Project 1 Metricom Ricochet

The popularization of the Information Superhighway has enticed users to join the highway and take advantage of what it has to offer. The data communications industry has responded by providing both wired and wireless options. This paper seeks to analyze one of those options, Metricom’s wireless modem, and how it relates to the rest of the industry. Who are its competitors? Who offers a substitute product? Who provides complementary products? How has Metricom managed to be successful so far? And what factors should be taken into consideration for future growth and profits?

Contents

- Introduction
- Metricom Background
- User Profile
- Existing Infrastructure/Current Available Technology
- Equipment challenges
- Revenue Model
- Conclusion
- References

Introduction

The data communications industry is split between products using wired and wireless connections (Refer to the diagram below). Traditionally, consumers have used land lines like telephone, cable, and ISDN lines in order to transmit data. Modems capable of using these connections have been aggressively marketed and now are commonplace in many homes. Recently, technological advancements have freed consumers from needing to use a land line connection to transmit data. With the advent of wireless services, the mobile consumer can read and send email and surf the net from remote places like the beach or even the sky. In order to accomplish this task, different approaches have been pursued. In the cellular industry, the introduction of "smart" phones in 1997 signaled the cellular industry’s response to create a compact information appliance capable of meeting a user’s voice and data communication needs. These smart phones extended the functionality of traditional cellular telephones by allowing users to check their email, send email to others, and surf the Net. Some smart phones have even gone so far as to include stripped down versions of applications like Lotus Notes.

For those mobile users who want the full functionality of a computer, alternative wireless products and services exist. This is Metricom’s speciality. It holds a unique role among wireless communication providers because it not only provides the services of an ISP but it also manufactures the PC wireless modem - the Ricochet modem- which allows its clients to engage in wireless data transmissions. Prior to
Metricom introducing the Ricochet modem, mobile users needed to attach a cellular telephone to their PCs in order to acquire the wireless connection for data transmission. The Ricochet modem bypassed the purchase of a cellular telephone and service contract for individuals simply interested in transmitting data. Now consumers can purchase, lease, or buy a wireless modem from Metricom. And rather than pay per minute rates in addition to a monthly base rate for cellular service, consumers can pay a flat monthly rate of $39.95 to transmit data from the comfort of their laptop from anyplace within the Metricom coverage area.

**Metricom Background**

Founded in 1985, Metricom provides wireless data communications and network solutions for personal computer and industrial applications. The firm, headquartered in Los Gatos, California, has over 200 employees in Los Gatos, Houston, Seattle, Washington D.C., and satellite sales offices. The company is public-held, major funding comes from two public offerings in 1992 and 1994 respectively, and private investment. The largest investor is Microsoft cofounder Paul Allen’s company, Vulcan Ventures Inc. After a recent stock purchase, Vulcan’s has 49.5% interest in Metricom.

Metricom has two product divisions. The Richochet Products and services division and the Industrial Communications division. The former is the focus of this report.

Metricom’s Ricochet division provides wireless access and communications solutions for groups and individuals using computers in the corporate, consumer and education market sectors. Richochet offers the following services:

- Monthly subscriptions to its wireless service at flat rates which includes internet and e-mail accounts with unlimited usage.

- Subscribers can also access corporate LANs and intranets, on-line services such as America Online and CompuServe with additional options.
Ricochet wireless modems can be rented, leased, or purchased. The company’s web site contains a detailed price list. The modem price ranges from $299 to $599, depending on the type of modem and whether service subscription accompanies the purchase. For consumers, the modem rental fee is $15 for mobile computers or $99 for unlimited lifetime rental for desktop computers. The monthly service charge is $29.95 for consumers. A discount is given to higher education and K-12 schools.

In 1997, the Ricochet modem and Internet service received two prestigious industry awards - the Mobile Computing Product of the Year Award by Network Magazine and the Wireless Software/Service product of the year Mobility Award by Mobile Insights, Inc. By July 1, 1997, Ricochet has surpassed 15,000 subscriber mark.

