.

But even where local loop unbundling has been mandated, the wholesale prices set for unbundled local loops, are a critical factor in determining the development of infrastructure competition. On balance prices in Europe are probably too high (see Table 1), and the margin between the wholesale price and the retail price are too low, meaning that there is little incentive for resale. The main lessons from Korea and Japan are that infrastructure competition is an essential element in promoting broadband growth. Competition doesn't

Broadband prices per month and per 100 kbit/s, selected economies, July 2004, and change 2003–04

Economy	Company	Technology	Speed (kbit/s)	Price per month (USD)	Price per 100 (kbit/s)	Change 2003–04
Japan	KDDI	DSL	47'000	25.85	0.06	-44.1%
Korea (Rep.)	Hanro	DSL	20'000	47.86	0.24	-4.0%
Sweden	Bredbandsbolaget	FTTH/DSL	24'000	58.63	0.24	-97.0%
Taiwan, China	Chunghwa	DSL	8'000	35.30	0.44	n.a.
Hong Kong, China	Netvigator	DSL	6'000	51.03	0.85	-33.2%
Canada	Bell	DSL	3'000	34.05	1.13	-66.6%
Belgium	Belgacom	DSL	3'300	48.40	1.47	19.6%
Singapore	StarHub	Cable	3'000	46.50	1.55	-31.3%
Switzerland	SwissCom	DSL	2'400	77.88	3.24	-73.3%
USA	Comcast	Cable	3'000	52.99	1.77	-50.0%
Netherlands	Wanadoo	DSL	1'120	42.35	3.78	5.5%
Finland	Sonera	DSL	2'048	82.28	4.02	-53.6%
Iceland	Vodafone	DSL	500	21.00	4.20	-37.1%
Denmark	Tele2	DSL	2'048	86.32	4.21	-32.1%
Norway	Tele2	DSL	1'024	62.95	6.15	-11.0%
Average			**8'429**	**51.56**	**2.22**	**-36.3%**
Best practice (top 20%)			**30'333**	**44.12**	**.018**	**-48.5%**

Table 1.
Note: Prices relate to July 2004 and change between July 2003 and July 2004.
Source: Adapted from 'ITU Internet Reports 2004: The Portable Internet', ITU Geneva, 220 pp.

simply 'happen' overnight and there needs to be active government involvement to create the right environment in which competition can thrive. The margin between the wholesale and retail prices for DSL is a key regulatory indicator, and benchmarking of this figure, both within Europe and against broadband leaders such as Korea and Japan, is an important element in promoting competition.

Broadband applications

Globally, the major take-up of broadband has not been in the business market, as might have been expected, but rather in the residential market. Even in Korea, which has the highest levels of broadband penetration in the world, the main applications tend to be games, file sharing, video services, downloading music clips etc, all of which are primarily consumer applications. There is some overlap: for instance, businesses may then use these as a platform for developing commercial type applications (for instance, sale of music online) but to a large extent they are geared at consumers. But this is only the first phase of development of the broadband market. In the longer term we will see businesses adopting broadband as it becomes cheaper than alternative solutions such as leased lines. In the longer run, broadband may boost broader national economic development. It can help, for instance, small businesses to establish an e-commerce presence, while it can help larger businesses with controlling communication costs.

Broadband is important, for instance in making available to small entrepreneurs, people working from home or small companies, a level of

connectivity previously available only to large companies, governments and universities. It puts them on an equal footing so they can have their own websites and run their own e-commerce services effectively from home. In the future, we may see much higher rates of small-firm creation and of people working from home, either independently for themselves or for another company. And of course, we will also see new types of partnerships between small companies or between larger and smaller ones, using broadband as a way of working together. So while the major impact of broadband to date is very much in the residential consumer market, in the long term it will have a big impact on the business market, particularly for entrepreneurs, teleworkers and small/medium-sized enterprises.

