

Revisiting the Revolution that Wasn't: Reassessing Consumer Broadband

By Ken Zita

The advent and promise of broadband has struck a deep social nerve. For a new information elite, broadband has become a gateway to electronic knowledge, an enabler of economic fortune, and the touchstone of a lifestyle revolution predicated on virtually unlimited digital information and entertainment services. Fueled by industry determinism, wild telecom sector valuations and a future-bedazzled popular press, the benefits and mystique of high-speed services have come to permeate public consciousness. Consumer expectations for broadband are high. So far they have been met largely with disappointment.

As of year-end 2001, fewer than 11 percent of American households (10.7 million) took to the Web with broadband access.¹ With the recent demise of numerous competitive local broadband providers, limited broadband content relevant to consumers, high monthly costs, and the spectacular collapse of communications stocks, there is a pervasive sense of a future that has been over-promised and under-delivered: a consumer broadband revolution that never was.

The industry has focused its hopes on

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interactive entertainment services leading consumer adoption of broadband. This paper argues that entertainment will remain a key demand driver but business services enabled by broadband will yield better near-term potential. In addition, lifestyle changes, and specifically, the evolving nature of work, is creating intrinsic demand for application services that extend the traditional workplace into the home.

However, to capture the market for new “higher layer” content services² for both business and on-demand entertainment programming, service providers must surmount major new technological hurdles. Broadband Internet services make clear that managing software complexity is more challenging than increasing the speed of data transmission. Carriers need to build sophisticated middleware platforms to capture a shift in economic value from access to applications and managed content services. This transformation is essential for generating future revenue growth – and reestablishing credibility on Wall Street.

Build It and Hope They Stay Home

Anyone accustomed to high-speed networking in an office knows that broadband makes it easier to do business by speeding access to corporate databases, file servers, e-mail and other services. But what is the attraction of fast connections in the home? Industry thinking has long held that if high-speed residential services were

available widely, people would flock to use them. One recent study maintains that as much as \$500 billion a year in new revenues could be generated if broadband were an information utility as common as the telephone.³ The prevailing expectation is that, once consumer broadband is in place, a host of new opportunities will emerge to drive revenue, sustain entrepreneurs and increase discretionary consumer spending on information products. Like the dot.com revolution that has come and gone, this optimism seems tied to an almost evangelical correlation between broadband and a New Economy based on information services. Thus far the reality of consumer broadband uptake has largely demonstrated otherwise.

Singapore's population of 6.5 million, for example, is possibly the most wired society on earth. Latest generation fiber optic facilities connect virtually every residential building. Digital subscriber line (DSL) service is available universally and nearly 90% of households can obtain high-speed cable modems. Multimedia kiosks litter shopping arcades and government-sponsored promotional buses tour factory sites to lure workers into the wonders of the digital age. The entire essence of Singapore-as-Intelligent-Island resonates in binary code.

And yet, only about one household in 10 has elected to subscribe to a high-speed network service. While local businesses have taken advantage of the fast facilities, average Singaporeans have greeted the arrival of the broadband era with a terrific yawn.⁴ In Hong Kong, another early digital utopia, broadband acceptance has fared only marginally better. After a slow start, about a quarter of households now use broadband.⁵ Market appetite was primed by the world's first commercial interactive TV network and extensive local language digital content. Pornographic movies and online gambling

are legal, and vices historically constitute the greatest volume of broadband usage.⁶

Consumers in the US, likely the world's largest market for some time to come, have also been slow adopting broadband technology. Only one household in 10 able to subscribe to broadband cable Internet actually does, even as cable broadband subscribers outnumber DSL by a margin of 2 to 1.

The Telecommunications Act of 1996 was meant to encourage competition in the local loop, but the reality for would-be broadband consumers is that market supply has dramatically trailed market hype. Implementation of the Act became a victim of partisan squabbling on Capitol Hill and failed its mission to introduce genuine competition in the local loop. Incumbent network providers led by the Baby Bells have fought regulatory skirmishes at every turn to prevent competitors from interconnecting to their facilities.⁷ Red tape, high connection costs and alleged intransigence plague alternative carriers that dare act in the spirit of the legislation and challenge dominant operators on their home turf.⁸

Incumbent telecom carriers have been slow deploying broadband access facilities, in part to prevent cannibalizing existing revenue streams.⁹ Major phone carriers such as Verizon and Bell South only began aggressive marketing of DSL in 2000, even though the technology has been around for years. High-speed Internet services have proven technologically challenging over legacy broadcast and switched networks, creating both trepidation and installation delays. Nevertheless, analysts believe that home usage may reach 46.1% penetration by 2005¹⁰ or as many as 58 million homes.¹¹

In the European Union, take-up of broadband has met similar obstacles.

