



The Wireless Industry: Vibrant and Competitive

Mark Lowenstein
Managing Director, Mobile Ecosystem
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Executive Summary

We are celebrating the 20th anniversary of mainstream cellular communications in the United States. Few, if any, industries have grown this fast. Today, more than 130 million Americans and some 60% of households use wireless services. Growth in the past five years has been especially rapid, as wireless has transformed from an analog, voice only product sold in a duopoly market structure to a highly competitive voice and data product sold by multiple carriers based on digital services and features. Wireless is the most competitive sector of the communications industry, in part, because it is the least burdened by regulation.

Consumers have been the main beneficiaries. According to the Federal Communications Commission's (FCC) July 2002 report on wireless competition, more than 80% of Americans have a choice of five or more wireless carriers in their market. This intense competition has helped cut wireless service prices in half since 1995. As a result, average usage per subscriber has more than tripled, while the average wireless bill is about the same as it was in 1995.

Wireless is also playing a growing role in the nation's security and safety infrastructure. In 2001, more than 57 million calls to 911 were made from wireless phones.

Wireless operators must continue to invest aggressively in their networks to support the growth in subscribers and usage. In the midst of a general pullback in IT related spending, the wireless carriers are investing more than \$25 billion in network capital expenditures (capex)– more than \$3 billion of it in California – this year. This initiative to expand coverage, add capacity, and introduce exciting new data services represents the highest capex as a percentage of revenue for the industry in years.

Consumers have become accustomed to the convenience and immediacy of the information and e-commerce age. Just as cable subscribers can order a pay per view movie using their remote control, wireless users will be able to use their mobile phone as a remote control: to download ringtones, try out games, and even pay their bill. Consumers will demand that the process for signing up and accessing wireless services and features be quick, easy, and convenient.

The wireless “ecosystem” contributes nearly \$250 billion to the United States economy. And it is a vital part of the California economy – from the “wireless canyon” of San Diego to the billions of dollars that have been invested in mobile-related startups in the state. There are 60,000 wireless-related jobs in California, representing an annual payroll of about \$3.5 billion.¹

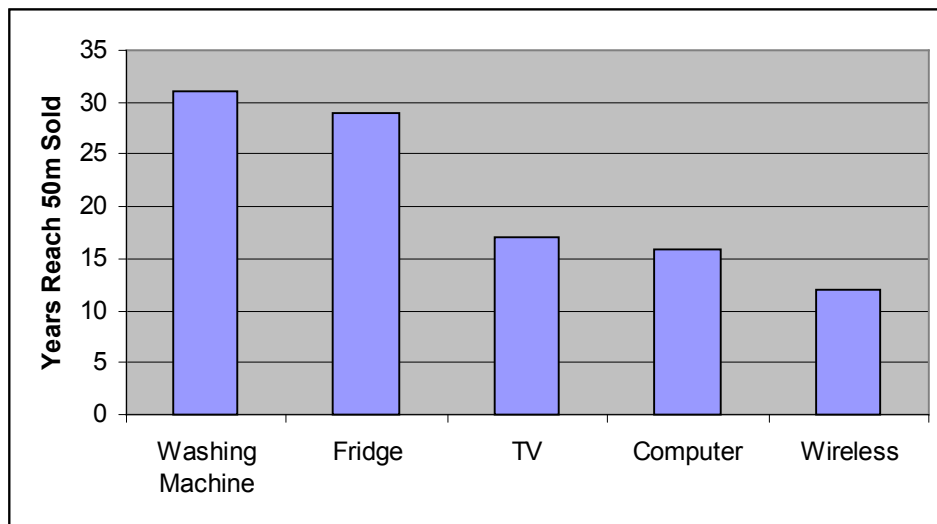
With the high-tech sector facing a challenging economic environment, the wireless industry can continue to prosper in an open, dynamic, and competitive environment. And consumers will therefore benefit from improved networks, exciting new features, and processes that keep this sector at the cutting edge.

¹ O'Melveny Consulting/San Diego Regional Technology Alliance from a June 24, 2002 *Los Angeles Times* article.

I. Wireless Industry Background

Wireless has been one of the most dynamic and fast growing industries of the past twenty years. Rapid developments in digital signal processing technology, driven by Moore's Law, transformed wireless from primarily a car-phone business into one based on personal portable communications. Early car phones had cost \$2,000 with air time prices well over \$1.00 per minute. Today, phones costing less than \$100 (often much less with new activations) and usage prices of about 10¢ per minute are the norm. When cellular services were launched in 1983, original predictions were that by the late 1990s there would be about one million subscribers. Instead, as of the end of 1999 there were 69 million subscribers, and today there are about 130 million wireless users in the United States. Wireless has been one of the fastest growing consumer products in history, as shown in Exhibit 1.