Government's role to accelerate broadband deployment

There is a very important role for governments to play in creating the right environment for broadband to take off, in particular through policies that promote infrastructure competition (like unbundling the local loop, both for telecom operators and cable TV network operators) and through policies that promote inter-modal competition (for instance, through technology-neutral regulation). Where competition is not effective in regulating prices, it may also be necessary for government to set benchmarks for the tariffs at which the incumbent offers services to wholesalers.

Governments can also play an effective role in terms of projects that demonstrate how broadband can be used effectively in the public sector, for instance within the health sector or in traffic management-type applications. Governments are a major procurer in their own right, of ICT networks and services, so if they can show that broadband is an effective replacement for private leased lines, this would have a significant influence on the market. A third way in which governments can help is at the regional level, by promoting the adoption of broadband at the local level, and in some cases it may be worthwhile for the government, particularly in rural communities, to act as an intermediary between service suppliers and users. There are now a growing number of examples of cities – such as Amsterdam, Stockholm or Utah – that have established their own broadband networks for resale through commercial providers, in order to stimulate take-up and to enhance competitiveness. Canada has played a pioneering role in promoting community initiatives.

Regulation and investment

There are a number of areas where European regulation is probably not as effective as it might be, notably in the relationship between competition policy and sector specific regulation. European countries have not really thought out collectively what they want to achieve through competition policy, and there are certain inconsistencies between competition policy actions and those of sector specific regulation. A second area where European regulation probably falls down is in not paying sufficient attention to price and

tariff regulation. European regulators have given the incumbents too easy a ride with regard to unbundling the local loop, interconnection rates, and the rates levied for termination of calls to and from mobiles.

In Europe, there has been relatively little fresh investment in local networks. By contrast, there has been arguably too much investment in creating long-distance fibre networks (for instance, between London to Frankfurt, there is probably a choice of 15 or more competing fibre optic networks). The hope in Europe is that, rather than creating competing fixed-line local loops, wireless-based services will emerge as the viable alternative to provide competition in the local loop. To some extent that is already happening, but not as fast as might have been expected, due to delays in the roll-out of 3G mobile networks, and because of the high investment costs in obtaining licences and constructing networks.

Once high-speed mobile services are in place, there should be greater competitive pressure on incumbent fixed-line operators to improve, and reduce the price of, their service offerings. For the moment, broadband within most of Europe remains at a price that is relatively high compared with the pioneering countries in Asia; while the services offered are relatively slow speed. In Korea and Japan, broadband services using VDSL (very high speed digital subscriber line) technologies are already commonplace, with speeds of 25 Mbpsbit/s and above.. By contrast, the speeds available through ADSL (asymmetric digital subscriber line) services in Europe are not much faster than those being promised for 3G; typically below 0.5 Mbit/sps. So the development of high-speed wireless services in Europe should encourage fixed-line operators to reduce their prices and/or provide faster connectivity.

Within Europe, broadband is neither sufficiently mature nor widespread to be considered a universal service. However, beyond the universality aspect, an important consideration is geography: in any rollout of DSL technology in particular there will always be large parts of a country that are inadequately served. There are important geographical constraints on how subscribers can be from the central office exchange if they're using ADSL and VDSL-type technologies. Many of the local loops in Europe, particularly in France, which has a relatively low density of population, are very long, meaning that these geographical constraints can be quite significant. Effectively, it may mean that 50–60 per cent of a country's population may be served immediately with broadband within a few years of the service being announced, but the remaining 30–40 per cent will only receive broadband in 5, 10 or 15 years' time. In a purely commercial market environment, they may never receive it without some form of subsidy to network rollout. So governments need to consider their social and economic goals in terms of geographical rollout of broadband, perhaps by encouraging infrastructure sharing or by developing 'least cost subsidy' mechanisms for certain areas or certain types of institution (like village schools) that would not otherwise receive broadband. If a government decides that it does want broadband in all schools, then it should

be prepared to pay for implementing it in those schools that would not otherwise be able to afford it, or in those parts of the country that would not otherwise be among the first to receive it.