### User Profile

Deciding which data communications option to choose can be a cumbersome task for many consumers. The table below outlines the major considerations consumers wrestle with when making up their minds. Based on their personal needs, they may find one option better suited for their lifestyle and wallet size.

<table>
<thead>
<tr>
<th>Communication Choice</th>
<th>Mobility</th>
<th>Full functionality of a computer</th>
<th>Equipment cost</th>
<th>Monthly cost</th>
<th>Transmission speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wireless modem e.g. Ricochet</td>
<td>Yes. Limited to major metropolitan areas which provide Metricom’s service.</td>
<td>Yes</td>
<td>Users must purchase their own PC ($800 and up) and they can either purchase, lease, or rent Ricochet modems.</td>
<td>Flat monthly service rate of $39.95. Student rate of $29.95.</td>
<td>The maximum transmission speed can reach 28.8 kbps.</td>
</tr>
<tr>
<td>Land line connection e.g. telephone, ISDN, cable</td>
<td>No.</td>
<td>Yes</td>
<td>Users must purchase their own PC ($800 and up) and they must purchase a standard modem ($99 and up)</td>
<td>Flat rate pricing for standard telephone connections as low as $19.95 per month. ISDN and cable connections may have monthly charges and per minute charges.</td>
<td>Standard modems provide up to 56 kbps connection. ISDN provides up to 128 kbps, cable modems provide speeds up to 30MBPS (subject to shared bandwidth) and xDSL provides speeds of 6 to 8 MBPS.</td>
</tr>
</tbody>
</table>
The smart phone

Yes. Limited to cellular service coverage area and roaming agreements.

No. The smart phone is only able to provide email access, Internet browsing, and sometimes stripped down versions of desktop applications like Lotus Notes.

Users only need to purchase a smart phone ($299 and up). It contains all the necessary devices to transmit data. Some carriers may even subsidize phone purchases.

Dependent on carrier. Some offer flat rate data communication services for as low as $19.95 if you contract for cellular service as well. Others charge a per minute fee in addition to the base rate.

Their maximum capacity is currently 9.6 kbps.

Existing Infrastructure/Current Available Technology

The land line network is more extensive than the wireless networks for smart phones and Ricochet modems. There exist four basic categories of land line modems. These are analog modems (14.4, 28.8, 33.6, 56 kbps), Integrated Services Digital Network (ISDN), cable modems and Digital Subscriber Line (xDSL - the "x" is a variable that represents the varying speeds and methods of transmission offered by different companies). ISDN and xDSL use the existing phone lines. The former can provide up to 128 kbps bandwidth, and the latter can get 6 to 8 megabits data transmission per second. The cable modem is the fastest land line connection, running at speeds of up to 30 mbps. Of the four technologies, only analog modems are widely available and comfortably priced for most consumers. Industry-wide, analog modem shipments should reach 55 million in 1998, up from 33 million in 1995. The number of computer users with Internet access worldwide should swell from about 60 million in 1997 to well over 200 million in the year 2000.

Instead of focusing on increasing transmission speed, the cellular industry is waging a standards battle for digital technology. Digital technology does not have a nationwide, much less a global standard. Different technologies are competing to become the standard. Amongst the players are PCS, CDPD, and GSM. Some technologies may be interoperable but the vast majority of the competitors have incompatible technologies. Therefore, cellular service carriers must commit themselves to one technology in order to build an infrastructure capable of supporting digital communication. The maps below provide a sample of the diffusion of PCS and GSM technologies nationwide.
The Ricochet Network is a wide-area wireless system using spread-spectrum, packet-switching data technology and Metricom’s patented frequency-hopping, mesh architecture. The network operates within the license-free (902-928 MHz) portion of the Radio Frequency (RF) spectrum, providing Ricochet subscribers with an affordable wireless solution and an alternative to standard telephone modems requiring phone line connections. Currently, the Ricochet network covers three metropolitan areas: Washington D.C., San Francisco Bay Area, and Seattle. A collection of coverage maps can be found on the web. Below is the map for Alameda county. In addition to the metropolitan areas, wireless services are available in several airports, corporate and university campuses. Some hotels have joined Richochet’s Wired Access Providers. The list of these sites can be found from the same web page above. Metricom plans to deploy into other major cities in the future.
Equipment Challenges

Land Line Modems

Analog modems have a bandwidth Catch-22 problem. Simply stated, the more users venture beyond 28.8 kbps modems into high-speed connections, the more crowded the backbone becomes. So, increasing your access speed at home or at the office contributes to the slowing down of the Internet as a whole.

