

Executive Summary

Baker Communications is part of a group of three emerging data competitive local exchange carriers (CLECs). These companies are attempting to compete against a diverse group of industry players in the developing broadband provider market. These data CLECs are building out national footprints by constructing ADSL networks in major cities throughout the US. ADSL is one of many broadband technologies that will be used to replace the existing narrowband telephony access consumers have for accessing the Internet. Baker is currently positioning themselves primarily as a solution for business and ISP customers for the broadband access market. We were approached to explore what implications there were for Baker in entering the emerging consumer broadband market.

In our analysis, we focused on four key components in the consumer market. We analyzed the emerging competitive landscape, the potential market size, future product offerings and the financial performance of the firm given different entry strategies. With our analysis of the market landscape, we found there was a clear value chain for offering broadband products and services. In forming consumer strategies, we focused on alternatives that would provide Baker a strong position throughout the broadband value chain. By constructing a value model, we were able to evaluate the financial and operational performance of different market entry strategies.

In our final analysis, we found it profitable to enter the consumer market. Given different entry strategies and the uncertainties of the emerging market, there was wide variation in the value created for Baker. We found that from an operational perspective, Baker should focus on building the ADSL network. Given their positioning in the business market, expanding into the consumer market does not have high capital requirements. The consumer market would also leverage the business quality network management functionality currently being developed. However, entering into the ISP and broadband content would require lengthy and costly investments that could jeopardize early mover advantages in the marketplace. There are currently significant strategic relationships that can be formed to fill in the gaps of Baker's offerings. These partnerships would position Baker as a strong player throughout the broadband value chain. We detail our specific analysis and our recommendations in this report.

Table of Contents

PROJECT BACKGROUND	1
BAKER S DECISIONS	1
PROJECT ANALYSIS	1
VALUE CHAIN	2
<i>Content Providers</i>	<i>2</i>
<i>Internet Services</i>	<i>3</i>
<i>Broadband Infrastructure</i>	<i>3</i>
<i>Broadband Access</i>	<i>4</i>
MARKET PLAYERS	6
AOL	6
AT&T/EXCITE/@HOME.....	7
YAHOO/BROADCAST.COM/OTHER MEGA PORTALS	8
OTHER SIGNIFICANT INTERESTS	8
SUMMARY	9
DIFFUSION MODEL	9
<i>Results</i>	<i>10</i>
<i>Insights</i>	<i>10</i>
CONJOINT ANALYSIS	11
<i>Approach</i>	<i>11</i>
<i>Sensitivity Analysis</i>	<i>12</i>
<i>Scenarios</i>	<i>12</i>
<i>Next Steps</i>	<i>14</i>
VALUE MODEL	14
<i>Model Components</i>	<i>15</i>
<i>Proposed Strategies</i>	<i>16</i>

Results and Insights..... 17

FURTHER ANALYSES ON VALUE MODEL..... 18

Sensitivity Analysis 19

Sensitivity Analysis Results and Insights 19

Simulation 19

RECOMMENDATIONS.....**21**

CONTENT..... 21

INTERNET SERVICES 22

BROADBAND INFRASTRUCTURE..... 22

BROADBAND ACCESS 23

CONCLUSIONS.....**23**

Project Background

Baker Communications is an emerging data competitive local exchange carriers (CLECs). They compete against a diverse group of industry players in the developing broadband provider market. The CLECs are constructing DSL networks in major cities throughout the US. Baker has a growing business customer base. However, with the anticipated explosion of the Internet and consumer demand for higher bandwidth, Baker is eyeing the consumer market.

Baker s Decisions

We have identified the following three strategic decisions: (see figure1- in appendix F)

1. *Whether to enter the consumer broadband Internet access market -*

Baker must determine the value of extending its offerings to consumers.

2. *Where to position the company in the value chain -*

Baker must decide where in the value chain it can capture the most value.

3. *How to get to the desired position in the value chain —*

After deciding where to focus in the value chain, Baker needs a strategy for getting there.

Project Analysis

Our analysis separates into three steps: market sizing, competitive market analysis, and strategy evaluation. First, we used competitive analysis and a value chain approach to frame the broadband market. Second, we used a product diffusion model to predict the future Internet and broadband market sizes, and utilized conjoint analysis to determine important product attributes relevant to market share. Combining these tools we can suggest value enhancing alternatives and strategies for Baker to pursue in the consumer market. Third, we built a value model to estimate the NPV and incremental market value of different strategies. Through the analysis, we give Baker both quantitative and qualitative perspectives of future strategy alternatives. Figure2 summarizes the three components of our approach.

Value Chain

In exploring the broadband market, we decomposed the emerging industry into four different components: content providers, Internet services, broadband infrastructure, and broadband access. The areas of the value chain mirror both the consolidation of the market and the necessary pieces to give consumers a broadband Internet experience. Each area, and the relevant players, are described below.

Content Providers

Content providers are the most visible to consumers. These players are content aggregators, central repositories of diverse media. They distinguish themselves by the types of content they offer. Many are developing broadband content to increase consumer demand for faster Internet access. We further divided this space into three components: e-commerce, news/media/information and portals.