Exhibit 1 Number of Years to Reach 50 Million Sold²

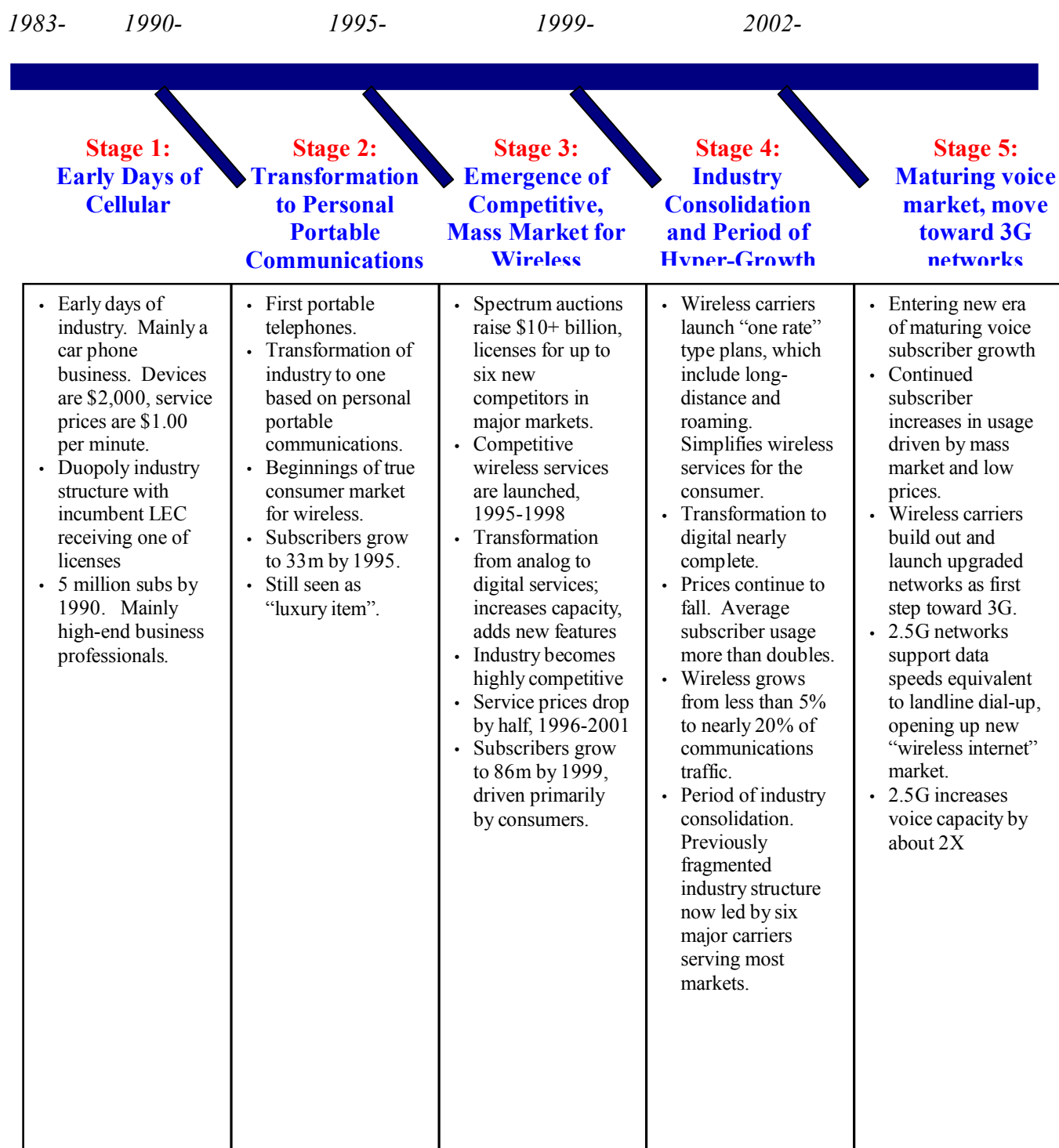


Wireless "penetration" has reached 45% of the U.S. population, or about 60% of households. That number is even higher in other Organization for Economic Cooperation and Development (OECD) countries. In Italy, for example, wireless penetration is more than 80%. Clearly there's still plenty of growth ahead for this industry in the United States.

Mobile Ecosystem sees the wireless industry as having gone through four stages of growth since its inception. As Exhibit 2 shows, we're on the cusp of the fifth major stage in wireless, as carriers deploy always-on, Internet protocol (IP)-based networks that support higher data rates and add significant voice capacity.

² Sprint PCS Industry Analyst Presentation, June 16, 2002.

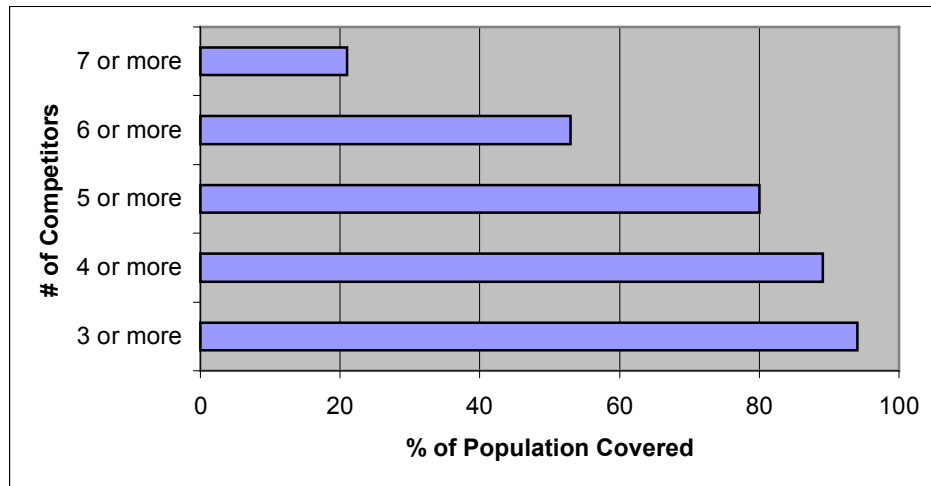
Exhibit 2 Wireless Industry Historical Snapshot



II. The Communications Industry's Most Competitive Segment

Federal Communications Commission (FCC) Chairman Powell has characterized the wireless industry as “leading the way” in competition.³ In the wireless market, 94% of consumers can choose among three or more carriers and 76% can choose among five or more carriers.⁴

Exhibit 3 % of Population Covered by Multiple Competitors



Wireless is the only sector whose customers, in the past three years, have seen *all* of the following:

- Expanded choice of service providers
- Lower service prices
- Expansion of affordable national service plans with free roaming and long-distance
- Continued high levels of investment in network coverage and capacity to meet increases in subscriber growth and uses
- Continual advancements in enhanced features, devices
- A more real-time activation process

Most other sectors fail to hit the mark in one or more of these areas. Exhibit 4 charts the progress of wireless compared to other sectors of the communications industry.

³ ZD Net News, “New FCC Chairman Puts Markets First”, February 5, 2001.

⁴ Federal Communications Commission Seventh Annual Report and Analysis of Competitive Conditions with Respect to Commercial Mobile Services. July, 2002.