To move up to the next generation of high-speed wired technology, the industry has to make several critical transitions:

- Analog to Digital

Today’s analog modems can run up to 56 kbps. However, the usual line noise and signal degradation with copper phone lines result in a typical speed for most users in the high 40 kbps range. Furthermore, one of the biggest problems for these modems is that they cannot make a 56 kbps connection if there is an analog-to-digital conversion in the line. The reason is that the conversion is not an exact process as errors and noise are easily introduced. For voice communications, this imprecision means nothing, but when dealing with many discrete voltage levels -- each representing an 8-bit combination -- the errors are deadly. The conversion in the other direction, from digital to analog, does not result in this "quantization noise." This is the reason these modems are asymmetrical -- receiving at 56 kbps, but transmitting at 33.6 kbps. The phone lines from the telephone company to your home can have several conversion devices that
prohibit a 56 kbps connection resulting in dogged non-interoperability. By taking advantage of the mostly unused capacity of the copper wire infrastructure that is already out there, digital ISDN and xDSL technologies will greatly increase bandwidth. So, switching to digital technology is the inevitable next step.

- **Circuit Switching to Packet Switching**

  One major challenge facing the computing/telecommunications industry is the technical structure of the telephone system, which for 120 years has been focused on the challenge of transmitting the 4 kilohertz frequency range of the human voice. Analog communications in the telephone world have imposed a proprietary structure between users and providers in which all traffic is routed through the phone companies’ circuit switches.

  Digital communications, however, have begun to erode the primacy of circuit switching, replacing it with packet switching, which routes information by virtual addresses rather than by a physical piping of electrons. Each packet of information contains its own destination address and finds its own way through the web-like network of routers. The packet-switched system is far more efficient for moving data, a reality reflected in the relatively low prices for data connections from Internet service providers.

  By leveraging on the existing phone wires, xDSL seems to be the next logical step in high-speed data connections. It also argues against ISDN, which still relies on the phone companies’ switching systems. It may take years for xDSL to be widely deployed, but it seems inevitable that packet-switched systems will become the primary method of connecting not just computers, but also voice callers, who have already begun to the slow migration away from the phone companies’ circuits through devices like Internet telephones. Eventually, this conflict between voice and data will disappear as a new packet-switched system is created with voice becoming a mere subset of data calls.

**Smart Phones**

Smart phones are usually dependent upon the digital technology they have been engineered for. This requires manufacturers to commit their marketing dollars to a particular digital technology which may not necessarily be compatible with all carriers. This poses a difficult problem for consumers because they must select what type of digital technology they are willing to support, find a carrier in their local area and/or areas they travel to, and then select a smart phone that is compatible. This can be quite a daunting task for the average consumer. Some manufacturers have met this need by making their products backward compatible to analog technology. Samsung is a good example of this with its Duettेएऍ® smart phone which combines analog and CDPD technology "to offer subscribers access to public and private networks in addition to the convenience of traditional cellular communications."

Smart phones also suffer from one other challenge - baud rate. While average modem can reach equal or surpass a 33.6 kbps, the cellular industry is only able to provide up to a 9.6 kbps. This slow rate can not only be trying to a consumer’s patience but also costly to his/her wallet if the consumer is not paying a flat monthly rate data service.

**Ricochet Wireless Modems**
Ricochet modems operate within Metricom’s Microcellular Data Network, which is a wide-area digital, packet-switching radio network. The network consists of shoebox-sized radio transceivers, also called Microcell Radios, which are typically mounted to street lights or utility poles. The radios are strategically placed every quarter to half mile in a checkerboard pattern.