E-commerce is spearheaded by companies like Amazon, eBay, DoubleClick, and E*Trade. By drastically speeding up consumer access to content, many of these vendors believe the online customer shopping experience can be revolutionized. E-commerce will continue to be an important factor in the Internet experience, however the relationships will not drastically change.

News/Media/Information services are represented by CNET, ZDNet, thestreet.com, and many traditional media broadcasters. Text news is well suited for the narrowband world. But the advancement of streaming audio and video, the newscasters will offer more compelling content. Media companies like Disney, Sony, and Time Warner have a vested interest in exploring how their existing content repositories can be offered to broadband consumers.

Portals like Yahoo, Netscape, Excite, Infoseek, and Lycos are positioning to become the crossroads of the Internet experience. By aggregating content and organizing services, these players want to capture viewers and keep them through providing compelling "sticky" services. Broadband portals appear to be the next wave. Yahoo signaled this by purchasing Broadcast.com, arguable the number one aggregator of broadband content today.

Content players will play a pivotal role in driving broadband demand in the future. Many are beginning to make the deals to lock in relationships for the future. Given their existing base of registered users, upstart broadband players must negotiate with the portals to gain access to these viewers. Leading content providers are realizing a substantial premium from the market over second tier providers. This reflects the strong belief that established players will continue to dominate the consumer relationships.

Internet Services

Internet services consist of traditional services offered by ISPs: email, web access, news, etc. The Internet Service providers have developed acquisition sales channels and customer care support for their existing customer bases. In many ways, Internet services are commodity in nature. This explains the observation many ISPs are either trying to move up into the content aggregation role, or into advanced network and data services.

The market is easily tiered into three levels. AOL is the only first tier ISP in the US. They currently report 17 million dial-up customers (including CompuServe). This is approximately 50% of the US consumer Internet market. The second tier ISPs have 0.5-2 million customers, like AT&T WorldNet, MSNetwork, Mindspring and EarthLink. The Baby Bell phone companies also have second tier ISP offerings. For the remaining 7-10 million Internet users, there exist over 2,500 third tier ISPs.

AOL secured DSL offerings from SBC and Bell. They are pursuing federal regulation to open the cable broadband infrastructure to all ISPs. Many of the second tier ISPs are negotiating with the Baby Bells and data CLECs for broadband access. There is currently no broadband future for the vast majority of the third tier ISPs. This is a compelling market opportunity since many of these ISPs will disappear as broadband services grow.

Broadband Infrastructure

Internet infrastructure players offer proprietary solutions to speed up the web experience. These players either build private networks for higher quality access or offer caching solutions to minimize repeat requests for information. For the broadband world, these technologies will become crucial. The current

design of the Internet will not support a large number of high bandwidth requests spanning across the US.

This necessitates increased intelligence around how content will be delivered to the end consumers.

Inktomi and RealNetworks are the two best known narrowband infrastructure players. Inktomi has set up proprietary server farms all around the US that cache content served by large portals. Internet requests are then routed to the geographically closest caching sites, lessening server loads and speeding response times. RealNetworks is another player offering technology tools to view and serve multimedia content. They are slowly moving into applications allowed by broadband connection speeds.

As broadband content becomes more prevalent, pushing the caching closer to the user and providing higher quality multimedia programs will become important. Broadcast.com and @Home are the best known for their broadband infrastructure. Broadcast.com has negotiated exclusive agreements with many media players. To ensure the highest quality of these audio and video feeds to their users, they have constructed a national data network optimized for broadband content delivery to ISP partners. @Home has constructed a similar network to provide local caching of content for their cable modem subscribers.

As broadband content becomes more important to users, the quality of delivery will be a key differentiator for providers.

Broadband Access

Broadband access was the starting point of the market analysis. It became apparent that there are other crucial value chain components driving demand for new services. However, to enable any broadband services requires cost effective ways to provide broadband data services to the home. There are currently two primary entry points into residential homes: the phone line and the cable line. Fixed wireless solutions will be introduced and provide an alternative solution without requiring any new construction. The major cost for providing broadband access is building the pipe to the home, the "last mile". xDSL is leveraging the existing phone line, cable modems are leveraging the existing cable TV line, and wireless is hoping to not require a physical link to the home. Each broadband technology has different advantages

and disadvantages for offering broadband access to consumers. However, none can claim a clear technology advantage over the others.

Cable modems are the first technology out for the broadband market. The two main service providers are @Home and RoadRunner. @Home is a branded service owned mostly by cable providers. RoadRunner is a reporting subsidiary set up by Time Warner and MediaOne. Cable modem service is provided over the existing coax cable. Cable TV is found in 80% of households in the US. Cable companies are currently spending money to upgrade their cable infrastructure to support both digital cable and data services over their existing analog TV networks. @Home plans to reach 30 million homes by the end of the year with a million customers.

xDSL has been slow to market due to the Baby Bells' fears of cannibalizing existing high end data services (frame relay, ISDN, T1/3). With the advent of the Telecommunications Act of 1996, competitive local exchange carriers were allowed to lease the copper loop to the home from the Baby Bells. NorthPoint, Rhythms and Covad have taken advantage by constructing national xDSL networks, primarily offering business quality data services. Since the business network infrastructure can be leveraged to serve consumers, the data CLECs are looking to compete in this market. This has encouraged the Baby Bells to more aggressively roll out xDSL services. DSL services can be quickly offered to new markets by integrating (or building) into the local data network and installing equipment into telephone central offices. The capital requirements are less than those of the cable companies.