Exhibit 4 Wireless Compared

Industry Sector	Competitive Status and Direction	Investment Status	Pricing 12/97-12/01 ⁵	Customer Satisfaction
Long Distance	Second-most competitive sector, though hurting in a major way led by Worldcom bankruptcy	Capacity glut. Investment decreasing 10-20% in 2002	-12% 1997-2001, but only 1.8% decline in 2001	Many customers find service confusing. Unhappy with minimum charges for discount rate plans
Local Telephone	CLEC business has largely failed. Residential competition developing slowly. Access line growth has been slowing	Slow evolution to next generation IP networks that would make market more competitive	15% increase 1997-2001; Last two years have seen steepest increases	Generally good
Cable	Some competition from satellite. Fiascos such as Excite@Home	Industry has been heavily criticized for slow upgrade	Has increased 13% since 1997	Industry is notorious for rate increases, poor customer service, slow network upgrade. As example, AT&T-Comcast merger being opposed in many communities
ISP	Near commodity service for dial-up. Broadband service perceived as expensive. Slower adoption than anticipated	Leading ISPs such as AOL have slowed rollout of broadband due to competitive threat	Starting to creep up; broadband perceived as expensive	Varies by provider; Growing pains for cable modem and DSL providers
Wireless	Increasingly competitive. 80% of U.S. population can choose from 5+ providers	Only industry sector to not experience major network investment falloff	Prices have decreased 33% 1997-2001	83% of wireless customers are satisfied with their wireless service ⁶ Churn rates stable or dropping.

⁵ Bureau of Labor Statistics, per FCC Report, page C-11.

⁶ Yankee Group 2002 Mobile User Survey. Used with permission.

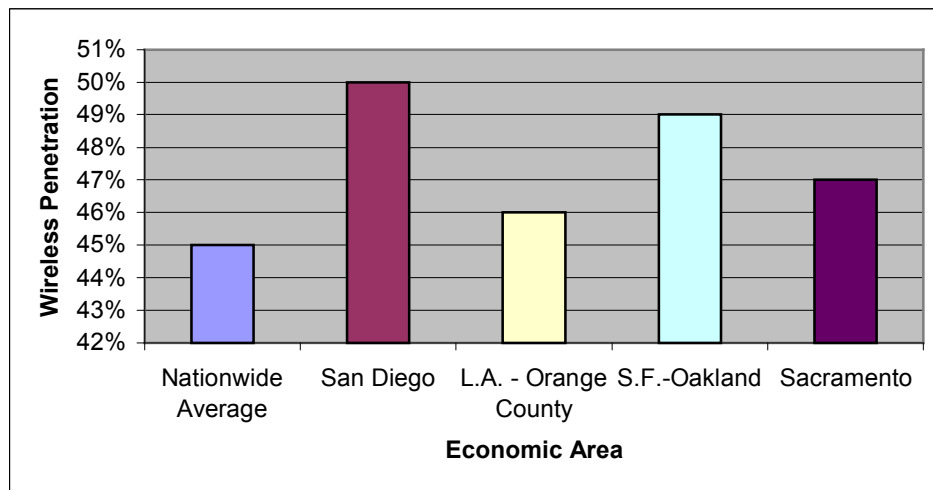
The consumer benefits of a competitive market are evident. From year-end 1998 to year-end 2001⁷:

- Wireless penetration has grown from 25% to 45%
- Prices have decreased by more than 30%
- Average usage has more than doubled
- The average bill has only increased by 20%
- Consumers are adopting enhanced services at a greater rate:
 - Short message service (SMS) now exceeds 10% of the subscriber base
 - there are about 3 million wireless data users
 - mobile email service such as Blackberry have attained great success, and in fact are used by many government officials

California is a Center of the Wireless Communications Industry

The wireless industry has proven to be especially vibrant in California. The FCC tracks wireless penetration in 172 Economic Areas (EAs) across the 50 states as defined by the Department of Commerce. As Exhibit 5 below shows, wireless penetration in all four California EAs is above the nationwide average of 45%⁸.

Exhibit 5 Wireless Penetration in California Compared to National Average



California has emerged as the center of the U.S. wireless communications industry, with the most workers and the most headquarters of publicly listed wireless companies (28%). California hosts more than 2,000 wireless companies, nearly double the 1,100 in Texas, which has the second-highest concentration among U.S. states. The wireless industry represents 60,000 California jobs, for a total payroll of \$3.5 billion. Within the state, Los Angeles and neighboring areas have the greatest number of wireless firms and employees among California regions, or about 800 firms and 22,500 employees. The San Francisco Bay Area has received the most venture capital in the state for wireless companies, nearly \$4 billion over 8 years. The San Diego is also a wireless hotbed. It is the headquarters of Qualcomm, which invented CDMA technology that is the major force behind digital wireless communications and the next phase of mobile evolution, 3G networks.

⁷ Sources: CTIA Wireless Market Indices; FCC Competition report; Mobile Ecosystem Research

⁸ FCC Report, Appendix C

Qualcomm is to San Diego what Microsoft is to Seattle. The company has spawned dozens of spin-offs that have led to additional jobs in San Diego and the area's growing reputation as the "wireless canyon". San Diego has 484 wireless employees per 100,000 residents, the highest concentration in the state. Nokia, Siemens, Sony-Ericsson, Kyocera, and Novatel all have offices in the San Diego area, drawn there by Qualcomm and other area wireless companies⁹.

The vibrant and diverse California economy is also one of the reasons why hot new wireless products and services are first made available in California. Metricom, which offered the first truly high speed wide area wireless data service, launched initially in three areas: the Microsoft campus in Redmond, WA, in downtown San Francisco, and in parts of Silicon Valley. Verizon Wireless, Sprint PCS, T-Mobile, and AT&T Wireless have all targeted major California cities for the first wave of their 3G service launch, which involved major network upgrades. The enhanced networks feature data speeds of 30-144 Kbps, and more than double voice capacity.