Household penetration of broadband at year-end 2000 ranged from a low of 0.1 percent in Italy to 0.9 percent in Germany. By 2005, even optimistic forecasts predict maximum adoption rates of only about 15 percent in the Community.¹² With the longstanding financial role of the State in incumbent network operators in Europe, competitive providers have struggled to gain market entry. Monthly charges for broadband services are higher than in the US. Europeans have also generally believed that the broadband revolution would arrive in the form of 3G mobile services. This costly gamble – on massive license fees and unproven technology – has drained R&D and deployment budgets that might have been applied to more reliable fixed network solutions.

In Japan, only an estimated 0.65 percent of homes had high-speed Internet access in 2000. Of these customers, 95 percent received service via cable modems.¹³ To date, the giant NTT has dragged its feet marketing DSL, even though it has largely upgraded its infrastructure for the service. The government hopes to dramatically increase adoption and ensure that broadband reaches about half of all households, about 30 million, by 2005.

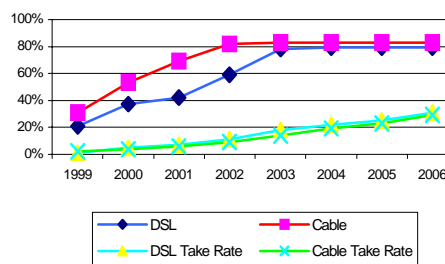
Korea is the lone market with runaway broadband success. The number of home broadband users recently soared by a factor of four, to 6.25 million in July 2001 up from 1.25 million the previous year. Nearly 50 percent of households currently have broadband Internet access, more than twice the penetration of Canada, the next most successful broadband nation.¹⁴ The Korean government hopes that by 2005, 85 percent of households will have access at the sensational speed of 20 MBs.¹⁵ Korea is one of the few markets anywhere with extensive competition in local network services (eliminating the price differential with dial-up); balanced and open interconnection

among carriers (enabling service portability and customer choice); and a progressive government policy (raising public awareness) that is calibrated to distinctly Korean cultural demand.¹⁶

The Elusive Nature of Demand

Lack of ubiquitous low cost access facilities has dogged adoption in the US and Europe but tepid acceptance in digital hamlets like Singapore and Hong Kong indicate that market acceptance is not dependent on network availability alone. Clearly, customer take-up trails market supply. See Figure 1.

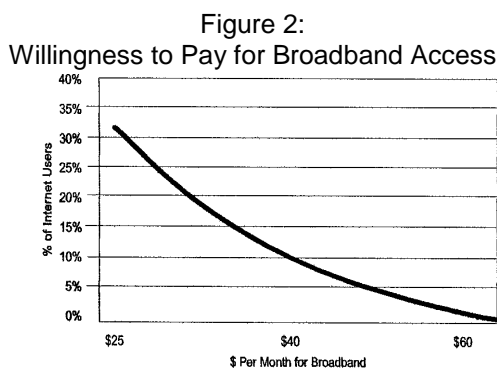
Figure 1:
Take Rate Lags Availability



Source: Morgan Stanley Dean Witter, July 2001

At what point is a 250% price premium over dial-up justified for the discretionary convenience of an always-on connection and fast web browsing?¹⁷ This elasticity is not yet proven. A recent poll funded by AT&T and other long-distance telephone carriers found that 40 percent of Americans who had access to high-speed Internet service did not want it, while 36 percent said they were interested but not at the current prices.¹⁸ A study from a leading trade organization determined that while 64 percent of households could get broadband access, only 19 percent took the service.¹⁹ In many respects broadband remains a luxury item rather than an essential information utility. In a sluggish economy, consumers are proving to be particularly cautious about

increasing expenditures on broadband. See Figure 2.