Wireless access remains a wild card in the battle for the broadband home. Before AT&T began their foray into the cable industry, they had been working on a fixed wireless technology to offer local and data phone services. Given their recent investments in cable companies, it appears AT&T has decided to bet on cable being the broadband technology of the future. However, recently, AT&T purchased a large percent of Teligent, one of two emerging national wireless players. AT&T also indicated as the cable networks are upgraded, fixed wireless would be used for 10% of their new local phone customers. Sprint and MCI have also picked up substantial national wireless companies over the last 3 months, allowing them to access close to 80% of the US consumer market.

Market Players

There is still a lot of uncertainty surrounding whom and what will be the wave of the broadband future. But it is clear the big name players are lining up behind access technologies and are aggregating and creating new content to satisfy demand. Mapping out the player partnerships exposes where players are focusing. There are three groups that are discussed from this viewpoint.

AOL

AOL is the narrowband provider of choice for half the consumer market. Their market cap and subscriber growth foretell a profitable future. AOL's core business centers around providing content and Internet access components to their subscribers. AOL will seek to leverage their customer ownership in new markets and businesses. AOL's content focus is spearheaded by their AOL portal site and acquisition of Netscape. According to Media Matrix, the AOL web sites reach 54.5% and Netscape reaches 30.9% of US users of the Internet (respectively number 1 and 6 ranked web properties). AOL creates their own content and partners with CBS and Bloomberg for specialized news content.. AOL is also pursuing a AOL everywhere strategy by developing AOL TV that will be available via DirecTV in the winter 1999. The majority of AOL s customers will remain in the narrowband world. But to stay a premier Internet provider, AOL is developing broadband offerings to leverage their vast assets and content relationships. They have partnered with SBC and Bell Atlantic to offer ADSL services using the Baby Bell ADSL networks. SBC consists of SBC, PacBell, and potentially Ameritech. Bell Atlantic consists of Bell Atlantic, Nynex, and GTE. Both Bell companies can provide AOL ADSL service to a significant percentage of US households. AOL will likely continue to favor the Baby Bells over upstart data CLECs for ADSL service given the strong brand identities, cut throat pricing offered, and significant service coverage of the Bells. AOL is also aggressively lobbying Congress to open up the cable networks to any ISP. AOL wants to be able to buy the local transport access from the cable companies and offer AOL Internet services and content. It is unlikely the FCC will intervene. However the broadband battle has helped make broadband access a national issue of debate, spurring interest in the market.

AT&T/Excite/@Home

AT&T has gone on a spending spree the last few months. Acquisitions of TCI and MediaOne (pending), position AT&T on the cutting edge of the digital future. Many believe these are necessary moves to stem the coming competition in AT&T's core LD business. Not only did the Telecommunications Act of 1996 open up the local network, it allowed ILEC entry into the long distance business (pending compliance with a 8 point checklist outlined by the FCC). No Baby Bell has been granted permission yet, but each is trying to do the minimal amount required. Seeing the huge revenue risk from LD competition, AT&T is positioning to enter the home through their cable and wireless properties.

Broadband cable's poster child is @Home. @Home is 70% owned by AT&T/TCI, Cablevision, Cox and other cable providers. @Home is positioning itself to be the AOL of the broadband world. They are in the enviable position of generating a return on the billions poured into upgrading the cable infrastructure. @Home is acting as an ISP by providing Internet services and broadband content, while the cable companies provide the cable modem networks. @Home is aggregating content in their @Media group. @Media is charged with negotiating for broadband content with partners such as Time Warner, Fox, CNET, and CNN. @Home's purchase of Excite (29.2% reach as the 7th ranked web property) provides a premier portal to channel its growing broadband content and traditional narrowband content to Internet users. Excite@Home also expects to either leverage Excite's registered user base to generate new cable modem subscribers and partner/purchase a narrowband access player to become a traditional narrowband ISP as well. Leveraging AT&T WorldNet remains an expected strategic partnership in the works as well. @Home has also distinguished their content distribution by constructing a national data network optimized to deliver broadband content to their cable partners. This gives @Home a competitive advantage by increasing the quality of services available to users. Both AT&T and Excite@Home are positioning to own the broadband customer in the cable world. AT&T is motivated by a need to protect its core LD business. Cable provides an alternative entry into the home (bypassing the Baby Bells), enabling the delivery of telephony and entertainment content.