III. Benefits to Consumers

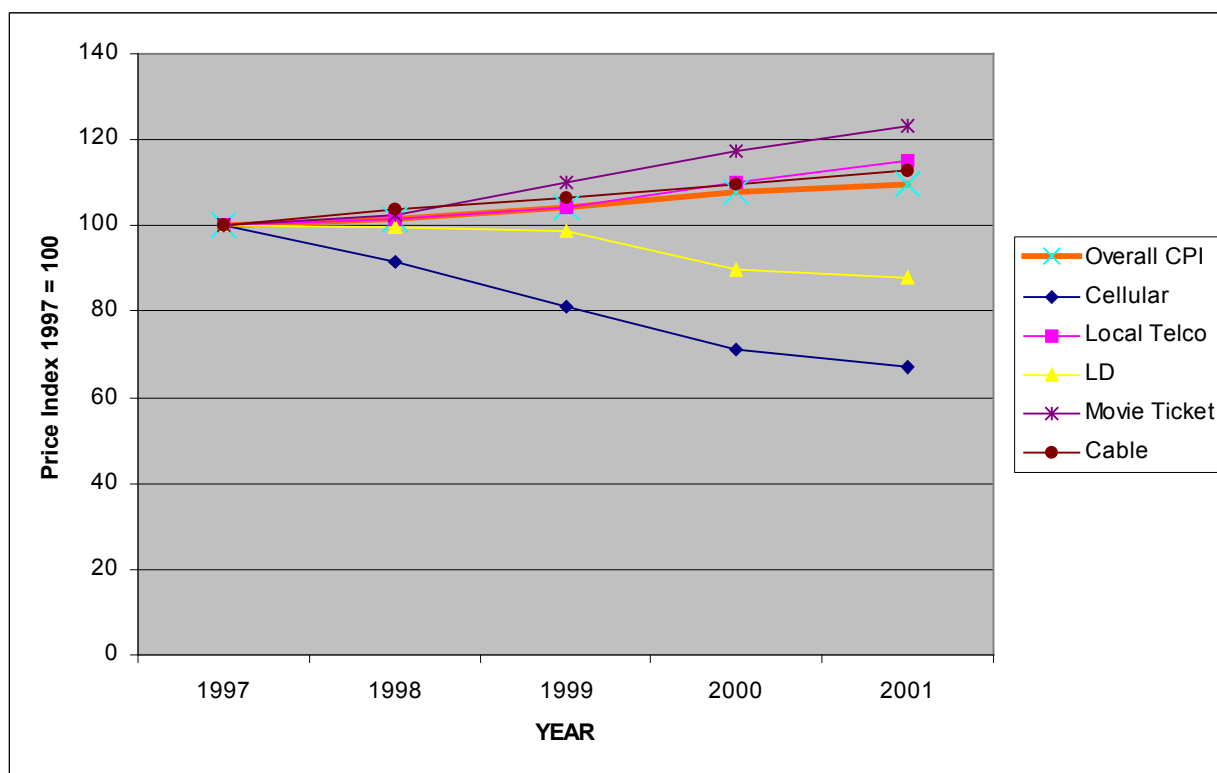
Consumers have reaped greater benefit from wireless services in the past three years than in the entire 20-year history of wireless communications. Wireless is a mainstream consumer service, and is becoming an integral part of the wireless communications fabric. Wireless is closing on representing nearly 20% of global circuit switched telecom traffic.

The growing competition in wireless services has resulted in a dramatic reduction in wireless service prices. Prices have dropped by more than 30% since 1997, and by more than 50% since multiple carriers entered the market in the mid-1990s. This decline in wireless prices is even more impressive when compared to other communications market segments, as Exhibit 6 shows. In the most recent JD Power and Associates Residential Long Distance Customer Satisfaction StudySM, wireless users reported displacing 38% of long-distance calls in 2001, up from 30% in 2000.¹⁰

⁹ California economy data is taken from O'Melveny Consulting/San Diego Regional Technology Alliance, referenced in a June 24, 2002 *Los Angeles Times* article.

¹⁰ J.D. Power and Associates 2002 Residential Long Distance Customer Satisfaction StudySM, press release July 18, 2002.

Exhibit 6 Change in Consumer Price Index Across Several Industries¹¹



There is solid evidence of high price elasticity among consumers of wireless services. While prices dropped by more than 30% from 1997-2001, average usage per subscriber has more than doubled, from under 200 minutes per subscriber per month to about 400 per month. Even though the U.S. is sometimes perceived as “behind” Europe because wireless penetration here is lower than in many European countries, average subscriber usage is substantially higher.

Even as usage has been steadily increasing, the average bill has not. Average revenue per unit (ARPU), which is the common measure for the wireless subscriber’s bill, is about \$47 per month. That number represents an increase of about 20% since 1999 (although it is about the same as it was in 1997) – far less than the concomitant increase in usage.

Less Rather Than More Confusing

In most industries, proliferation of competition has resulted in an increasing array of confusing service plans with lots of fine print. But wireless service plans have become less confusing than they once were, due to:

¹¹ Sources: National Association of Theater Owners; Ernst & Young Survey; FCC Competition Report, Appendix C; Kagan World Media

- *Industry consolidation.* The wireless industry has historically been very fragmented. But after a wave of consolidation over the past three years, six providers offer ostensibly national services, and collectively have a market share of about 85%.
- *Introduction of national service plans.* All of the major carriers have introduced “national” rate plans, which are usually free of roaming surcharges and often include long-distance as well. An increasing number of customers are signing up for these plans. Also, the least expensive “one rate” plan, which three years ago was close to \$100, is now available for \$30.
- *“All you can eat” plans.* Companies such as Leap Wireless and Metro PCS have introduced “all you can eat” service plans for as low as \$29. These plans are meant for primarily local market coverage, with long-distance available on a pre-paid basis. Response has been highly positive. Leap customers average 1230 minutes per month.

Wireless Customers Are Satisfied

Contrary to popular cocktail party discussion where people love to gripe about coverage holes, most wireless users are satisfied with their wireless service, as indicated by several recently conducted surveys of wireless consumers:

- In a survey conducted by the Consumer Electronics Association in October 2001, 80% of wireless phone users said they were “very or somewhat satisfied”¹². A telephone survey conducted by the American Association of Retired Persons (AARP) two years earlier yielded very similar results¹³.
- The Yankee Group’s 2002 Mobile User Survey of 2100 households with wireless service reveals that:
 - 82% of users are “somewhat or very satisfied” with their **wireless service**.
 - 78% believe they are getting “good” to “excellent” **value for their money**
 - More than 80% believe their wireless coverage is “good” to “excellent”¹⁴

Wireless coverage continues to improve as carriers continue to invest heavily in building out and fortifying their networks. Because it is a radio-based technology, wireless coverage will never be perfect. Coverage is affected by numerous variables outside of a carrier’s control, such as line-of-sight, weather, and various geographic and topographical factors. Also note that many communities have adopted very restrictive zoning laws, which have restricted the optimal deployment of cell sites.