Implementing this technology poses some challenges. First of all, it can be costly to get approval from the light pole owner to install the radio. For example, Puget Sound Computer User reports that:

Infiltration into various city and county jurisdictions depends more on political and economic decisions rather than technical decisions. Clyde Hill, for example, wanted $1,000 per light pole per year for each MR. Metricom said, "see you later." In Seattle, most light poles are owned by the city and maintained by City Light. City Light is charging Metricom $14.66 per year for a 100-percent-owned City Light pole; $7.33 per year for a pole owned by City Light/US West; $4.89 per year for a pole owned by City Light/US West/Metro. In addition, Metricom’s current contract through February 1997 requires them to pay $1.76 per radio per year for electricity.

There are other limitations to the Microcell Radio technology. Radio reception may be weak inside buildings, and moving the modem a small distance can change the reception dramatically. In addition, the modem may interfere with other devices such as TV monitors, cellular phones, and broadcast towers, etc.

A common problem shared by the smart phone and the Ricochet is the scarcity of spectrum. For Ricochet, its use of unlicensed radio spectrum in the 900-megahertz range makes its equipment more vulnerable to interference than that of some competitors. To increase the speed of Ricochet, more spectrum is needed. In April 1997, Metricom announced that it had won a recent Federal Communications Commission auction of the radio spectrum for wireless communications services. The company said it would use the new capacity to lift the performance of its network to 128 kbps or faster. That would be comparable to ISDN.

Even at the speed of ISDN, the performance of wireless communication won’t be comparable with the next generation wired technology using xDSL or cable modem technology.

---

**Revenue Model**

**Introduction**

In the data communications industry the basic revenue model consists of modems which cost several hundred dollars offered by one set of companies (modem manufacturers) and monthly flat-rate billing for unlimited Internet access offered by another (ISPs). This model differs greatly from the voice communications industry’s model in which customers generally purchase a $50 or $75 phone and pay variable rates based upon the time and distance of their voice calls. Problems arise because in many cases some of the same players play across both industries. In fact, the convergence of computing and telecommunications is leading to a consolidation of the two into one industry. In order to understand the prevailing revenue models in the data communications industry it is necessary to understand some of the politics and call characteristics behind the data and voice communications revenue models.
Disparity between Data and Voice Communications Revenue Models The disparity between the data and voice communications revenue models, ie. flat rate and variable rate billing, can be traced back to 1983 when the FCC declared that on-line computer service providers would be exempt from the access charges that long-distance carriers paid to the Bells for completing their calls. This is known as the Enhanced Service Provider exemption. While AT&T, MCI, and Sprint had to pay Pacific Telesis or Nynex a per-minute rate for completing their voice calls, companies that offered access to the Internet paid only the basic monthly rate for a phone line. The FCC’s goal was to nurture a nascent industry and guarantee that fledgling Internet providers were not strangled in their cribs by onerous telephone bills. But with the growth of the Internet, many of the infants have grown into big companies like America Online. Moreover, AT&T, MCI and Sprint now all offer Internet access. This has the Baby Bells up in arms. They say that the federal exemption has served its purpose and is now counterproductive.

Further exacerbating the situation is the relative duration of voice and data calls leading to congestion of the telephone network. The Bells argue that Internet providers have not paid full freight for using the local phone network as the primary pipeline to their customers. The argument of the phone companies is simple: most Internet connections begin with a dial-up phone call, and local phone rates are based on the assumption of brief conversations. The question of whether computer users should be allowed to tie up lines indefinitely remains. Unlike data networks, which typically can carry a variety of different communications simultaneously on a single line, telephone networks use a dedicated line for each single communication -- whether it is a voice conversation or a modem connection. Tying up lines is not a problem for voice calls because they last an average of three or four minutes. On the other hand, Internet calls tend to last much longer - 30 minutes to an hour - and it is becoming common for Internet users to simply sign on at the beginning of an evening and leave the line open for several hours. Open lines tie up network switches and necessitate expensive new equipment to avoid dial-tone delays.

What Revenue Model Will Prevail?

