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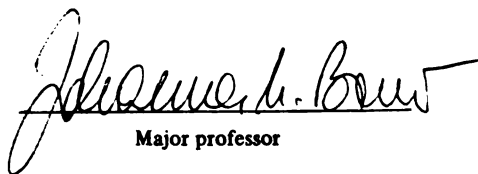
Entry strategies of Personal Communications Services
providers in the U.S. Cellular Communications market

presented by

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**ENTRY STRATEGIES OF PERSONAL COMMUNICATIONS SERVICES (PCS)
PROVIDERS IN THE U.S. CELLULAR COMMUNICATIONS INDUSTRY**

By

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ABSTRACT

ENTRY STRATEGIES OF PERSONAL COMMUNICATIONS SERVICES (PCS) PROVIDERS IN THE U.S. CELLULAR COMMUNICATIONS INDUSTRY

By

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Prompted by technology advances and industry demand, the Federal Communications Commission decided in 1994 to allocate more spectrum for cellular communications in the U.S. and to allow more competition in the industry. Licenses have been awarded to provide digital cellular communications in the 1900 MHz frequency band called Personal Communications Services. The introduction of PCS has tremendously transformed the industry which promises high growth and fierce competition. The goal of this paper is to analyze the competition in the newly reformed industry and to determine what kind of entry strategies are pursued by PCS operators. This study is based on a structural and a competitor analysis using Porter's framework and is supported by empirical data. Despite the limitations of strategy forecasts, this study identified a great potential for differentiation and niche strategies. As the industry opens to the mass market, customer focus will be the key.

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INTRODUCTION

This paper analyzes the evolution of the wireless communications industry resulting from the introduction of PCS. More particularly, it is aimed at giving a perspective on the competitive strategies being developed by the different players in the field. The overall goal of this paper is to provide the reader with tools to understand the evolution of the market and determine which strategies are likely to permit survival in this highly competitive but fast growing market.

This study aims at answering two research questions. First, how is the new competitive landscape in the cellular services industry transformed by the emergence of PCS? Second, what kind of entry strategies are pursued by the PCS operators?

Several reasons account for my interest in these questions. PCS is the emerging segment of the wireless telecommunication industry. With the first licenses granted in 1994 for narrowband and 1995 for broadband, PCS was first made commercially available in November 1995 in the Washington DC and Baltimore regions by American Personal Communications (an affiliate of Sprint Spectrum). Since then two more operators have commercialized their services: Bellsouth Mobility DCS and Western Wireless Corporation

(under the commercial name of Voicestream). However, many PCS licensees are expected to launch their services by the end of 1996 and the beginning of 1997.

The PCS industry is expected to experience an extraordinary growth in the coming years. In a context of intensified competition, convergence of technology and increased mobility stirred by the New Telecommunication Act, Personal Communication Services will revolutionize the wireless communications industry.

With new spectrum resources and obligations to provide services using digital technology, PCS will enter in competition with the “traditional” cellular industry. Encompassing a wide variety of communication services including mobile telephony, messaging and paging, PCS will create new services as well as compete with existing ones.

Various strategies are being pursued. What is certain is that PCS operators, having invested millions in bids for licenses, will seek maximum reward for the stakes they have taken. However, it is also certain that the so-called “traditional cellular operators” will not passively watch the entry of these new PCS competitors. The cellular industry will undergo an important evolution too.

As a result, studying PCS competitive strategies entails analyzing cellular as well, since the evolution of these two markets are very interrelated. The fact that some players are involved in both markets at the same time will make the evolution of PCS and cellular even more intertwined.

Finally, for a new industry promising an enormous growth in the very near future, it is critical to understand its dynamics. Cellular will compete with wireline services but also create new usage. As a result, some people say that the wireless market will grow so much that there will be room for everybody to compete. However, most likely not all of the

competitors will survive. This paper will enable the reader to understand how the actors will compete and what will happen.