Yahoo/Broadcast.com/Other mega portals

Yahoo continues to aggressively expand in the web space, assuring its continued relevance in the future Internet world. By purchasing GeoCities and Broadcast.com, Yahoo further expands its reach of web users. The Yahoo sites reach 48.2%, GeoCities reach 33.4% and Broadcast.com reach 12% of US Internet users (respectively, number 2, 5 and 17 ranked web properties). Yahoo is the premier portal in the narrowband world. They are aggressively pursuing relationships to push their reach the broadband world. The acquisition of Broadcast.com assures Yahoo key media content and a highly optimized national network for broadband content. Broadcast.com is arguably the strongest broadband content aggregator in the market. They have negotiated multi year contracts with radio/TV stations, various professional and college sports organizations, and businesses to be the Internet broadcaster of choice. Lycos and InfoSeek/Disney/Go Network are two key competitor mega portals. Lycos reaches 46.5%, Disney reaches 23.9% and InfoSeek reaches 22.1% of US Internet users (respectively, 4, 8, and 9 ranked web properties). All mega portals are developing and aggregating broadband content for the future. None have aggressively pursued moving down the chain to become ISPs or have negotiated with broadband players to assure an audience for their broadband content. This appears a compelling opportunity for emerging broadband access players.

Other Significant Interests

There are other players in the Internet and web worlds without broadband market entry strategies. As discussed before, Sprint and MCI WorldCom have bought fixed wireless companies creating an option to enter the residential market using wireless. But neither has a clear path to broadband yet. Sprint has been playing around marketing it's "ION" network, a national ADSL network. MCI WorldCom continues to focus primarily on business and the backbone networks of the Internet. Microsoft is another key player that has a strong portal site, a significant ISP presence (MSN), and a portfolio of technology bets across the industry. Microsoft sites reach 48.4% of US Internet users (number 2 of web properties). Microsoft has developed and negotiated many content agreements for their portal site. However, it appears the clear

motivation for Microsoft is to spur future software sales and not focus as an aggregator of web content. WinCE is potentially a huge future revenue generator for Microsoft for various devices. Microsoft has invested \$5 billion in AT&T to ensure WinCE has some presence in the digital cable box world. Microsoft is also investing heavily in cable and DSL players to drive the need for new multimedia and network applications to take advantage of higher bandwidth.

Summary

By discussing the positioning of players in the value chain, there is a divide between the customer facing companies and the network companies. Content and Internet service providers are leveraging their existing customer bases with "sticky" services. Infrastructure and access players are building the next generation pipes in the home to deliver the services of the future. Some groups have assured relationships throughout the value chain. But many players have gaps in how to offer either the content or network components of the broadband solution. Each is developing a strong story in their areas of traditional strength. Given Internet time, there is the urge to wait and defer betting on any existing player until it is clear they will become dominant. But for a new entrant data CLEC, it remains important to forge important partnerships before becoming locked out of the broadband content world.

Diffusion Model

To size the broadband market, we used the Bass Diffusion model. We used the Bass model twice: for the Internet market and for the broadband market. The two-step method we used is:

- 1) Collect historical data for the Internet market (1990-1999)
- 2) Determine p and q for the internet market by minimizing the sum of squared errors
- 3) Obtain the complete sequence of forecasted Internet market size (1999-2009)
- 4) Collect historical data and future prediction of broadband market size (1997 - 2000)
- 5) Compute the percentage of broadband market share in each other these years
- 6) Assume the future broadband market size to be 50% of the total Internet market in 2009
- 7) Determine a polynomial growth function of broadband percentage share

8) Fit Bass model to the estimated broadband market and determine p and q for broadband

Results

	Internet	Broadband
Estimated p	0.01363	0.007
Estimated q	0.3	0.5
Estimated m	60M HH	30M HH

The Internet is a special product and its behavior is unlike others. Hence, it is hard to explain the market behavior of Internet using other markets. It is reasonable to incorporate the Internet and broadband markets because broadband is a subset of the Internet.

P for the Internet market is higher than that of Broadband market. Due to the higher price of broadband services consumers are likely to start with narrowband service. On the other hand, q for the broadband is significantly higher than for the Internet market. Broadband services have advantages over narrowband, so become attractive to Internet users once people are more familiar with the technology and the prices drop. Thus, there is a strong reason for users to "imitate" the use of broadband quickly.

The other important result from the model is that both markets will start to level off after 2007. Maximum growth will be achieved in 2000 for Internet and 2003 for broadband. This suggests Baker enter the residential market now to capture the growth in the upcoming five years.

Insights

Comparing the diffusion model prediction with the industry predictions, we see that the model actually predicts the same trend of growth in the coming 10 years and coincides with the more conservative predictions. We believe our model gives a good lower bound market estimation given no technological advancement.

In addition, our model predicts the broadband market will start to take off in year 2001 and this aligns with a few industry predictions. Even though our model does not predict a dramatic growth in the broadband market, we conclude that there will be a lot of revenue generated in the consumer broadband market and Baker should pursue the consumer market.

Conjoint Analysis

Conjoint analysis assessed the buying preference of the market for products with certain features. These products can be existing ones with modified/new features or completely new products. This information about buying preference becomes the foundation of the strategy generation process.

Approach

Our group first designed a computer-interactive interview and administered the interview to fifty-three respondents (using Sawtooth ACA software). Then respondents utilities were calculated. In our analysis, all products in the broadband industry were described by nine attributes: Price, Connection Speed, Customer Service, Service Problems, Brand Name, Video Content, Audio Content, Internet Services and Telephony. We generalized all broadband products into a few representative products with similar features. Below is a snapshot of broadband products from the first quarter of 1999.