Role of wi-fi

The role of wi-fi, and wireless technology in general, is very important in the future of high-speed Internet access. For consumers, the integration of wi-fi with broadband is a very attractive proposition. In my home, we have three or four computers, and wi-fi enables us to connect them all very easily into a broadband network. I would like to be able also to link that in with my television set, or stereo, to view material being streamed over the Internet. That will soon be possible. Also, for businesses and universities, especially organisations that have new staff coming, departments changing, teams working together, it is clear that wi-fi combined with broadband offers a very powerful proposition. In the longer run, wireless LAN technologies, like WiMAX and Wi-fi, will complement and compete with 3G mobile networks. This, mobile operators will face a dilemma as to whether they fully integrate themselves with wireless IP technologies (like Wi-Fi and WiMAX) or whether they position themselves as competitors. For instance, should a mobile service provider offer handsets that have Wi-Fi and WiMax capability? Wi-fi is likely to be complementary to fixed- line broadband, but a competitor to high-speed mobile services.

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The portable Internet

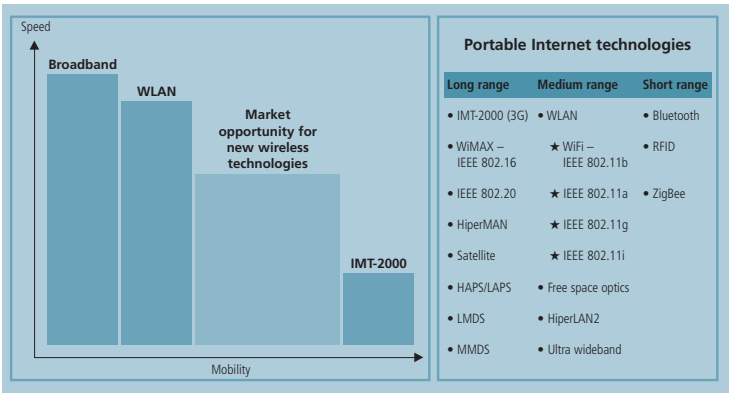

Figure 2.
Source: 'ITU Internet Reports 2004: The Portable Internet', ITU Geneva, 200pp.

One of the exciting aspects of wireless technology, which is an area where technological change continues to be very rapid, is the emergence of portable Internet-type technologies. These fit between short-range wireless technologies, such as wi-fi, and nationwide services, such as 3G, which is based on the IMT-2000 family of standards (see Figure 2). We will see technologies such as WiMax, portable Internet and ultra- wideband growing up in that gap between short-range and long-range wireless technologies. For developing countries, in particular, this set of 'portable Internet technologies'[2] offers huge potential for the future. Wireless technology over a relatively wide radius, say 50 kilometres, using a service like WiMax, offers huge potential not

2. This is the subject of a new ITU report, see 'ITU Internet Reports 2004: The Portable Internet', September 2004, Geneva, 200 pp.

only for providing broadband type services but also for carrying conventional voice services, with VoIP over a wireless platform substituting for the public switched telephone network.

Wireless is an area where there are many new technologies on the horizon. It is a really exciting area and a big challenge, of course, to the ITU membership, which has traditionally regulated the wireless spectrum by designating different types of use for particular bands, so as to minimise interference. But the traditional way of slicing up the spectrum for different uses, and allocating usage rights on a first-come, first-served basis is undercut by spread spectrum technologies such as WiMax or ultra wideband, and by services which used unlicensed spectrum, like wi-fi. These new advanced wireless technologies will force ITU member states to manage the spectrum in quite a different way.

The vision thing

Both Japan and Korea have developed, at government level, an information society vision of where they want to be in five to ten years' time. To do this, different government departments worked together with the private sector, consumer groups and academics, at both regional and national levels, in order to develop a national vision of what broadband could do for their economy and for society. This development of a common vision has been important in both countries, as has the competition between them.

Within Europe, there is a similar need for government, at national, regional and citywide levels, to work with the private sector and civil society to develop a shared vision of what broadband can do for the economy and society. But Europeans have a problem with 'the vision thing'. Maybe we're too modest – or maybe not ambitious enough – but in Korea and Japan, the political vision has been translated into reality through working groups, collaborative work and policies. Korea, for instance, has set a target of becoming 'the world's most advanced IT power'. Within Europe there is a danger that vision never gets translated into action, and while the words produced, for instance, by the EU Lisbon Summit of March 2000, sound very good on paper, there has been a lack of real effort to translate that European-wide into national and regional action.