This analysis is divided in five chapters. In chapter 1, I will describe the cellular communications market, position the new PCS entrants relative to the existing cellular providers, and lay the ground for the competitive analysis. In chapters 2 and 3, I will analyze the forces of competition in the market and highlight the issues specific to an emerging industry. In chapter 4, I will look at the entry strategies that may be undertaken by the PCS providers in this highly competitive industry. Based on the structural and market analyses, I will assess the likelihood of such strategies and their chances of success. Finally, I will make a limited competitor analysis and assess the competitive strategies in the light of the characteristics of two strategic groups in chapter 5. Two case studies will illustrate this analysis.

Michael Porter's Competitive Strategy and Competitive Advantage theories are used as a theoretical framework throughout this study.

Chapter 1

THE WIRELESS COMMUNICATIONS MARKETS

This section gives a broad overview of the development of wireless communications. Far from being a thorough analysis of the market, it is aimed at presenting PCS, the emerging segment of the industry. I assume here that the reader is knowledgeable of the wireless communications services industry, yet will benefit from a brief reminder of important facts and recent developments in this field. Moreover, I will outline some characteristics of the industry —such as the nature of the difference between cellular and PCS— that are critical to understanding the competitive analysis that will follow.

1.1. Evolution of wireless communications

1.1.1. Early history

The origins of radio or “wireless” communications rest in the developments of theoretical physics of the 19th century. Maxwell’s electromagnetic wave theory, following earlier hypotheses from Faraday and Newton, was confirmed by Hertz in the late 1880’s. In the late 1890’s Marconi looked for uses of wireless communication in wireless telegraphy. The invention of the vacuum tube by De Forest in 1906 enabled waves to carry voices as

well as telegraph signals. In the 1920's the police and fire departments started using the first mobile radio systems. In 1935, Armstrong's invention of FM radio technology was a watershed in the history of wireless radio communications.

The use of mobile radio systems then slowly spread to the private sector. In 1946, AT&T introduced a new mobile radio technology (MTS) which was the first to provide interconnection to the PSTN. Its usage grew steadily in the 1950's although it was slowed by a lack of capacity. In the 1969, AT&T introduced a redesigned system called IMTS yet this did not solve the capacity issue. In 1970, AT&T presented the FCC with a plan to provide services based on a concept known as **cellular telephony**, conceived by Bell Laboratories in 1947. Whereas mobile telephony used one powerful transmitter to send messages throughout large regions, cellular telephony uses many low-power, interconnected transmitters to send messages within smaller geographic areas known as cells. The idea of the technology is to expand the capacity of the system thanks to **frequency re-use**, meaning each cell has its own transmission equipment and channels. When a user moves from cell to cell, the call is re-routed thanks to a technique called **handoff**.

1.1.2. Emergence of cellular communications

In the 1970 the FCC allocated radio frequencies for mobile telephony use, and with the development of large-scale integrated circuits in the early 1970's, cellular communications became technically feasible and spectrally efficient. In 1975, the FCC allocated 115 MHz of spectrum of the 900 MHz frequency range to mobile communications and proposed to

allow one carrier per market. In 1977, the FCC authorized AT&T and American Radio Telephone Service (ARTS) to develop experimental cellular mobile systems respectively in Chicago and the Baltimore-Washington area but cellular service was first provided in 1983, exclusively by AT&T in Chicago.

In 1982, the FCC set up rules for the cellular markets by dividing the country into 734 territories and permitting no more than two companies to operate in each region. One of them would be the telephone company providing wireline telephone service in the market, and the other one would be anyone else. With the divestiture of AT&T in 1984, all the licenses reserved for wireline companies were awarded to RBOCS or larger independent telephone companies (e.g., GTE, Sprint, Contel Cellular). The second licenses went to a very diverse group of companies from different origins (paging, broadcasting, cable, long distance, press, etc.).

Cellular communications experienced an important growth yet their development was hindered by several factors. Among them were the problem of spectrum allocation, a poor quality of service particularly in urban areas, and last but not least, the limits of the duopoly system favoring prices above the competitive level.

1.1.3. Introduction of PCS

With only two providers per market, competition in the wireless telecommunications services was considered insufficient. Scarcity of spectrum being the primary barrier to

entry for potential competitors to the cellular operators, the FCC decided to take steps to encourage competition.