Source: The Strategis Group

Market appetite for broadband is tied as much to compelling content as to network availability and price. The broadband industry has yet to discover the “killer” applications that will make the technology a must-have for consumers. Few applications absolutely require broadband. High bandwidth “convergence” services such as interactive television and video-on-demand, long assumed to be the principle driver for broadband, have not been widely available, and have failed to entice interest when it was. Ironically, the one application that consistently appeals to consumers’ imagination – video telephony – is not scalable over current generation DSL and cable technology.²⁰

Today broadband generally means faster Internet access, not a managed content service environment per se. As such, home broadband users encounter the same frustrations they have since the dial-up web became mainstream: the web is confusing if you don’t know what you are looking for. Navigating content on a high-speed cable, satellite or DSL connection puts the onus on the user to “seek out” the content. Broadband programming such as film and video archives has yet to be packaged for a mass market in easily addressable streams. Most home users do not know where to

begin. Moreover, with an always-on connection, network security becomes a serious issue and most consumers are rightfully wary of having their privacy compromised.²¹

Build What for Whom?

Since the mid 1980s, industry pundits assumed that cable companies would compete head-to-head with telcos for command of a single high-speed pipe into the home. Telephone companies dreamed of offering interactive television as cable operators hoped to expand their residential entertainment base to include voice. This was the reasoning behind AT&T’s \$100 billion wager to become a fully integrated broadband provider, Microsoft’s \$10 billion-plus investments in infrastructure providers including AT&T, Comcast and Korea Telecom, and countless other acquisitions and field trials. None of these gambles has paid off. So far no operator has cracked the code for a unified platform able to serve both consumer and business broadband interests or to successfully provide compelling broadband applications and content to complement access.

Betting on future content and application services is currently out of favor with investors. With the tumultuous rise and fall of communications shares on Wall Street, service providers are mindful that the promise of “next-generation” services has to be matched with tangible revenues from tangible products. All are keen to minimize capital spending in the near term while diversifying in a limited way into new segments that provide immediate returns. Growth will not come from adding basic subscribers but by introducing new services that extract more dollars from the existing customer base through service bundling.²² Both the cable and phone camps expect to diversify into the other’s traditional territory

and capitalize on increasing e-commerce spending.

For example, Callahan Associates, Europe's second largest cable operator, has introduced both traditional switched telephony (over copper wires) and telephony-over-cable (carried on video coaxial cable) to boost monthly yield. UPC, Europe's largest cable operation controlled by Liberty Media, has created a separate subsidiary to offer voice services, Priority Telecom, to target medium and large business customers. Expansion into telephony has been slow. In the US, all cable operators combined had only about 800,000 voice access lines by early 2001.²³ Nevertheless, cable telephony is a "bankable" service in a troubled market environment as incremental costs are low and the dynamics of the voice market are well understood.

Phone companies have similarly little to show for years of ambitious plans. Early on, they assumed that consumers would pay well for video-on-demand services. But video-serving architectures were expensive to build; in 1998 BT estimated capital costs of \$21 billion to construct a national video network.²⁴ Actual market demand measured in field trials fell far short of expectations. Consumers did not take easily to on-demand services and telecom carriers stumbled trying to promote entertainment products.

Today, telecom operators have just begun implementing IP-based streaming video services that provide some of the same functionality at a fraction of the cost of full-fledged video networks. Broadwing, for example, has concluded a programming arrangement with Intertainer for first-run studio and classic films to the carrier's DSL customers. Content delivery networks from Akamai and others promise to make rich media programming more accessible and more reliable over public networks. That said, non-commercial streaming media of

broadband content is already a reality via the Internet.

A greater problem is that people do not want to watch small images on their PC when they are accustomed to TV-quality video for nightly entertainment. New terminal devices coming to market may overcome some of this awkwardness. Integrated home media "gateways" will simplify user access by intelligently routing multiple content streams to the most appropriate system. The television will display entertainment video, the PC shared applications, stereo system for digital audio, system controls for home automation, wall displays for digital art, and so on. Hybrid gateway equipment, like that from Moxi Digital and Microsoft's Freestyle, will attempt to bridge IP functionality with the appropriate display environments. Distribution of high-speed signals to devices within the home – DVD, digital recorder, camera or sound system – is already possible with a number of new local networking technologies including FireWire (IEEE 1394), wireless LANs (IEEE 802.11a), Bluetooth (IEEE 802.15), and so on.