	Price	Connection Speed	Customer Service	Brand Name	Video Content	Audio Content	Service Problem	Internet Service	Telephony
DSL - Low Speed	89.95	144	Web	National	No Service	Radio	Monthly	All	Video Conference
DSL - Moderately Low Speed	129.9	384	Web	National	No Service	Radio	Monthly	All	Video Conference
DSL Moderately High Speed	179.9	768	Web	National	No Service	Radio	Monthly	All	Video Conference
DSL High Speed	225.9	1040	Web	National	No Service	Radio	Monthly	All	Video Conference
Cable	49.95	500	Phone	National	No Service	Radio	Monthly	All	Video Conference

After gathering information on the utilities, we simulated respondent preferences for modified product offerings. Different scenarios, such as changes in pricing, connection speed, or services bundled were

explored. Finally, buying likelihood for each product and results were cumulated over respondents to provide share of preference for each product.

Sensitivity Analysis

One functionality of conjoint analysis is the ability to investigate the sensitivity of consumers buying preference to changes in attributes that describe different products. First we determined influential attributes. Then we investigated the importance of attributes in term of utilities. We found connection speed and price to be crucial features (see figure6). We also considered the importance of attributes in terms of impact on preference shares. The attributes of cable products were changed while holding DSL products constant to observe the impact on preference shares of DSL products. Again, price and connection speeds are the two most important (see figure7).

Next, we investigated the sensitivity of preference shares to changes in Price and Connection Speed (see figure8). Our model suggests consumers are more sensitive to low DSL price than high DSL price. They are more likely to shift to DSL products if the cost is decreased. This is more so when the costs of cable products are high.

In addition, our model suggests consumers are more sensitive to low connection speed than high (figure9). Consumers are likely to use other products if DSL speeds are reduced. Given any speed of cable products, DSL preference shares are not likely to rise dramatically even if DSL speeds are raised to 500 kbps. So raising connection speed alone is not sufficient to capture a significant amount of market share. It must be coupled with other strategies, like price cutting, to achieve a larger piece of the pie.

Scenarios

Another functionality of conjoint analysis is to estimate the market shares of different products. Our model calculates the preference shares of these products based on different attributes. These preference shares estimate actual market shares (assuming ideal conditions). In an ideal market, people will purchase or shift to commodities in accord of their buying preference which neglects shifting cost involved.

First, our group simulated the current broadband market to:

- 1) Calibrate our conjoint model with reality.
- 2) Estimate the market shares of DSL products.

As shown in figure10, the current broadband market is generalized into five main product streams with different attribute levels. The preference shares of these product settings were then calculated by the model. The model estimated the ratio of market shares between DSL and Cable products in the first quarter of 1999 to be roughly 1:4 whereas the actual split between DSL and Cable products is roughly 1:8. The discrepancy is probably caused by the lack of ideal conditions in real life (cable services have been offered longer).

Rather than allocating more resources in addressing these errors, our group decided to draw insights from such split of market shares. As we have mentioned above, price and connection speed influenced buying preference more than other factors. The generic Cable product beats the different DSL packages in this arena (figure10). This, therefore, results in the gap between the market shares of the two technologies. The even wider gap in real life numbers is probably due to the earlier market entry of cable products.

The gaps of pricing and connection speed between the two technologies are expected to erode as technology advances and as the competition and standardization hits the DSL market. However, due to the guaranteed bandwidth property of DSL products, they are targeted more towards premier consumers. DSL carriers are more likely to bundle DSL connections with premium services like Video on Demand, Music on Demand, and Video Conferencing. Cable carriers are expected to follow suit, however DSL products are expected to beat that of Cable in that arena as predicted by our model- in figure11 DSL-Premium and DSL—Telephony lead those of cable. Our model predicts that cable packages for entertainment purpose are more likely to beat those of DSL. Customers in that area are likely be less sophisticated and keen on ease of installation and use. With the coming of G.Lite, the cable products market share lead should diminish. Based on the above expectations, our model estimated the distribution of market share in 2004 as seen in figure11. We anticipate wireless players to enter by then. We developed a generic package to generalize these products. The breakdown of preference shares between DSL, cable and wireless is 43-42-15, which is in line with some Wall Street predictions of 40-40-20.

Next Steps

Our group had 2 expectations from the use of conjoint analysis initially. Restated here:

1. To draw insights about the market response to features in new product offerings.
2. To estimate the market shares of Baker s given new scenarios - an input to our value model.

Our group accomplished the first goal, but fell short on the second. We were unable to estimate the market shares of products down to firm level. Instead, we were constrained to perform analysis by the technology level. Preference shares were calculated for generic products which were designed to generalize all products in the same technology segments.

We failed to estimate the market shares of Baker because a limitation in the conjoint software. The software limits the number of products to ten. This prevented our group from conducting a firm-specific analysis on consumer preferences. If such analysis were feasible, we would have a more incisive preference share breakdown.

Also, more attributes could be included to describe products. Installation cost and ease of installation are just two others. Due to limits in time, these attributes were not incorporated in our model. A more user friendly and more portable survey media would increase our sample size, and efficiency of the survey. A web-based conjoint survey could address these problems.