In 1993, the FCC devised a plan to reallocate spectrum as a provision for a new class of wireless services called Personal Communications Services. The plan proposed the allocation of 120 MHz of spectrum for broadband PCS licenses to be auctioned off to the highest bidder. Initial plans allowed for up to seven PCS providers, with varying spectrum blocks, in each market.

This decision also responded to pressures from the industry which wanted better access to the market through new licenses, and from the US equipment manufacturers who wanted to expand worldwide. As a matter of fact, the US had located its cellular services in a different spectrum band than Europe and Asia. The auctioning of PCS licenses was also motivated by the opportunity to generate funds to reduce the federal budget deficit.

In 1994, the FCC awarded ten national and 30 regional licenses for narrowband PCS which can be used to provide new services such as voice message paging, two-way acknowledgment paging and other data services. On December 5, 1994, the FCC began its first auction for broadband PCS licenses. Prior to the auction, the FCC divided the United States and its territories in 51 Major Trading Areas (MTAs) based on designations contained in the Rand McNally Commercial Atlas and Marketing Guide. Two PCS licenses were allocated to each MTA (A & B). Licenses in block A and B were auctioned in 48 MTAs; in the other three MTAs, only the block B license was auctioned. In those

three MTAs, the block A licenses had already been awarded under the commission's pioneer's preference rules. The auction for broadband PCS licenses was completed on March 13, 1995.

Within the 51 MTAs, additional licenses were auctioned off for 493 Basic Trading Areas (BTAs). Each of them generally corresponds to a single metropolitan area. The 1,972 licenses to be issued include about 1,000 in the so-called entrepreneur's block (Block C), in which limitations on eligibility apply and where special provisions were made to benefit "designated entities" —small businesses, women, minorities, and rural providers.

The auctions for block C licenses were closed on May 6, 1996 and 18 licenses that were defaulted on by two companies were re-auctioned in July 1996. Block D, E, F auctions are still being held.

PCS operates in basically the same way as cellular although in a different frequency. Whereas cellular operates in the 850 MHz range, broadband PCS operates in the 1900 MHz range. With a larger number of smaller cells, they operate at a lower power level and use spectrum more efficiently. Unlike cellular systems which started with analog technology, PCS systems have been digital from their inception. We will take a closer look at the characteristics of PCS later and emphasize the differences between cellular and PCS.

1.2. “Traditional” cellular communications

1.2.1. Not so “traditional” cellular

Technically, Personal Communications Services are cellular communications only they operate in a different spectrum band. This problem of how to distinguish adequately between PCs and cellular creates confusion in the industry. As a matter of fact, when people mention cellular, it is not clear whether they refer to the existing cellular communications in the 800MHz band or to the range of cellular communications including PCS —the cellular communications in the 1900MHz band. Furthermore, there is no single definition of PCS, and the distinction between PCS and cellular is an endlessly debated issue. Some claim that the distinction between PCS and cellular no longer exists while others present PCS as a watershed in the wireless communications industry. This makes it all the more difficult to understand what people are talking about. We will study this issue in more detail in the paragraph defining PCS.

In order to end this confusion, one could be tempted to oppose “traditional” cellular communications in the 800MHz to the “new” PCS communications. However, this would mean mistakenly assuming that the cellular communications that were developed prior to the new generation of PCS are not evolving. Initially based on analog technology —unlike PCS which are digital from their inception— cellular carriers urged by the new competition are migrating to digital. As a result, we better talk about the “new” cellular communications rather than the “traditional”.

We will tackle this issue again as we define the industry for the purpose of the analysis in Porter's framework. In this paper, the cellular communications industry will refer to both cellular and PCS. However, cellular as opposed to PCS will usually refer to the 800MHz cellular. When clarification is needed we will mention "existing" cellular or "incumbents", to differentiate them from the PCS newcomers.