Understanding that radio is fundamentally an imperfect technology, most wireless customers are generally satisfied with their service, as Exhibit 7 shows.

¹² Wireless Device Usage Report, Consumer Electronics Association, October 2001.

¹³ Data provided by the Roper Center for Public Opinion Research, University of Connecticut

¹⁴ Yankee Group 2002 *Mobile User Survey*. 2100 Households National Sample, 215 in California. Used with permission.

Exhibit 7a Wireless User Satisfaction
Roper Center, October 1999

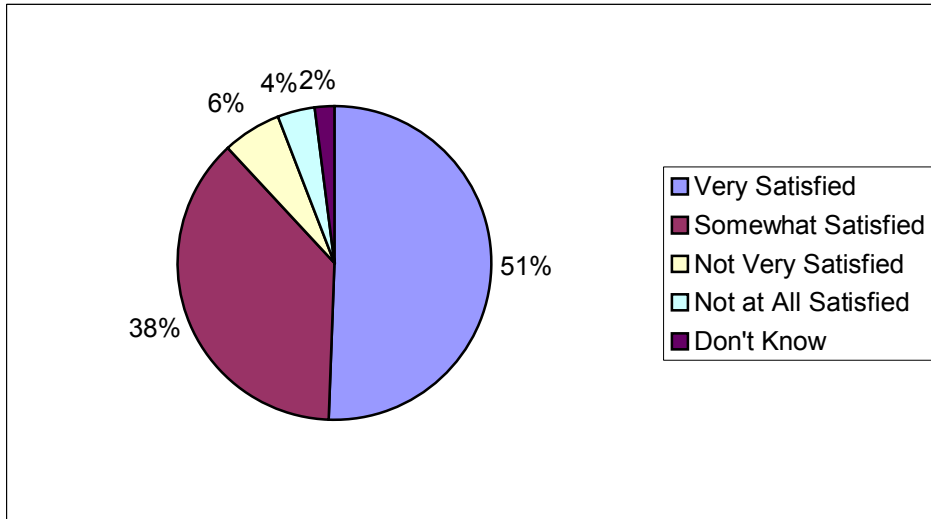


Exhibit 7b Wireless User Satisfaction
Consumer Electronics Association, October 2001

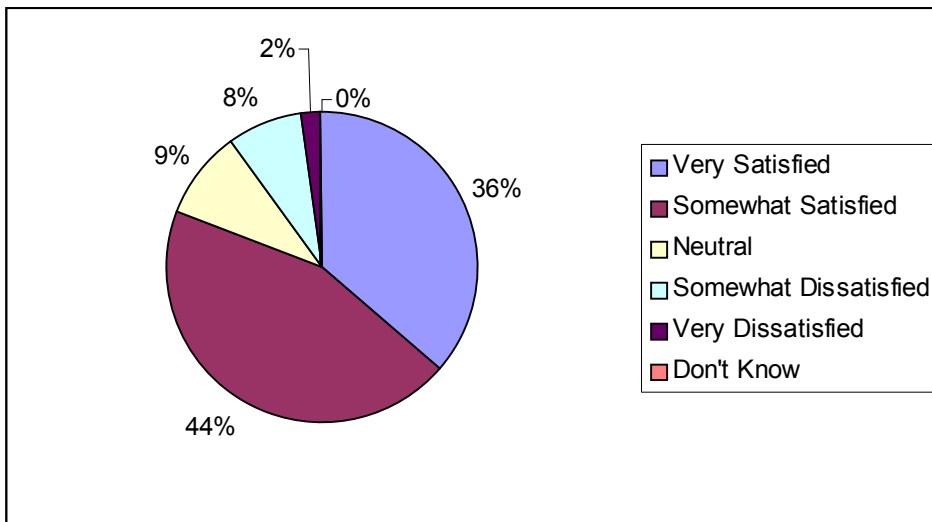


Exhibit 7 (c) Are You Satisfied With Your Wireless Service?
Yankee Group 2002 Mobile User Survey

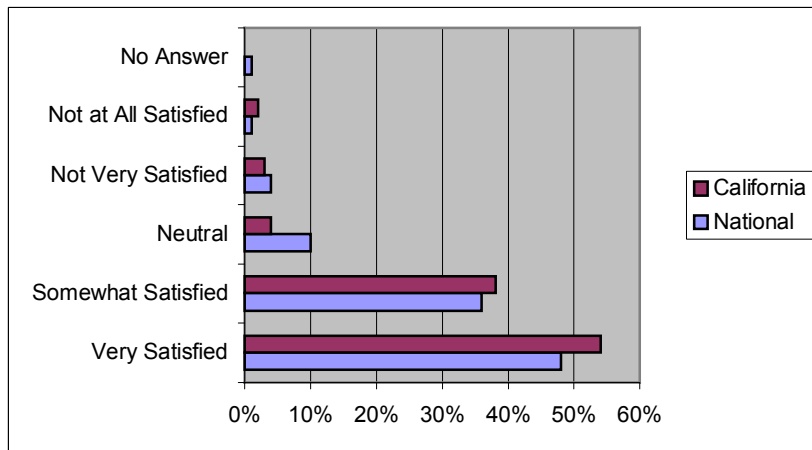


Exhibit 7 (d) How Would You Rate Your Wireless Coverage?
Yankee Group 2002 Mobile User Survey