Value Model

The purpose of our value model is to evaluate various feasible strategies for Baker to enter the consumer broadband Internet access market. We have identified a few major value driving uncertainties, e.g. profit from providing consumer broadband access services, profit from supplying added value services, number of subscribers, etc. The model is a multi-factor one, which tries to quantify the effect of each value driver towards the ultimate value created by Baker in dollar terms, with an objective function that gives a deterministic dollar value for Baker s incremental shareholder value with any given set of uncertainty values. As an example, the objective function would look like the following:

$$V = b_1z_1 + b_2z_2 + b_3z_3 +$$

where V = shareholders value created from the consumer broadband access market

b_i = value weights of value drivers

z_1 = profit from providing consumer broadband access services

z_2 = profit from supplying added value services

z_3 = number of subscribers

Having estimated the incremental shareholder values for different proposed strategies, we conducted sensitivity analyses to estimate how responsive those values are with respect to some of our model parameters. As a result, some key uncertainties have been identified, and a simulation was run to capture the probabilistic aspect of the value drivers.

Model Components

The value model contains three parts:

1. Strategy Configuration - This part basically characterizes each strategy numerically. Within our model, strategies are defined by their revenue and cost structures, corresponding market share value, and churn rate. Revenues and costs are each made up of monthly and non-recurring items with annual growth rates. For example, monthly revenue is composed of subscription and advertising, while non-recurring revenue contains labor and equipment charges. Each of these revenue and cost items is further broken down into figures for different value chain level, i.e. Content, Internet Access, Infrastructure and Transport, and their corresponding growth rates.
2. Financial Statements - With the configured strategies, an income statement and balance sheet are generated automatically, dependent on the strategy. In this way, revenues, costs, profits and hence NPVs could be calculated for each proposed strategy. See the value model in the appendix.
3. Value Drivers/Value Weights - research and regression on historical return were carried out to quantify a mathematical relationship between different value drivers, such as NPVs, revenues, subscribers, etc. and their contribution to market capitalization. With the financial data for various

strategies and value weights for different value drivers, the shareholder value created by each strategy could be estimated. Note that the contribution to shareholder value is incremental to not entering the consumer market at all. The following tables summarize the value drivers and value weights that we identified in our analysis:

<u>Major Value Drivers</u>	<u>Value Multiple</u>	<u>Value Weights</u>
Profit PV (Content)	1	19%
Profit PV (Access)	1	25%
Profit PV (Servers)	1	2%
Profit PV (Transport)	1	15%
Revenue (Content)	60	9%
Revenue (Access)	13	4%
Revenue (Servers)	20	2%
Revenue (Transport)	20	10%
# of Subscribers	\$ 3,500	10%
Household Coverage	\$ 100	4%

For example, with a profit NPV from Content operation of \$100 million, a value multiple of one and a market capitalization contribution of 19%, the incremental shareholder value from this profit figure would be \$19 million. Having the figures of various value drivers along with their corresponding value multiples and weights, we derive the incremental shareholder value by taking the sum of the products of the three set of numbers across strategies with their appropriate value drivers. So, by combining the three parts of the value model together, the incremental shareholder value of various proposed strategies can be estimated and compared.

Proposed Strategies

Based on the qualitative studies and competitive analysis, we generated six feasible strategies:

1. Base Case (Transport Only) — Baker will take a passive role in consumer market to focus on providing transport bundles to consumer ISPs. Consumer marketing functions are left to ISPs.

2. Small/Medium/Retail ISP Partnership — Baker will partner with second and third tier ISPs, without access to broadband technologies otherwise. This would give Baker a high indirect control over the ISPs business, but also incur large administrative costs in managing a large number of small partners.
3. ISP/Content Provider Partnership — Baker will partner with dominant players in ISP and Content levels of the broadband value chain. Baker can access consumer mass easily, but are unable to negotiate favorable terms with the partners owing to bargaining power of partners.
4. Infrastructure Builder Acquisition — Baker will acquire potential infrastructure builders. While most server-farm providers are privately held, Baker could buy one of these infrastructure players at a reasonably low price, and reduce WWW traffic over its network significantly.
5. Total Value Chain Ownership — Baker will try to exist at all value chain layers by building internal business units. Baker will create its own content, set up its own ISP services and server farm infrastructure and continue its transport business, all at the same time. This will give Baker direct control over all aspects of its businesses across the whole broadband value chain.
6. Total Value Chain Partnership — Baker will establish partnerships with existing, mostly dominant, players in all value chain levels to gain existence. Hence, Baker can leverage its expertise at the Transport layer with dominant players at other value chain levels, and gain access to the large pool of online customer base via various partnerships.

Results and Insights

With the configured six strategies, the following results are generated.