Fernando Gil de Bernabé y Varela | Editor

MANAGING DIRECTOR FOR SERVICE PROVIDERS,
INTERNET BUSINESS SOLUTIONS GROUP, EMEA,
CISCO SYSTEMS, INC

Fernando Gil de Bernabé heads a team of seasoned advisers drawn from the industry and the major management consultancies who provide independent advice to senior business executives. They help telecom service providers improve profitability through innovative programmes that target both new revenue generation and operational expenditure reduction.

Fernando joined Cisco as Group Manager, IBSG in late 1999 to roll the Service Provider practice out from the USA to EMEA (Europe, Middle East and Africa). He was promoted to Director in 2001. In October 2003 he was promoted to his current role of Managing Director. He is a member of the senior executive management team that defines Cisco's strategy in the service provider market. Most recently he has led Cisco's worldwide initiative on consumer broadband.

Prior to Cisco, he was an Associate Director in the telecommunications, information technology, media and electronics practice of Arthur D Little in Palo Alto, Silicon Valley. He has worked for telecom, media, high-tech, consumer electronics and government customers in the USA, Europe, Asia and Latin America. Fernando holds an MBA and an MOT from the Haas School of Business at Berkeley, California. He previously graduated from the School of Telecommunications engineering at the Polytechnic University of Catalonia in Spain.

Bill Bodin

CHIEF TECHNOLOGY OFFICER,
INTERNET HOME ALLIANCE AND SENIOR TECHNICAL STAFF MEMBER (STSM),
IBM

In his role as CTO of Internet Home Alliance, Bill Bodin provides technology counsel and works with member companies to optimise collaborative technical efforts.

Bill leads the research and prototyping efforts for the Pervasive Computing Division at IBM in Austin, Texas. He is currently involved in bringing key technologies to IBM's Pervasive Development organisations. The Pervasive Computing Advanced Technology Lab, which he directs, provides the conduit through which many of these technologies flow.

He has been awarded several US patents across many disciplines related to computer operating systems with dozens of patents pending. He is a Steering Committee member of the MIT Media Lab, has authored or co-authored several books, writes regularly in many publications and is a frequently requested speaker at universities, technology expositions and technical developer conferences. He was one of the original OS/2 architects and is the concept originator and chief architect of IBM's Visual Age Developer Domain (VADD). VADD was IBM's first foray into an online revenue-based, professional developer portal.

Pierre Danon

CHIEF EXECUTIVE OFFICER,
BT RETAIL

Pierre Danon, aged 48, was appointed CEO of BT Retail in September 2000 and took up post on 4 October. He is responsible for managing BT's 21 million UK customer relationships, ranging from residential consumers to major corporate clients and government. BT Retail employs 42,000 people and has an annual turnover of £13.3 billion. He is a member of the BT Group Executive Committee and plc Board and reports to Ben Verwaayen, Chief Executive BT Group. He is also a Director of Hays plc.

Prior to joining BT, Pierre Danon was president of Xerox Europe, the European operations arm of Xerox Corporation. He was also a member of the company's worldwide strategy committee, driving its transformation in Europe as a networking, services, solutions business.

Pierre holds a degree in civil engineering from the Ecole Nationale des Ponts et Chaussees, a masters in law degree from the Faulte de Droit Paris V Assas, an MBA from the HEC and has wide ranging international expertise gained as an executive working for Xerox in Europe and the USA as well as experience in finance, sales, marketing , customer service and research and development.

Stephen N David

CHIEF BUSINESS-TO-BUSINESS OFFICER,
THE PROCTER & GAMBLE COMPANY

After graduating with a BSC degree from the University of Nebraska in 1970, Stephen N David joined Procter & Gamble as a sales representative. Since then, apart from a leave of absence to serve as a US Army captain, his career at P&G has spanned many diverse assignments and country postings.