This is why the prevailing revenue models today may not prevail much longer. If and when the FCC does finally get around to rescinding the Enhanced Service Provider exemption, there will be a need for a new revenue model. A new pricing system must be carefully considered, for if not, attempts to reconcile voice and data call pricing will in all likelihood be prohibitively expensive or unfair. Many of the telephone companies have relied on a system of “value” pricing for new digital services such as ISDN and xDSL, which is a nice way of saying that they charge as much as people can endure. In a competitive market, prices tend toward a system of "cost" pricing -- that is, charging slightly more than the actual cost of the product, to undercut other providers. As things stand there are now three basic revenue models: 1) Flat rate, in which a user pays a certain fee for unlimited access. 2) Metered usage, in which the user pays by the amount of data sent or received. 3) Timed charges, in which the user pays by the minute or other fraction of an hour. A fourth candidate would be a hybrid of flat rate and metered pricing such as the cellular communications industry now employs. A fifth and possibly more remote alternative to achieve fairness requires a new system that does not involve the voice network and focuses on the wires that can carry you to a packet-switched network like your Internet service provider. In this way, voice and data can be priced as always, that is, variable and flat rate charges respectively.

Metricom’s Novel Approach

In order to pave the way for its Ricochet wireless modem, Metricom has vertically integrated by not only making the modems, but also by setting up the equipment infrastructure required to make them operational and the ISP service which connects them to the Internet. This interesting combination of
equipment and services allows Metricom to add some interesting twists to the standard data communications revenue model. Furthermore, it is strategic because it allows them to differentiate themselves from their competitors in the modem manufacture business and move toward a more service-oriented model. By doing so, they will be able to emulate the cellular industry’s revenue model.

The cellular communications industry currently subsidizes the cost of their cellular telephones in the belief that the truly important source of revenue is the on-going service contract associated with the phones, not the one-time equipment sale. Therefore, they offer expensive phones for cheap as long as the customer agrees to enter into a fixed-term cellular service contract chosen from an assortment of plans with flat service rates and per minute charges. If the customer attempts to buy the phone separately, then the subsidy disappears and the equipment cost can go up to $400 or more. By subsidizing cellular telephone purchases, the industry has nurtured the development of a critical mass and turned what was previously viewed as a luxury by most people into a need by many. Metricom is currently taking a similar approach and hopes for similar results, i.e., once you try wireless, you won’t want to go back. Interestingly, the advent of smart phones is challenging the up-front equipment subsidy revenue model because consumers may be willing to pay more for the technology. This would allow cellular service providers to make money on both the front and back ends. This provides Metricom with an interesting opportunity. If their Ricochet modem and network service share enough of the same characteristics, then they would like to emulate the cellular revenue model and prosper similarly.

**Metricom Pricing**

Specifically, Metricom currently sells the Ricochet Original Wireless Modem for Mobile Computers for $299, with service subscription. If the user selects to rent the modem, the monthly rental fee is $15 plus the user can optionally choose to pay $3.95 per month for modem loss insurance. The modems bought without service subscription are much more expensive. For example, the price for the above modem for mobile computers is $599, twice what it costs if one also gets a service subscription. The basic Internet service charge is $29.95 per month for consumers. Metricom offers discount for higher education and K-12 schools. Additional services, such as Telephone Modem Access, Web Hosting, etc, are charged extra. A detailed price list can be found on Metricom’s web site.

**Land Line Modem and Network Service Pricing**

56 kbps modems (which do not need special telephone line installation) are around $220 while ISP’s are around $20 - $25 monthly. 128 kbps ISDN modems (which do need special telephone line installation) cost around $300 while ISDN phone service is around $30 monthly and ISDN ISP service is around $25 monthly. Cable modems are around $250 while cable Internet access costs around $40 monthly xDSL service is expected to be priced at $40/month while ADSL terminal adapters are currently around $500.