1.2.2. Technology

1.2.2.1. How cellular works

In an industry report, the U.S. International Trade Commission makes a very simple description of a cellular system. It is composed of three parts: cellular phones, radio base station equipment and one or more mobile telephone switching office (MTSO). The subscriber uses the phone to place or receive phone calls over the system, while radio base station equipment at each cell site acts as an interface between the phone and the MTSO. The MTSO is the brain of the system, coordinating traffic among cell sites and switching calls to connect mobile subscribers with other mobile subscribers and with the public-switched wireline telephone network. Each cell is equipped with a low power transmitter/receiver known as the base station. Depending on topography and population, the radius of a cell can range from 2 to 10 miles. Typically, the base station of each cell is connected to a MTSO by means of either conventional telephone lines or microwave technology. The MTSO is a central switching point that monitors signals and hands off calls to the next cell if the subscriber crosses the border. When the subscriber moves outside of the home system's area, it is called roaming.

1.2.2.2. Technology and standards

First generation cellular telephony uses analog technology. The world's most popular cellular telephone systems are AMPS (Advanced Mobile Phone System), developed in the United States, and TACS (Total Access Cellular System) developed to serve various European countries. The American AMPS is an 800 MHz system. The multiple access method used by these systems is FDMA (Frequency Division Multiple Access).

In the late 1980's and early 1990's, analog cellular experienced capacity shortages in certain metropolitan areas, reducing transmission quality. Cell-splitting solved the quality issue in most places but the capacity remained an important concern. To address this problem, cellular is migrating from analog to digital technology. This technology increases transmission speed, protects transmission integrity and allows service providers to offer an expanding new array of data services. To manage the transition from analog to digital, some systems have been designed to use both analog and digital transmission.

In the US, two competing digital technologies for cellular communications have emerged: TDMA (Time Division Multiple Access) and CDMA (Code Division Multiple Access). A derivative of TDMA technology incompatible with US standards has been implemented in the European global system for mobile communications (GSM) digital network.

1.2.3. The cellular market

1.2.3.1. Trends

Table 1 - Cellular market trends

	1994	1995	Evolution
Subscribers	24, 134, 421	33, 785, 661	+ 40%
Market penetration	9.55%	13.38%	+3.83%
Number of cells	17,920	22,663	+ 26.65%
Subscribers per cell	1,256	1,490	+ 18.63%
Average monthly bill	\$56.21	\$51	+ 9.27
Average length of call	2.24 minutes	2.15 minutes	- 4%

Source: CTIA.

The cellular market has experienced an enormous growth in 1995. The market penetration of cellular has reached 12.7% and has more than doubled in two years. According to a survey from Donaldson, Lufkin and Jenrette, the market should keep growing. With 9 million more customers, cellular penetration should reach 16% of the population in 1996.

Another important trend is that while the number of subscribers is increasing, their average monthly bill is decreasing.

1.2.3.2. Players

There are three different kinds of cellular players e.g. independent local and long distance companies, RBOCS and all-wireless companies (Airtouch, 360 deg)

Table 2 - Ten biggest players ranked by number of subscribers

Company	1994	1995	Evolution
AT&T	2,790,000	3,900,000	+ 39.8%
SBC Communications	2,979,000	3,659,000	+ 22.8%
Bell Atlantic Nynex Mobile	2,340,000	3,356,000	+ 43.3%
GTE Mobilnet	2,339,000	3,011,000	+ 27.8%
Bellsouth	2,155,820	2,847,416	+ 32.8%
Airtouch Cellular	1,560,000	2,262,000	+ 45%
Ameritech	1,299,000	1,891,000	+ 45.5%
360 deg communications	1,040,000	1,455,000	+ 39.9%
US West	968,000	1,339,000	+ 38.3%
US Cellular	421,000	710,000	+ 68.6%

Source: Merrill Lynch Estimates.

Table 3 - Market share and market of the ten biggest cellular players

Company	POPs(1)	Market share (2)	Market penetration (3)
AT&T	68.3	11.54%	5.7%
BANM	57	9.9%	5.88%
GTE Mobilnet	49.3	8.91%	7.63%
SBC Communications	47.9	10.83%	6.1%
Bellsouth	47.4	8.42%	6%
Airtouch Cellular	38	6.7%	5.95%
Ameritech	25.2	5.6%	7.5%
US Cellular	21	4.3%	3.37%
US West	20.3	3.96%	6.6%
360 deg communications	19.5	2.1%	7.44%

(1): Potential cellular subscribers in millions. Base census US 1990. Source: CTIA.

(2): Market share in December 1995 (number of subscribers of the company / number of subscribers nationwide). Source: Donaldson, Lufkin & Jenrette 1995.