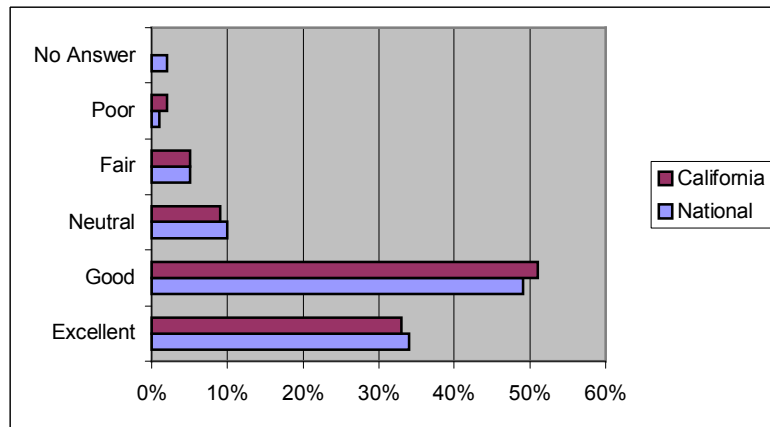
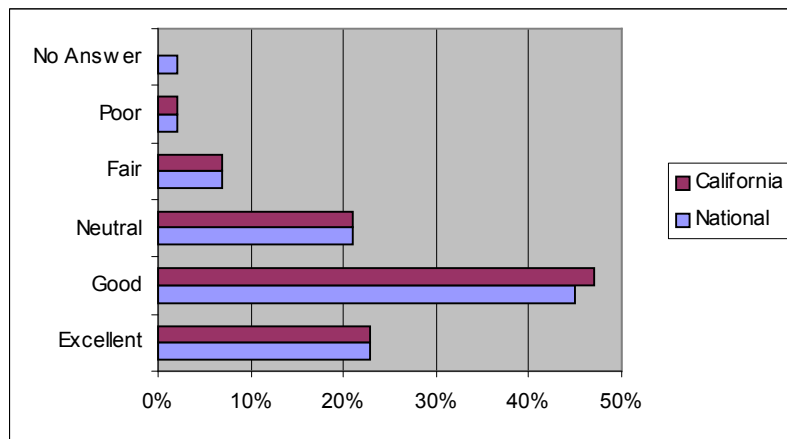


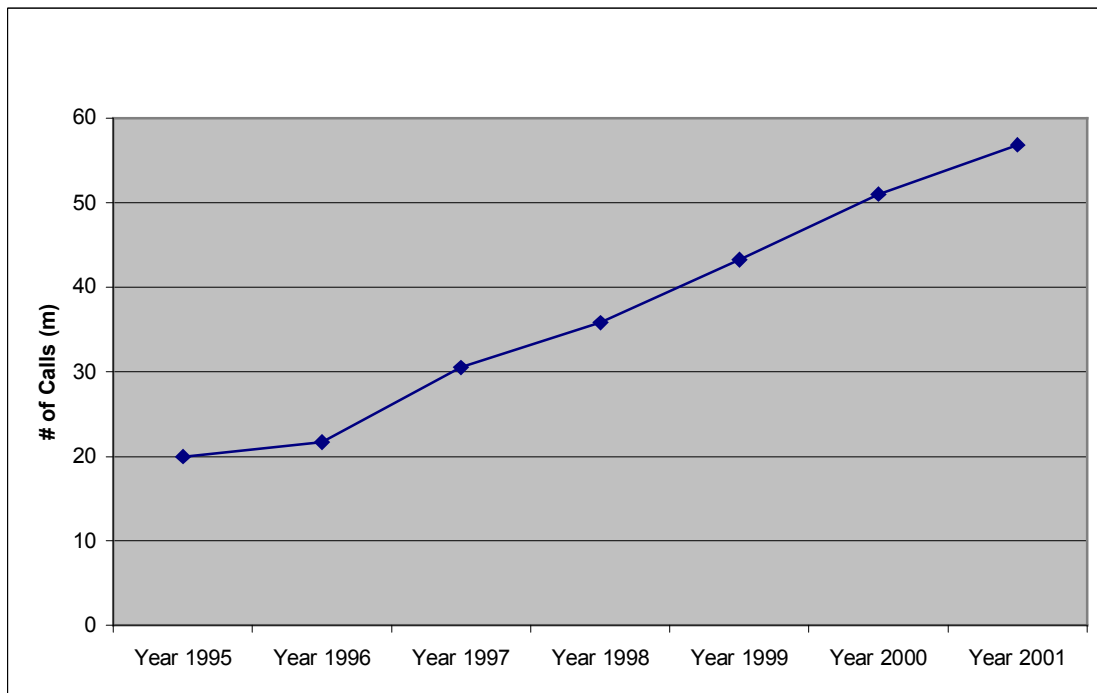
Exhibit 7 (e) How Would You Rate Your Wireless Service “Value for Money”?
Yankee Group 2002 Mobile User Survey



Wireless is Also Critical for Safety

Wireless is about more than merely convenience. It has also become an integral part of our safety and security infrastructure. According to the Cellular Telecommunications and Internet Association (CTIA), more than 56 million calls to 911 were made from wireless phones in 2001 – more than double the number that were made in 1997. That works out to 155,000 calls per day¹⁵ that are helping to save lives, report crime, and warn about erratic driving behavior.

Exhibit 8 Number of Annual Wireless Calls to 911



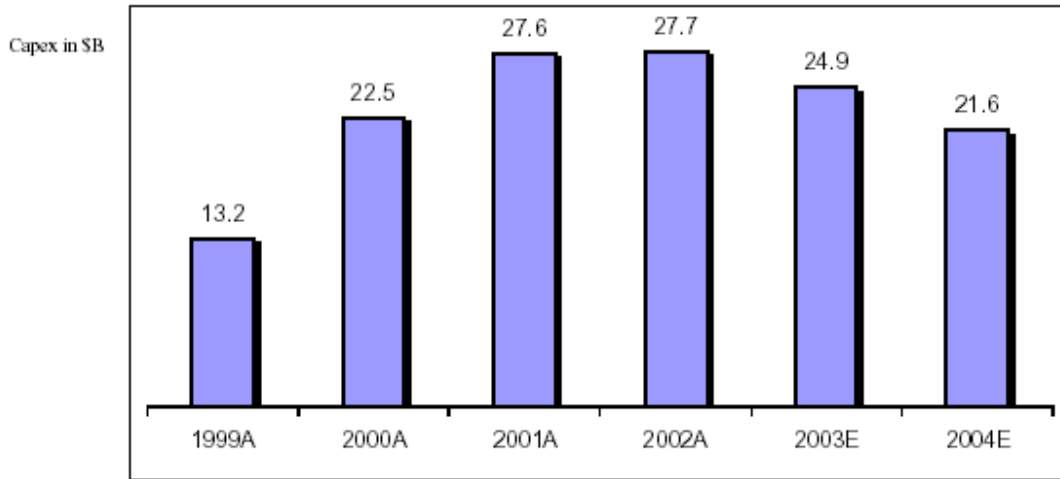
IV. High Levels of Network Investment Continue

Supporting surging subscriber growth and increased network usage costs money. Wireless operators have been investing in their networks at a furious pace. According to Morgan Stanley research, we are at the peak of wireless network capital expenditures (“capex”). As the Exhibit shows, wireless operators will invest more than \$25 billion this year¹⁶, \$3 billion of it in California. As a measure of the priority that the operators are placing on network investment, capex as a percentage of revenues is at its highest level in years.