Strategy	1	2	3	4	5	6
Profit PV (Content)	\$ -	\$ -	\$ 121,356,595	\$ 221	\$ 50,316,048	\$ 162,673,997
Profit PV (Access)	\$ (2,747,917)	\$ (117,061,447)	\$ (43,309,621)	\$ (19,908,928)	\$ (237,504,935)	\$ (90,045,506)
Profit PV (Servers)	\$ -	\$ -	\$ -	\$ 75,478,638	\$ 64,335,367	\$ 79,803,048
Profit PV (Transport)	\$ 47,997,114	\$ 356,123,151	\$ 350,898,347	\$ 166,279,461	\$ 224,664,773	\$ 372,141,974
Revenue (Content)	\$ -	\$ -	\$ 110,024,966	\$ -	\$ 50,830,580	\$ 95,618,414
Revenue (Access)	\$ 61,263,854	\$ 171,142,480	\$ 212,204,273	\$ 91,895,781	\$ 135,801,032	\$ 205,586,466
Revenue (Servers)	\$ -	\$ -	\$ -	\$ 73,361,412	\$ 69,841,025	\$ 108,901,337
Revenue (Transport)	\$ 234,460,775	\$ 534,242,524	\$ 607,318,061	\$ 356,100,585	\$ 416,693,427	\$ 632,940,704
# of Subscribers	\$ 510,532	\$ 1,021,064	\$ 1,276,330	\$ 765,798	\$ 935,976	\$ 1,361,419
Incremental Shareholder Value	\$ 322,977,107	\$ 676,340,779	\$ 1,059,043,003	\$ 489,806,711	\$ 645,059,792	\$ 1,077,413,424

From the Incremental Shareholder Value of strategy 1, we can tell that Baker should simply get involved in the consumer market, even if they just let the consumer ISPs seek customers. Thus, we can draw our first conclusion from our analysis that Baker should not be reluctant to enter the consumer market at all. At a first glance, it seems like the valuation from Profit PV (Access) is always negative across all proposed strategies, and it may make sense for Baker to opt out of the Access market completely. However, it turns out that the incremental valuation from the revenue and number of subscribers created by jumping into the Access market far outweighs the loss from the profit figure.

Comparing the results of all six strategies, the Total Value Chain Partnership strategy appears to be the most favorable one, giving Baker the highest incremental shareholder value of \$1.08 billion. The ISP/Content Provider Partnership strategy is a close second with an incremental shareholder value of \$1.06 billion. Thus, based on this preliminary result, the Total Value Chain Partnership strategy stands out as our recommended strategy to Baker.

Further Analyses on Value Model

We conducted sensitivity analysis to capture the responsiveness of the incremental shareholder value with respect to various model parameters. After assessing the distribution of the major uncertainties in our value model, we ran a Monte Carlo simulation for the six strategies to estimate their distributions of incremental shareholder value. We wanted to know whether the recommended strategy, Total Value Chain Partnership, would sustain its dominant position under different scenarios.

Sensitivity Analysis

The value model makes a few assumptions about external parameters. We feel that it may be crucial for us to investigate how changes on these parameters would affect the best strategies. The six most important parameters we identified are:

- 1) Discount rate
- 2) Tax rate
- 3) Annual CO growth
- 4) Depreciation Rate
- 5) Household reached by each CO
- 6) LT interest rate

In order to see their individual effect on the final decision, we did a sensitivity analysis on each of them.

Sensitivity Analysis Results and Insights

Having done the sensitivity analysis, we found that the change of the six parameters actually has no impact on the best strategy at all (figures12-17). Total Value Chain Partnership remains optimal throughout. One important observation is how these parameters relate to shareholder value. Discount rate, tax rate, and long term interest rate, are all linearly related to incremental shareholder value in a negative way. The higher their values, the lower the shareholder value will be. On the other hand, annual CO growth and average number of household per CO are the two parameters that add shareholder value when they increase. They provide linear growth to the value. Surprisingly, depreciation rate is not a linear factor in our model. It is exponentially reducing the shareholder value when it increases.

Simulation

Due to the high volatility of the Internet market, we expect many uncertainties involved in Baker's decision. To effectively capture the uncertainties in our model, we have used a stimulation to generate different market conditions and determined how different strategies performed. The first step of the

simulation is to decide the most significant uncertainties in the Internet market. Baker is primarily concerned with market size, recurring revenue, recurring cost, and non-recurring cost.

- 1) Market Size — From several industry reports there is a wide range of predictions of the future Internet market size. If it grows constantly at the current rate, it would keep explode in the next few years. However, there is also a good chance the market growth will level off soon. We have decided to use a normal distribution to model this uncertain market. We obtain the mean and variance by using the market prediction from our diffusion model and the residuals of the model.
- 2) Recurring Revenue - There is large competition in the Internet market and the ease of entry makes the market close to "perfectly competitive", which undercuts price, as well as revenue. Even though there is still a slight chance for higher revenues in the future, we expect downward pressure on revenue. We used a triangular distribution to capture this trend. We assume the most likely as 0 where the high is +20% and the low is -40%.
- 3) Recurring Cost - Since the Internet is more open now, there are a lot of ISPs out there and their presence has lowered the costs of various of service costs for Baker. Hence, it is quite adequate to use triangular distribution to model the uncertainty. The low end of the distribution is -40% of current cost while the high end is +20%.
- 4) Non-Recurring Cost - Technological improvement can greatly drive down the price of equipment and Baker is quite optimistic that there will be other breakthroughs, like the G.Lite, in the coming years. We used a triangular distribution centered at 0 with the high in +10% and the low in -40%.

After we defined the underlying uncertainties, we have did a trial run of 100 times to estimate the appropriate number of runs needed for a 1% relative error. Then, we applied the formula $((z * \sigma) / (0.01 * \mu))^2$ to find the number of trials needed for the actual run and it comes out to be 1600.