(3): Market penetration of the competitors in their market in December 1995 (number of subscribers of the company / POPs of the company). Source Donaldson, Lufkin & Jenrette 1995.

Most of the major telecommunications carriers are among the biggest players in cellular.

Sprint was one of them until they spun-off their cellular licenses which became 360 deg.

Communications. On the contrary, MCI which was absent from the cellular field until

1995, but playing in the ESMR field instead, joined the cellular big players thanks to the acquisition of Nationwide Cellular. Airtouch and 360 deg. are the only independent cellular companies in the big ten. About 1500 independent companies share the remaining 26% of the market.

1.2.3.3. Subscribers

There were 33.8 million subscribers on December 31, 1995. 53% were men and 47% were women. On average, the cellular subscriber is 42 years old and has an annual income of \$65,000. The reasons for subscribing are summarized in the following table:

Table 4 - Usage/Reasons to own

	Current users	New users	Potential users
Conduct Business	47%	36%	17%
Call friends/family	30%	21%	32%
Safety	19%	40%	48%
Other	4%	3%	3%

Source: CTIA

Table 5 - Findings of the Yankee Group's 1996 Mobile User Survey

• The typical cellular phone user makes 10 calls a week. • 91% of cellular users are satisfied with their current cellular service. • 60% of cellular users make the majority of their calls within their home metro area, but 58% of cellular users agree that having nationwide coverage is important. • The average price paid for a cellular phone is \$142. • 15% of cellular users said they would increase their usage if the service was priced 10% lower. 77% of cellular users said they would increase their usage if prices were 50% lower. • 61% of portable computer users are interested in using wireless data services. 31% of portable computer users believe wireless data transmission is too complicated and 60% believe it is too expensive.	The wireless lifestyle • The average survey respondent works about 51 hours a week at both primary and secondary work space. • The mean commuting time for the average respondent is 29 minutes. • 60 % of business travelers that responded spend more than 15 days a month on the road.
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Source: Yankee Group.

1.3. "New" PCS

1.3.1. Definition of PCS

1.3.1.1. A variety of definitions

Although everybody will agree that the acronym PCS stands for Personal Communication Services, nowhere will you find two interpretations of what it means that are exactly the

same. As a matter of fact, PCS has a variety of definitions ranging from: “PCS is 2 GHz” to very visionary descriptions of the services and applications it may provide.

TPG’s Telecom Lingo Guide *Online* gives the following definition: “Personal Communications Services: A term coined by the FCC to describe an intelligent, digital, two-way, wireless telecommunications system that someday may make it possible to reach an individual at any time, in any place, by dialing that individual’s telephone number. The PCS concept embraces cordless phones, cellular mobile phones, paging systems, microcell-based personal communications networks, wireless office phone systems and any other wireless telecom technology that allows people to place and receive voice and data calls while away from home or out of the office. PCS could be a complement to the present mobile and terrestrial phone networks or a competitor.”

Despite the large number of definitions that can be found for PCS, or maybe because of it, the meaning of this term is not clear in people’s minds. “Personal Communications” clearly refers to the concepts of unique personal phone number and customized services. However, since PCS is relatively a new approach to wireless communications services, without being a complete new service or new technology, people have difficulties differentiating it from the existing cellular communication services.

It is critical here to know what PCS is, but more importantly to understand that its meaning remains very vague. This will have important consequences on the marketing

strategies being developed by the different players in the wireless communications arena, since they are likely to use their own “personal” definition, according to their interests.

1.3.1.2. FCC definition

The FCC defines PCS as “a family of mobile portable radio communications services which could provide services to individuals and business, and be integrated with a variety of competing networks”.

1.3.1.3. Other definitions

People define PCS by what it is and is not.

PrimeCo Personal Communications: “PCS, or Personal Communications Services is a new class of wireless telecommunications services made possible by the Federal Communications Commission’s (FCC) decision to allocate new public radio spectrum to meet the growing demand for wireless communications.”