¹⁵ CTIA Press release, May 22, 2002.

¹⁶ Morgan Stanley equity research, “Long Run to Profitability”, June 2002.

	1999A	2000A	2001A	2002A	2003E	2004E
Industry Capex (\$B)	13.2	22.5	27.6	27.7	24.9	21.6
% Change		71%	23%	0%	-10%	-14%
Industry Revenues (\$B)	44.8	62.3	76.5	87.5	97.0	105.7
% Change		39%	23%	14%	11%	9%
Capex/Revenues	29%	29%	36%	32%	26%	20%



Source: Morgan Stanley Research
E=Morgan Stanley Research Estimates

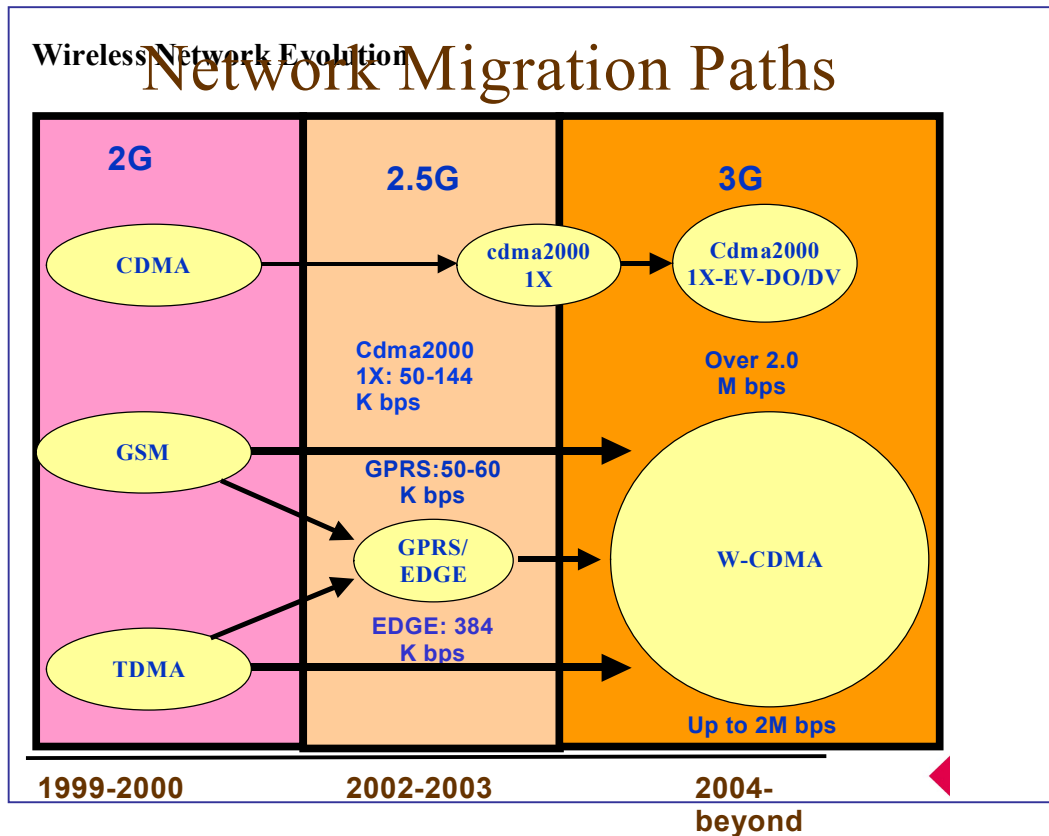
This \$25+ billion in network investment this year is divided into three baskets – all focused on supporting the surge in network usage and the provision of advanced new services:

- *Network expansion and fortification.* Continued high levels of subscriber growth fuel demand for improved coverage.
- *Network capacity.* Wireless operators are expanding network capacity to accommodate the surge in average usage per subscriber.
- *3G Services.* Exciting technology developments are allowing the wireless operators to upgrade their existing networks with greatly improved wireless data capability. The main characteristics of the first phase of this buildout (referred to commercially as GPRS and 1X services) include:
 - The overlay of an IP network for wireless data transmission. These “always on” networks increasingly resemble the wireline internet infrastructure
 - Expansion of data speeds to an average of 30-50 Kbps (equivalent to landline dial-up), with bursts of up to 144 Kbps
 - Increase in voice network capacity by a factor of approximately 2x

It remains important for wireless operators to continue to improve network coverage, increase capacity, and roll out new data capabilities to meet growing subscriber demand.

The introduction of 3G services this year by the major operators is the first major step toward the next generation wireless network. The promise 3G includes even faster data speeds – from 144 Kbps to 2 Mb – and voice network capacity improvements of up to 5x. This will be required to accommodate expected subscriber usage and penetration in the 2005 timeframe.

Exhibit 9 Wireless Network Evolution



There is also an intensified effort in Washington to expand the availability and adoption of broadband services – the so-called “Broadband Initiative”. Wireless could become an integral part of this effort. Next generation wireless networks offer the potential for data speeds roughly equivalent to today’s cable modem/DSL services, and might be easier to deploy in certain geographies. Part of the mix includes the deployment of wireless LAN hotspots, based on the 802.11b standard. VoiceStream and Sprint PCS have invested in wireless LAN companies, and it has been reported recently in the *New York Times* that several major wireless operators are developing a plan to deploy a national 802.11b network.¹⁷

¹⁷ Fierce Wireless, July 16, 2002
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V. An Evolved Purchase Experience

The rapid growth of e-commerce has altered both buying behavior and the buying experience. Consumers have become accustomed to the convenience and immediacy of buying goods and services on-line, whether it's a movie ticket or a fridge.