In 1982 as senior project manager, Customer Services, he led the deployment of the first personal computers for the company and helped to train the advertising and sales departments on how to use them. In 1986 he was named country manager P&G Hellas (Greece), and, in 1989, general manager Arabian Peninsula. He returned to the USA in 1992 when he became vice president Fabric Conditioners, P&G USA and in 1993 was given a special assignment as vice president in the Strengthening Global Effectiveness programme. He was appointed senior vice president Customer Business Development in 1998 and global customer development officer in 1999.

His experience in line management and customer business development, combined with his personal passion for IT and involvement in the current business-to-business work, contributed to his becoming, in 2000, chief information officer and business-to-business officer with overall responsibility for P&G's Internet strategy.

Kei-ichi Enoki

EXECUTIVE VICE-PRESIDENT, MANAGING DIRECTOR,
I-MODE BUSINESS, NTT DOCOMO, JAPAN

After receiving an MSc in Electrical Engineering from the University of Waseda in 1974 and a career with Japan Post & Telecommunications, Enoki joined NTT Mobile Communication Network (later NTT DoCoMo) at its foundation in 1992. Assigned by Koji Oboshi, then CEO of NTT DoCoMo, in 1997 he initiated the development of i-mode. He started the i-mode service in 1999, with the participation of colleagues. The current number of subscribers amounts to 4160 million, which means that one out of three Japanese uses the service. He is responsible for all aspect of the i-mode business.

The roles played by Enoki during the i-mode's development years have been: Team Leader, Bonding (i.e., picking up the best of the capabilities of each of the partners: Financial power, the brand image and the sales channel of a large corporate company such as NTT DoCoMo on one hand, and the ideas, the gumption and execution speed offered by external partners), mentor, or advisor/protector (i.e., saving the i-mode Group activities from traditionalism and potential frictions intrinsic to large companies). Enoki became a Board Member in 2000 and Executive Vice President and Managing Director in 2003.

Ashley Highfield

DIRECTOR,
BBC NEW MEDIA & TECHNOLOGY

Ashley Highfield joined the BBC in 2000 and is a member of the BBC's Executive Board. He is responsible for the BBC's output on the Internet and interactive TV, as well as new and emerging platforms such as mobile and broadband. He also has responsibility for managing the BBC's technology portfolio, including research and development, and is charged with leading the BBC's technological innovation through the BBC's Creative R&D team.

In November 2001 he was responsible for the introduction of BBCi, the unifying interactive brand across all digital TV platforms: cable, satellite and digital terrestrial (now Freeview). In 2003 Ashley was given the Digital Innovator Internet award by the *Sunday Times*. He is a fellow of the Royal Society of Arts and a chartered engineer and was recently appointed a special adviser and committee member of the Science Museum.

Before joining the BBC, he worked at Flextech TV, a pay-TV channel provider, where he created the new media organisation Flextech Interactive and became its managing director. He was appointed non-executive director to a number of 'dot.coms' during this time, including the online mapping company, MultiMap.Com, and the UK's largest online ticketing company, WayAheadGroup.

David Hulbert

PRESIDENT,
WALT DISNEY TELEVISION INTERNATIONAL

David Hulbert has responsibility for the consolidated international free and pay television activities of The Walt Disney Company in Europe, Middle East, Africa (EMEA) and Asia Pacific. These activities include branded and non-branded programme distribution through Buena Vista International Television (BVITV), production and broadcasting, including the development and management of 25 worldwide Disney Channels that can be seen in 68 countries, and other media investments in Europe.

Through Disney Clubs and Disney animation, WDTV-I provides 94 branded shows per week around the world. BVITV licenses internationally successful series from Walt Disney Television and Touchstone Television, feature films from Walt Disney Pictures, Touchstone Pictures, Hollywood Pictures and Miramax Films plus ABC News, entertainment, sports and children's programming. WDTV-I's portfolio of investments in Europe includes Super RTL and RTL2 in Germany, Multicanal in Iberia, and GMTV in the UK. WDTV-I is also well positioned to respond to growth in the emerging markets of central Europe through equity participation with HBO.