**Smart Phone Equipment and Service Pricing**

Pricing and user cost depends upon which revenue model a consumer’s local carriers have selected. If consumers must bear the cost of the smart phone purchases, price could be anywhere in the hundreds of dollars range. The Samsung Duett alone has a list price of $299. But if the consumer has a flat data service rate, the long-term cost may be minimal compared to carriers willing to subsidize phone purchase but who charge per-minute rates for data sent.
Conclusion

Metricom and the Competition

Metricom competes for a market share in the data communications industry by targeting a segment of the population with specific needs. The profile Metricom caters to is:

- Highly mobile. This person does not want to rely on finding a land line connection whenever he/she needs to go on-line.
- Major metropolitan dwellers/workers. Because Metricom coverage is only available in major metropolitan areas like San Francisco and DC, users could only use this ISP's service in restricted places.
- Laptops users (normally). Metricom clients want full computing functionality. They probably already possess a laptop because their mobile lifestyle necessitates it. Therefore, they want to extend the usage of their laptop by buying/leasing/renting a modem allowing them to go online and increase their range of computing options.

Individuals who fall into this profile are typically on-the-go business professionals and university students. And these are precisely the groups that Metricom has targeted. Using this information, one can deduce who might be Metricom’s potential competitors and who might not. The irony is that between wired and wireless options Metricom faces the greatest competitive challenge from organizations using land line connections.

Even though the cellular industry is initially marketing smart phones to the business professional, the likeliest segment for long term profits will probably be generated from the average consumer who simply wants to extend the functionality of his/her cellular telephone. The average person may not want to buy a laptop to get email access and surf the Net while he/she is away from the office or home. But if that person already used a cellular telephone then having online access would be a handy added feature. This type of consumer would get a big advantage with a dual function information appliance like a smart phone whereas they would find Metricom’s services and products too costly and not useful enough to warrant the purchase.

Land line services, on the other hand, could presumably appeal to the same market segment that Metricom targets. Therefore, they pose the greatest competition to Metricom’s long term success. Even though land line services can’t cater to the desire for a highly mobile person to gain online access devoid of a land line connection, they do offer one thing that Metricom is currently unable to provide - greater coverage areas. Users can find land line connections almost everywhere they look. Telephone jacks exist in almost all hotel rooms, office buildings, homes, and even cafes. And telephone connectivity is not limited to just the major metropolitan areas. You can acquire a telephone connection in rural areas as easily as you could in an urban one. Metricom, unfortunately, does not possess the infrastructure to make this claim so its clients must be willing to accept the service limitations. This greatly limits the extent to which Metricom can penetrate the market. Because even if a mobile consumer wanted to purchase a Ricochet modem and use Metricom’s ISP service, he/she might decide otherwise due to limited coverage areas. The consumer might prefer to deal with the inconvenience of finding a land line connection rather than being unable to connect outside the Metricom coverage area.

Metricom has met this challenge in two ways. First, it allows customers to use land line connections to
log on to its service for an additional fee. This serves as an interim measure until Metricom has a greater service area. Second, Metricom’s long term investment strategy aims to expand its services to other metropolitan areas and increase its coverage area in cities it already has established a presence. By following this two-fold strategy, Metricom focuses its investment and efforts in places that encourages its target segment to choose Metricom over a land line option because urban customers would have little justification to choose a competitor, especially since the competition is unable to provide one key feature. As an ISP dependent on land line connections competitors would be unable to give mobile customers the luxury of going online anywhere they desired e.g. relaxing at a table in a restaurant, sitting in rush hour traffic. By closing the coverage gap in urban areas, Metricom can level the playing field with land line competitors while gaining a competitive advantage that can make them the easy choice for the mobile community.

References

1. Cellular One
2. AT&T Wireless
3. Sprint
4. Bell South
5. Wireless News
6. PocketNet Phone
7. Nokia 9000 Communicator
8. GSM
9. Metricom Home Page
10. Get Wired--Wirelessly! Metricom’s Ricochet service hooks metropolitan Seattle to the Internet via radio waves.
11. The Ricochet Effect Revisited
12. the coolest toy
13. The ‘smart car’ revs up
15. Metricom’s Ricochet Wireless Network and Internet Service Passes the 15,000 Subscriber Mark
16. Metricom Receives Product of the Year Awards from Network Magazine and Mobile Insights