Communications and information services have kept pace with the electronic revolution. Consumers can order a pay-per-view movie with their remote control and see the charges on their next cable bill. No human interaction or signature is required, which keeps the cost of such services competitive. Or if they're having computer problems, they can allow someone at a customer care center to take control of their mouse for a remote diagnosis.

The process of signing up for wireless services has become remarkably more consumer-friendly as well. In the early days of cellular, potential customers were required to complete a lengthy application form and then wait several days while this was processed and a credit check conducted. Today, customers can sign up for wireless service in the following ways:

- In-person at a wireless carrier store or other retail distribution outlet
- Via the telephone
- Over the internet, through either a carrier site or an e-commerce retailer such as Amazon.com
- By "breaking the seal" after buying a "phone in a box" off the shelf from a mass market retailer, such as Wal-Mart or Best Buy

Fewer activations require completing a paper-based application now. The only time impediment is the credit check process, which has been winnowed from several days to a few minutes.

Increasingly, subscribing to cellular service is like any other consumer product. At Best Buy or Wal-Mart, a customer can choose a phone "in a box" off the retail shelf, bring it home, and activate service by calling a toll free number. The process works similarly when ordering a phone/service over the Internet. In a survey conducted by the Consumer Electronics Association, 15% of wireless users reported buying their wireless phone at a warehouse/electronics/office supply store. Five percent bought on-line¹⁸. Increasingly, changes in service, activation of new features, or downloading applications are performed over the telephone (landline or "over the air" on a wireless phone) or electronically over the Internet.

No matter where or how wireless service was purchased, the primary ongoing customer care relationship is generally centralized with the wireless carrier. Wireless subscribers have the option to receive paper-based bills, or, like many other recurring services, can have monthly charges automatically charged to a credit card or debited from their bank account. With most carriers, subscribers can also view their service profile, usage, and bill on-line.

¹⁸ Consumer Electronics Association, *Wireless Device Usage Report*, October 2001, page 46.

The “off the shelf” experience is even more prevalent with pre-paid services, which represents about 10% of the subscriber base today. With pre-paid, no credit check is required. The principal is similar to pre-paid phone cards, except the user must purchase a device as part of the package.

Impact on Enhanced Services and M-Commerce

The revolution in e-commerce has allowed consumers to buy just about anything from their PC. The next major development in e-commerce is extending the experience to mobile users and devices – the true “edge network”. This truly fulfills the “anytime, anywhere” promise of wireless communications. The value add of “m-commerce” moves consumers even further down the continuum of immediacy and ease of use.

The evolution of wireless networks and services is also resulting in an exciting new world of enhanced features being made available to subscribers. Some features, such as short message service (SMS) or wireless data plans, involve a monthly recurring charge. An increasing number of features, such as downloading ring tones or screen animations, rely on a “pay per use” model. The management of these features is very dynamic. In a typical month, a subscriber might make several “pay per use” purchases, and might also make some adjustments to, for example, the SMS message allocation. These features can be accessed via the phone and activated over the air, or they can be added via the subscriber’s personal profile on their carrier Web site. Also note that the charge for many of these pay per use features is often very small, perhaps as little as \$0.10.

Consumer expectations of immediacy and convenience are very high in the age of e-commerce. Just as they can order a book or a fridge on-line, in only a few minutes, so too will they expect a simple process with their wireless service.

It should also be noted that the wireless carrier is becoming the gateway, but not necessarily the purveyor, of exciting new content that customers will want to access via their wireless device. For example, in Japan, NTT DoCoMo has signed up more than 30 million customers to its iMode wireless data service. Through the iMode web site, or via the screen of their wireless phone, users have access to literally thousands of mobile-centric content sites. In order to make this work, NTT DoCoMo has set up a sophisticated micro-payment infrastructure, where revenues are shared with the content provider and subscribers know that all charges will be centralized on their monthly bill. This works well from a customer perspective, because they would not want to receive separate bills from the dozens of content providers whose features they might be accessing in a given month. Wireless operators in North America are in the midst of developing a similar “back office” infrastructure.

This argument extends even further when one considers the possibility that the wireless phone might be used as a “debit card” for various point of sale purchases. Oft-mentioned examples include the ability to buy a soda from a vending machine, or paying for gas by typing in an authorization code on a wireless device and then seeing the charges itemized on the monthly wireless phone bill.

Clearly, in order for next generation wireless services and features to be adopted, we need a billing and payment infrastructure that is flexible and easy to use. It should leverage the unique capabilities of a mobility device and service in evolving era of e-commerce.



Appendix

Mark Lowenstein Managing Director Mobile Ecosystem

Mark Lowenstein is recognized as one of the leading authorities in the wireless and mobile communications industry. Mr. Lowenstein spent ten years with the Yankee Group, where he founded and led the company's top-ranked global wireless practices. As Executive Vice President, he supervised a team of more than twenty analysts worldwide, authored dozens of influential reports, and headed large-scale strategy consulting projects. As a member of the Yankee Group's executive management committee, Lowenstein oversaw the growth of the company's Canada, Latin America, and Asia-Pacific practices, and led early stage electronic content and commerce initiatives.

Most recently, Mr. Lowenstein was Chief Industry Strategist at Informio, which develops enterprise voice solutions for mobile users. His role there included corporate strategy, industry evangelism, and partner development.

Mr. Lowenstein is a keynote speaker at major industry events worldwide and is frequently quoted in the print and broadcast media. As a recognized thought leader, Mr. Lowenstein writes a monthly opinion column, "Mobile Mindset", for *Wireless Week*. He was also selected to be a judge in the December 2000 Lycos business plan competition.

Mr. Lowenstein serves on numerous corporate advisory boards. He is an adjunct professor at Tufts University, where he teaches "The Business of Wireless Communications". Mr. Lowenstein has been invited to provide testimony to the FCC and has been retained as an expert witness in several cases pertaining to the wireless industry.

Mr. Lowenstein holds a B.A. from Tufts University and an M.A. in International Communications and Technology Policy from the Fletcher School of Law and Diplomacy. He lives with his wife and two children in Wellesley, Massachusetts.