Simulation Results and Insights

With the optimal strategy, Total Value Chain Partnership, the simulated value distribution is in figure19. The simulated mean and standard deviation of the value distribution is \$965 million and \$189 million respectively. At the same time, the range of simulated value runs from \$400 million to \$1.5 billion. This distribution shows that the Internet broadband access market is indeed a very volatile market, giving a very uncertain incremental shareholder value to Baker with the optimal strategy.

However, we also measured how dominant our recommended strategy is under those uncertainties with our simulation. Figure 18 shows the result we obtained from such a simulation. As it turned out, the Total Value Chain Partnership Strategy is dominant among the six strategies almost 80% of the time. This should establish even firmer footing for Baker to follow our recommended strategy.

Recommendations

After exploring the market landscape, market potential, customer preferences towards product offerings, and evaluating multiple consumer strategies, we feel we have generated some insights into the important strategic positioning and directions required to succeed in the broadband world of the future. The clearest result is that it makes financial and strategic sense to enter the consumer market. There are many potential alternatives for how this is accomplished, but overall, the potential size of the broadband market and new product offerings provide a compelling picture for new entrants.

We have also seen how important having a "whole" story is for both the consumer and the financial markets. Narrowband services are commodity and players entering into the space can leverage components provided by existing players. In the broadband space, the new products and services are undefined. It becomes necessary for individual players to have coherent visions of where they are positioned in the market and how other components of the value chain will be realized. We discuss below what strategic alternatives provide the most compelling broadband story for an entering data CLEC.

Content

By examining the content provider market place, we recognized content aggregators are already staking out holdings of broadband content. Yahoo/Broadcast.com and other Internet portals are investing to deliver broadband portals. They currently do not have relationships with broadband access players to deliver the new content to their audience. There are significant synergies associated with partnering with a mega portal. There is an existing registered user base that can be readily upsold to DSL services. The

work of aggregating broadband content and media relationships has been established. There is also the need to closely couple content with the delivery to provide compelling broadband experiences for users.

Ideally, portal relationships with all major aggregators of broadband should be pursued if possible. There is a strong motivation to position DSL as a universal access medium for all broadband content, to contrast with @Home's closed model. This allows flexibility in service offerings if telephony and entertainment do not become the key services driving broadband demand.

Internet Services

It does not make sense financially to enter into the cutthroat ISP market. AOL and second tier players have been able to acquire a sufficient scale of subscribers to allow focus and differentiation through specialized services to drive profitability and future revenue potential (web hosting, e-commerce, etc.). Baker's core competencies are in network engineering. Building an ISP from scratch requires significant investments in marketing/sales channels and customer care functions. It makes financial sense to partner with ISPs to drive customers to higher bandwidth products.

We believe AOL will not provide a profitable arrangement to have access to their customer base. But there is a large group of second and third tier ISPs that do not have clear broadband access partners. @Home and the cable companies have indicated these ISPs will not have access to the cable networks. The Baby Bells offer competing ISP services so do not appear as compelling a DSL partner as the data CLECs. Baker should aggressively pursue a sales/marketing and operational structure that allows DSL role out to medium to small sized ISPs. Since many of the companies do not have a future broadband story, interest should be very strong.

Broadband Infrastructure

To fully realize the advantages of broadband content, it is necessary to get content as close as possible to the consumer. Caching and private data networks remain the methods of choice. Baker should pursue an aggressive push to construct both a national network and data centers to speed the delivery of broadband

content from partners. Partnering with an emerging national data network provider (Qwest, Level 3, Frontier) will provide Baker significant room for future bandwidth needs. An acquisition on the data server side can provide a compelling proprietary broadband delivery capability.

There are synergies between the consumer and the business infrastructure strategies. Both benefit from high quality infrastructure beyond the local DSL pipe. Business customers will demand virtual private network features to connect their geographically diverse locations. Baker would benefit by leveraging the costs of a national network and data centers across both the business and consumer DSL customers.

Broadband Access

Baker should continue to strengthen their network advantage. A key strength is their negotiations with the Baby Bells and with regulatory bodies to offer DSL service in major US markets. The current xDSL infrastructure in place for the business markets make market entry into the consumer market less costly and more flexible. This provides Baker a quick entry option into large markets in the US.

We have identified connection speed and price as two key product attributes for consumers in the broadband market. Baker must price their product close to cable pricing. Unlike cable, DSL can more easily differentiate services since the delivery medium is dedicated. Given a comparably priced, similar speed product, DSL can differentiate from cable by offering premium services to individual customers.

Conclusions

We believe Baker can bring together content and Internet service providers to create substantial value in the consumer broadband market. There are content players that are not assured future audiences for their broadband content. There are ISPs that have no broadband delivery channel for their customers. We feel there is a compelling story for Baker to aggregate ISPs into a broadband audience to receive the broadband content from content players. In this manner, partners in both components of the value chain gain what they are currently lacking in the future broadband world.

From an operational side, Baker should continue to focus on building a broadband optimized delivery network. There are outside partnerships and acquisitions that make strategic sense. A key differentiator in delivering broadband content will be the quality of the network. The end user quality depends heavily on how close the content is to the end user connections.