In time, many home electronic appliances will embed an IP software "stack" turning them into networked computers. This advance, which will parallel the introduction of IP version 6, will be useful for telephones and televisions that are primed for intuitively useful enhanced IP services. Power utility companies, similarly, are likely to implement remote monitoring of thermostats and major appliances to make real-time reductions in power consumption.²⁵ A bit more imagination is required to anticipate market acceptance of more creative applications such as the "intelligent kitchen" envisioned by MIT's Media Lab.²⁶

Why the Back Office Matters

Simpler home access will stimulate demand but there are larger challenges ahead. Carrying traffic alone will clearly not yield the kind of profits once anticipated. Analysts maintain that entry-level broadband access packages alone do not even cover the cost of providing the service²⁷ and that revenues from transporting data are falling faster than costs.²⁸

With fast connections, customers obtain broadband content from the web on their own; the broadband carrier's (or ISP's) role in the content value chain is limited almost exclusively to providing access and IP connectivity. This is the so-called "dumb pipe" problem. The service provider can become reduced to a virtual water boy for other providers' content products. To play a meaningful role in content delivery – to participate in content service revenues rather than merely transporting applications developed by others – broadband service providers need to define their relevance both to broadband content providers and to consumers.²⁹ Getting the right advanced service delivery infrastructure in place is key.

Delivering new applications is no simple matter. Moving "up" the value chain by offering "higher layer" content (like streaming entertainment video) and application services (such as rented software applications) is a significant departure from both the phone and cable service provider's core business of providing information "transport." Content and application services over broadband are essentially shared computing applications, not telecom or cable services in the traditional sense. Even though carriers control the physical means of delivering new services – the high-speed circuits – they have yet to master the skills of application session management and interactive content delivery demanded for online services ranging from content

distribution, application rental and e-commerce. The missing link is back office software integration.

Carriers must build highly sophisticated operational support systems and software management tools that enable the provisioning, monitoring and mediation of computing systems, databases and content caching. This is equally true whether an operator expects to concentrate principally on consumer entertainment or "apps-on-tap" business applications, or both.

Technologically sophisticated operators such as Qwest, Cable and Wireless and Genuity have begun building extremely complex "middleware" platforms to bridge the gap between service managers for IP-based content and applications with legacy network management and billing systems. Middleware refers to a constellation of interlocking software tools that make possible advanced service provisioning. Marketing broadband content and applications to a wide customer base, on demand, requires unprecedented resources for managing security and customer profiles; storing and retrieving content; monitoring servers and application performance; billing for on-demand services, and so on. Managing this complexity is a big challenge and, arguably, far more difficult than physically constructing high-speed circuits into the home.

Telecom companies may have an advantage over potential competitors in their longtime experience integrating disparate and extremely complex corporate data networks. Enterprise customers have extensive data communications requirements and carriers have steadily invested in new architectures to support their needs. An estimated 80% of phone company's profits come from business rather than residential services, and some of these returns have been ploughed into complex data management tools. For

example, all of the major telecom operators have diversified into managed hosting services that monitor users' web and applications servers and which can store content and business applications locally. Cable & Wireless recently acquired hosting pioneer Exodus for \$850 million in cash, and NTT paid a stupendous \$5.5 billion for Verio in mid 2000. While managed hosting services is essentially a real estate business – renting space in shared data center facilities – it provides a critical technological framework for distributing broadband applications. Cable and satellite companies have not ventured into managed services as their core entertainment broadcast business has not thus far required “higher layer” IP services and data management. As a result, weak “back-end” systems and limited application management skills may be a competitive liability to broadcasters seeking to add value-added content services over time.

Build it and they Will Pay

Business services have traditionally led advances in telecommunications and IT and so it shall be with the emerging generation of consumer broadband. Even in the home, business services and applications will be the primary driver for demand. A recent study shows that 50 percent of consumers expect to use home broadband connections primarily to conduct business – either for tapping into networks and servers in their employer's offices or running a business from home.

Palpable evidence of this measure is easy to see. Web and communications technology generally has helped redefine the nature of work. People in the information economy increasingly structure work to fit their lifestyle, not the other way around. Computers and many business tasks are portable. Working from home is common. Some 19 million Americans are currently

engaged in e-work – formerly known as *telecommuting* – with the number expected to swell to 32 million by 2004.³⁰ Even those in corporate jobs are establishing more balanced lives by linking into company resources from home. Broadband access makes the process more effective and, in some sense, more satisfying. An estimated 80 percent of broadband households have at least one telecommuter.³¹

Linking the at-home work experience with the office is becoming increasingly critical. Already 57 percent of at-work Internet users have high-speed connectivity in the workplace and consumers tire of sluggish network performance at home. Jupiter Media Metrix projects that by 2005 the number of corporate broadband users in the U.S will rise to 87 percent of all employees with Internet access, or about 55 million people. This forecast for business broadband approaches the psychologically significant penetration the telephone (94 percent)³² and the stage at which a service is considered to be ubiquitous (sic).³³ In many respects the corporate world is already effectively a broadband environment, even if, statistically, all employees do not have fast access. Dramatically lower costs for high-speed transmission and distributed computing have enabled companies to build real-time application architectures in which even distant shared computers and data resources appear to be local to an “on net” end user. Public broadband Internet services will approximate this experience for users in the home.