Tim Kelly

HEAD,
STRATEGY AND POLICY UNIT,
INTERNATIONAL TELECOMMUNICATION UNION

Dr Tim Kelly is head of the Strategy and Policy Unit of the International Telecommunication Union (ITU) in Geneva, where he has worked since 1993. Before joining ITU he spent five years as a Communications Policy Analyst with the Organisation for Economic Co-operation and Development and three years with Logica Consultancy Ltd. He has an MA (Hons) degree in Geography and a PhD in industrial economics from Cambridge University.

Over the past 18 years, he has specialised in the economics of the telecommunications industry. He has written or co-authored more than 20 books on the subject, including the ITU's World Telecommunication Development Report, Direction of Traffic and ITU Internet Report.

Sanghoon Lee

EXECUTIVE VICE PRESIDENT, KT

Sanghoon Lee (sanghlee@kt.co.kr) is Executive Vice President of KT, where his organisation, Network Group is responsible for KT's Network planning and operation. Prior to the current appointment, he was the CTO of KT for three years responsible for corporate R&D.

He received his BS degree in electrical engineering from Seoul National University, Korea, in 1978, and MS and Ph.D. degrees in systems engineering from the University of Pennsylvania, Philadelphia, in 1982 and 1984 respectively. From 1984 to 1991 he was with Bell Communications Research (Bellcore), where his research activities were in ATM Technology and broadband networks. Since 1991, he has been with KT and currently served as the head of Network Group.

Dr Lee has been contributing to setting up the deployment strategy of the national Broadband infrastructure and is one of the leading opinion makers for directing the future information society of Korea. Dr Lee is a member of National Academy of Engineering in Korea and the fellow of IEEE.

Paul F Liao

VICE PRESIDENT AND CHIEF TECHNOLOGY OFFICER,
MATSUSHITA ELECTRIC CORPORATION OF AMERICA,
AND PRESIDENT, PANASONIC TECHNOLOGIES

Dr Paul F Liao is responsible for technology direction and R&D for the Matsushita Group in North America and for its relationship with Matsushita Electric Industrial Co's global technology direction. He serves on the board of directors of the Panasonic Foundation as well as several Panasonic companies, is a member of the FCC's Technological Advisory Council and serves on the Consumer Electronics Association's Technology Advisory Group.

Prior to joining Matsushita Electric Corp of America (Panasonic), he held a number of positions at Bell Communications Research, Inc. (Bellcore) and Bell Laboratories including vice president for Emerging Networks, assistant vice president of the Solid State Research Laboratory, the Network Systems Research Laboratory, and of the Network Architecture and Foundations Center.

He is a past president of the IEEE Lasers and Electro-Optics Society, and a recipient of the IEEE Millennium Medal. He is a former editor of the Journal of the Optical Society of America B: *Optical Physics*, and has been co-editor for the Academic Press Series entitled *Quantum Electronics*. He has served as a member of the Board of Directors of the Internet Home Alliance, and of the Board of Trustees of Brookdale Community College in Lincroft, New Jersey.

Keiichi Makizono

HEAD GENERAL MANAGER,
TECHNOLOGY DIVISION, SOFTBANK BB

Keiichi Makizono has been head general manager, Main Technology Division, Softbank BB since 2002 and is responsible for network design and building of Yahoo! BB, which at April 2004 had 4.3 million ADSL users and four million VoIP users.

From 1999 to 2002 he worked for Cisco Systems as SE manager for the New Common Carrier Division and from June 2001 participated in the network design and building of Yahoo! BB network as Cisco's responsible officer.

After graduating from Meiji University School of (Science &) Technology, Department of Mechanical Engineering in 1990 he was a Network Design Engineer for S&I until 1999 and was responsible for designing building numerous corporate networks.