In “Is PCS going nowhere fast?” Alan Stewart quotes the following definitions. For the American National Standards Institute (ANSI), PCS is “the next generation of telephony extended to wireless users based on any one of the seven US standard radio technologies available now (or soon).” According to Vinay Patel, Marketing Manager for Hughes Network Systems: “We should not view PCS as a technology because what it really is is a set of advanced services.”

Christine Yovnello, Systems Engineer at AT&T Bell Laboratories: “PCS is an evolutionary concept, but not a revolutionary one.”

1.3.2. What are PCS services?

According to the FCC, broadband PCS services will encompass a variety of mobile services including an entire family of new communications devices utilizing very small, lightweight, multifunction portable phones; portable fac-simile and other imaging devices; new types of multi-function cordless phones; advanced services with two way capabilities. Broadband PCS systems will be able to communicate with other telephone networks as well as with personal digital assistants, allowing subscribers to send and receive data and/or video messages without connection to a wire. Broadband PCS could also be used in the development of more advanced wireless phone services that would be able to pinpoint the subscriber in any given locale.

PCS is seen as an improvement on the existing cellular and paging services. In the long run it is also viewed as a substitute for the traditional wireline services. Yet it is hard to tell what PCS services will look like in the future. As PCS services are starting to be commercialized, some examples of evolving services are:

- Mobility
- Portability: small, light weight, pocket carried handsets.
- Personalized service profile

- **Universal address:** This feature associates one telephone number with a person, regardless of where he or she is, and regardless of who his or her service provider is. However, although PCS networks have the capability to track a user, this is not yet true for all communications networks and requires implementation of data bases, administration procedures and rules for number portability.

From the user's point of view, broadband PCS today is an all-in-one wireless personal communications system. It gives the subscriber a phone, an answering machine and a pager in one portable device. Other important characteristics of PCS systems are:

- a wide range of features including caller ID, voice mail, text messaging, call waiting, call forwarding, call barring, information services;
- privacy and security of communications;
- better voice quality and clarity.

From a customer service perspective, PCS presents new characteristics:

- absence of long-term service contract;
- over-the-air activation.

This paragraph briefly summarizes what are and what may be in the future some important PCS services. However, this does not mean that these services are exclusive to PCS. As a matter of fact, most of them are being developed by cellular providers as they move toward digital technology. We will tackle this issue again as we study the differences that exist between cellular and PCS.

1.3.3. Spectrum allocation and licenses

1.3.3.1. Spectrum allocation

The spectrum for PCS is divided into three broad categories, broadband, narrowband, and unlicensed. The FCC has allocated a total of 120 MHz of spectrum to broadband PCS, 3 MHz for narrowband and 20 MHz for unlicensed.

Table 6 - Spectrum allocation for broadband PCS

Channel block	Channel size	Spectrum frequency	Markets	Number and type of licenses	Auction period
A	30 MHz	1850-1865 / 1930-1945 MHz	51 MTAs	48 Standard 3 Pioneer's Pref.	5 Dec. 94 - 13 Mar. 95
B	30 MHz	1870-1885 / 1950-1965 MHz	51 MTAs	51 Standard	5 Dec. 94 - 13 Mar. 95
C	30 MHz	1895-1910 / 1975-1990 MHz	493 BTAs	493 Entrepreneur	completed May 6, 96*
D	10 MHz	1865-1870 / 1945-1950 MHz	493 BTAs	493 Standard	began Aug. 26, 1996
E	10 MHz	1885-1890 / 1965-1970 MHz	493 BTAs	493 Standard	began Aug. 26, 1996
F	10 MHz	1890-1895 / 1970/1975 MHz	493 BTAs	493 Entrepreneur	began Aug. 26, 1996

Source: PCS Primer.

* C-Band Re-auction: 18 licenses that were defaulted on by two companies were re-auctioned in July 1996. Auctions began on July 3 and closed in round 25 on July 16.

1.3.3.2. Licenses

The licenses vary by size of market and bandwidth. Licenses in blocks A and B cover MTAs while in C, D, E, and F they cover smaller BTAs. A, B, and C block licenses are for 30 MHz each while D, E, and F are for only 10 MHz. The licenses also differ by the type of potential licensees or the conditions in which they were awarded. The three forms of licenses are standard, entrepreneur, or pioneer's preference.