Extending business applications to workers at home offers the most credible potential for introducing enhanced services that boost basic transport revenue. Over time, revenues approaching those from access will be derived from the rental of application services, the so-called ASP model that was discredited sorely in the recent telecommunications market crash. Small,

medium and home businesses *will* turn to outsourced, off-site software rental as a means to lower capital costs, simplify complexity and stay focused on core businesses. Small office/home offices will follow the corporate example (and Microsoft's strategic lead) as software applications such as office, accounting, tax preparation, customer relationship management and IT trouble-shooting are tailored to a rental model, and eventually, to simplified solutions for the home.

Though the ASP sector was beset by early market failures, trends in computing and software design point inexorably toward ASP as a viable business model.³⁴ The next phase of ASP is web services. Web services refer to a new paradigm for building complex "service-oriented architectures" that enable various distributed processes to work together to create synergistic capabilities.³⁵ Web services are of special interest to enterprise IT managers seeking to extend corporate resources to managers working at home and which are already stimulating demand for broadband access.³⁶ This trend may accelerate given security concerns following the 9/11 terrorist attacks.³⁷ Broadband carriers have an opportunity to participate in the ASP value chain by managing web services from data centers on their networks, and partnering with distributors better equipped for the role.

Suggesting business services as a prime driver is a wide departure from early projections that interactive TV and video-on-demand would lead the broadband revolution. Entertainment will still play a major role. Early applications, however, are proving to be multi-player computer games and digital audio rather than the fiercely-consumerist vision of interactive TV pioneered by WebTV, AOL and others. Video-on-demand has failed to impress and broadband entertainment portals have thus far been a disaster, with @Home, Vizzavi

and Chello among the wreckage. The scene could change. As cable and satellite TV companies introduce digital set-top boxes, and the major studios agree on ways to protect their digital video properties from unauthorized copying, consumer demand and commercial revenues for on-demand programming could follow. Telecom carriers, if they are clever, still have a shot at delivering niche entertainment to the home by leveraging superior network technology assets and redefining their market reach.

The education market is destined to play a major part in stimulating wider adoption of residential broadband. The Internet is our era's Library of Alexandria and virtually any topic known to the contemporary mind can be researched with sound and in color from a high-speed computer screen. Parents increasingly understand that the "digital divide" between the information *haves* and *have nots* begins at home. Those that can afford broadband – and who appreciate the power of information – do not want to be left out. After work, education will be the second most important reason for obtaining broadband but it is unlikely to be a source for additional value-added services beyond access.

The Incremental Revolution that Will Be

In the great broadband revolution all eyes are focused on the build-out of high-speed facilities to the home. The industry is fixated with market penetration figures and adoption rates, the number of homes with fast connections, and the enormous cost of laying new infrastructure. The statistics are helpful markers of progress but they do not necessarily indicate what happens next.

Though over-promised and, so far, under-delivered, the consumer broadband revolution is very much on the way. The initial excitement generated by the press, Wall Street and industry itself created

impossible expectations rooted more in concept than reality. A hard fall was inevitable.

Building out high-speed connections to homes is now old science. The technology is straightforward and the economics are reasonably clear. The greater mountain to scale is profitability and, specifically, increasing operating margins through new on-demand content and business-oriented

software applications. Operational support systems and middleware – the humdrum back-office technology that makes complexity simple – will prove to be the engine for generating and managing new broadband services. The need for these services will be determined by actual changes in how we live and think and not by myths fabricated for the market.

Notes

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- ⁴¹ Parks Associates (www.parksassociates.com).
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- ⁴⁵ Flury, Greg, "Applying Web Services to the ASP Environment," www-106.ibm.com/developerworks/webservices/library/ws-wsasp/index.html?dwzone=webservices.
- ⁴⁶ Many corporations will reimburse employees for cable modem or DSL service in an effort to improve the productivity of working at home.
- ⁴⁷ Some companies are conscious of not having too heavy a concentration of key managers in any physical location and may create a new source for demand, according to Richard Ellenberger, CEO and President of Broadwing.