Forrest E Miller

GROUP PRESIDENT EXTERNAL AFFAIRS AND PLANNING,
SBC COMMUNICATIONS INC, USA

Forrest E Miller, group president external affairs and planning, is responsible for external affairs policy, federal affairs, and corporate planning. He oversees developing the company's federal and state regulatory and legislative policy agenda, implementing the company's federal regulatory and legislative plans, and is responsible for developing SBC's corporate strategy. He was appointed to his current position in May 2004.

Previously he served as group president-corporate planning. Prior to that he served as president and chief executive officer of SBC Southwestern Bell, and also previously served as president and CEO SBC SNET.

From July 1997 until his appointment to head SNET in October 1999, Miller served as president and chief executive officer of SBC Directory Operations, the directory publishing subsidiary of SBC Communications Inc.

Miller was a senior associate at Marakon Associates, a management consulting firm. He also spent four years with the public accounting firm, Coopers & Lybrand. He is a certified public accountant.

Miller holds a bachelor of science degree in accounting from the University of Southern California and an MBA from the Graduate School of Business at Stanford University. He and his wife Cynthia have two children.

Johannes Mohn

EXECUTIVE VICE PRESIDENT,
MEDIA TECHNOLOGY, BERTELSMANN AG,
GERMANY

Johannes Mohn has been focusing on media technologies since December 1998. It is his responsibility to spearhead technology scouting and to coordinate the developments in the field of new media technologies on a cross-divisional level for all divisions of Bertelsmann AG.

In 1980 he took over the responsibility as a sales manager for Consumer Electronic Products at the Philips sales office in Frankfurt. In 1982 he joined Bertelsmann AG in Guetersloh, where he has held a variety of positions. In 1984 he started the data replication business at Sonopress GmbH, Bertelsmann's electronic media production company, and in 1986, he was promoted to technical director of the Sonopress production plant in Guetersloh. In 1990 he became chairman and CEO of Sonopress, Inc in Weaverville, NC, USA where he concurrently supervised the Sonopress factory in Mexico City. In 1992 he became managing director of Mohndruck GmbH, in charge of the book printing business. From May 1995 to November 1998 he was managing director of Bertelsmann Kalender GmbH in Guetersloh.

After studying business administration at the University of Cologne and Business Administration and Engineering at the Technical University of Berlin, he graduated with a Diplom Ingenieur in 1979.

Andrew Odlyzko

DIRECTOR,
INTERDISCIPLINARY DIGITAL TECHNOLOGY CENTER,
UNIVERSITY OF MINNESOTA

Andrew Odlyzko holds an ADC professorship and is an assistant vice president for Research at the University of Minnesota. Prior to assuming his current position in 2001, he devoted 26 years to research and research management at Bell Telephone Laboratories, AT&T Bell Labs, and AT&T Labs, as that organisation evolved and changed its name.

He has managed projects in diverse areas, such as security, formal verification methods, parallel and distributed computation, and auction technology. In recent years he has also been working on electronic publishing, electronic commerce, and economics of data networks, and is the author of such widely cited papers as 'Tragic loss or good riddance: The impending demise of traditional scholarly journals', 'The bumpy road of electronic commerce', 'Paris Metro pricing for the Internet', 'Content is not king' and 'The history of communications and its implications for the Internet'. He may be known best for an early debunking of the myth of Internet traffic doubling every three or four months.

He has an honorary doctorate from Université de Marne la Vallée and serves on the editorial boards of over 20 technical journals, as well as on several advisory and supervisory bodies.

Aldo Olivari

DIRECTOR AND CHIEF EXECUTIVE OFFICER,
TELECOM ITALIA LAB

Aldo Olivari began his career in 1970 with Marconi Italiana, where he worked for 30 years in various positions as he was promoted up through the company. During the 1980s he was in charge of telecommunications industry R&D. He then became joint director of the Civil Telecommunications Division, director of the Public Telecommunications Division, and subsequently general manager. During these years he helped lead Marconi to a high-profile position on the world stage. Following the merger of Marconi and GPT and the foundation of Marconi Communications, he became managing director of the 'Data, IP and Voice Networks' Unit. He was subsequently appointed CEO of Marconi Mobile SpA.

In September 2001 he left his position to join telecommunications networks trade services company Sirti SpA, where he worked until joining the Telecom Italia Group.

Mr Olivari sits on the Telecom Italia Group Management Committee, Investment Committee and Acquisitions Committee.

Silvio Scaglia

CHAIRMAN AND CHIEF EXECUTIVE OFFICER,
E.BISCOM

A graduate in Electronic Engineering, Silvio Scaglia has gained significant experience in the telecommunications sector, as well as in start-up projects, having been general manager, and subsequently CEO during the launch and success of Omnitel and before that the re-launch of Piaggio as senior vice president for Non-European Activities. He also worked for more than eight years as a management consultant with Bain Cuneo e Associati, McKinsey & Co and Andersen Consulting. In 1999 he founded e.Biscom with Francesco Micheli and since then has been CEO of the Group and a board director. Since April 2003 he has also been chairman of e.Biscom.

Howard Watson

CTO AND MANAGING DIRECTOR, NETWORKS,
TECHNOLOGY & IT, TELEWEST

Howard Watson, 41, is managing director, Networks, Technology and IT, for Telewest Communications plc. In this role he is responsible for technical strategy as well as the design, implementation and operation of Telewest's entire network and IT infrastructure.

Howard has been with Telewest for eleven years and in addition to his current responsibilities he was instrumental in the development of the segmented broadband cable network which now passes 4.9 million homes. Prior to joining Telewest, Howard spent 12 years at GEC/Plessey Telecommunications (now Marconi) developing optical fibre transmission systems.

Jeffrey G Weber

VICE PRESIDENT, PRODUCT & STRATEGY,
SBC OPERATIONS, INC, USA

Jeffrey G Weber, Vice President, Product & Strategy is responsible for the new data and video product lines that will utilize the FTTx infrastructure. This includes defining and bringing to market the internet access product line, the actual video and programming made available to customers, the electronic program guide (EPG), video on demand (VOD), gaming and other interactive applications. He is also responsible for product development and strategy for the above areas.

Mr Weber joined SBC in 1986 and has held a number of jobs, including stops in IT, sales, strategy, network operations and marketing, while working on local, long distance, data, wireless, and entertainment.

Mr Weber is a native of Norman, Oklahoma. He received a MIS degree from the University of Oklahoma and an MBA from Northwestern University, Kellogg School of Management.

Mr Weber and his wife, Lesa, have two children, Allie and Parker.

Jong-Lok Yoon

EXECUTIVE VICE PRESIDENT,
TECHNOLOGY GROUP, AND CHIEF TECHNOLOGY OFFICER,
KOREA TELECOM

In addition to his role as executive vice president he also serves as chairman of the Technical Assembly at the Telecommunication Technology Association (TTA), which is the telecommunication standardisation body in Korea. He is also chairman of the Korea Broadband Convergence Network (BcN) Forum, the Internet Telephony (VoIP) Forum and the Home Network Forum, and is a member of the board of directors of the Korea Network Information Center (KICS).

Prior to his current position, he was responsible for supervising KT's marketing group business area, as well as operations for the company's local, long-distance, and overseas voice communications.

He also served as senior vice president of KT's Internet Business Center and the company's e-Biz Group.

Zhang Jia Hua

MANAGING DIRECTOR, PRODUCT DEVELOPMENT DIVISION,
CHINA TELECOMMUNICATION CORPORATION

Mr Zhang Jia Hua is the Managing Director of Product Development Division of China Telecommunication Corporation, in charge of product planning and service creation for the group. Regarded as an expert in both telecom technology and market strategy, Mr Zhang holds the Optical-Expert Membership of China Institute of Communications (CIC), and Permanent Membership of China Telecommunication Technical Committee. In addition, Mr Zhang is the Executive Director of Shanghai Institute of Communications.

Prior to this role, Mr Zhang held various leadership positions in Shanghai Telecom and Shanghai Telecommunication Bureau.

Mr Zhang holds an EMBA degree from China Europe International Business School and a Bachelor of Engineering from Tong Ji University.