Standard licenses are the most common type. They are the licenses awarded in the block A, B, D, and E and for which anyone could bid without economic restrictions. The **Entrepreneur's** licenses are for the C block and F block. Eligibility for these licenses is limited to benefit some "designated entities" often referred to as "swimmers": small business, women, minorities and rural providers. Unlike standard licensees who have to pay for their licenses as soon as they receive them, small businesses may benefit from installment payment plans and are eligible for a 25% bidding credit (a 25 percent reduction in the price of the winning bid). The rules for cross-ownership of PCS licenses by cellular and CMRS providers are relaxed for entrepreneur companies. **Pioneer's preferences** are licenses awarded to operators promoting first-time and new spectrum-efficient technologies. Three pioneer's preference licenses were awarded for broadband PCS, all in the block A. American Personal Communications (APC) received a license for the Washington, DC / Baltimore MTA, Cox Enterprises, Inc. received the license for the Los

Angeles / San Diego MTA, and Omnipoint Communications, Inc. received the license for the New York / northern New Jersey MTA. Although the FCC's initial plan was to award these licenses for free, APC, Cox and Omnipoint were required to pay at a discounted rate.

1.3.4. PCS auctions

1.3.4.1. Principle

Spectrum management authority in the U.S. is shared between the FCC and the Executive Branch. The FCC allocates and assigns frequencies for use by private and commercial entities other than the federal government. In the Omnibus Budget Reconciliation Act of 1993, Congress authorized the FCC to use competitive bidding procedures to award certain electromagnetic spectrum licenses. Previously, the FCC used either comparative hearings or lotteries, processes which caused administrative and judicial delay and deprived the public from the value of the spectrum. With competitive bidding the spectrum would go to the individual entity who values it most highly and who therefore would use the spectrum in the most efficient and extensive manner. The auction process also presented the advantage of creating revenues for the U.S. Treasury. The method adopted for the broadband PCS was simultaneous multiple round auctions.

1.3.4.2. Results of broadband PCS auctions

- **Block A & B** (December 5, 1994 - March 13, 1995)

Auction Net Revenue: \$7,034,240,010

Table 7 - PCS A&B Block Auctions Final Results: Top 10 high bids by bid size

Bidder Name	Net \$ of High Bids	# of high Bids
WirelessCo, L.P.	\$2,110,079,168	29
AT&T Wireless PCS Inc.	\$1,684,418,000	21
PCS PRIMECO, L.P.	\$1,107,226,000	11
Pacific Telesis Mobile Services	\$695,650,000	2
GTE Macro Communications Co	\$398,261,451	4
American Portable Telecommunications	\$288,872,034	8
Ameritech Wireless Communications	\$158,100,000	2
Western PCS Corporation	\$144,208,262	6
Powertel PCS Partners. L.P.	\$124,447,000	3
PhillieCo, L.P.	\$84,995,012	1

Source: FCC.

Table 8 - PCS Block A&B Auctions Final Results: Top 10 Markets by Net \$/POP

MTA	BTA	Market	Net \$/POP	High Bidder	Net High Bid
3	B	Chicago	\$31.80	PCS PrimeCo	\$385,050,583
3	A	Chicago	\$30.88	AT&T Wireless PCS	\$372,750,000
11	A	Atlanta	\$28.58	AT&T Wireless PCS	\$198,750,000
24	A	Seattle	\$27.79	GTE Macro	\$198,411,000
24	B	Seattle	\$27.48	Windsong Comm.	\$106,355,002
10	B	Washington	\$27.23	AT&T Wireless PCS	\$105,163,484
11	B	Atlanta	\$26.60	GTE Macro	\$184,660,483
2	B	Los Angeles	\$25.78	Pacific Telesys Mob.	\$493,500,00
15	A	Miami	\$25.64	Windsong Comm.	\$131,723,000
19	A	St Louis	\$25.48	AT&T Wireless PCS	\$118,836,000

Source: FCC.

- **Block C** (completed May 6, 1996)

Auction Net Revenue: \$10,216,596,324

Table 9 - PCS C Block Auction Final Results: Top 10 high bids by bid size

Bidder Name	Net \$ of high bids	# of high bids
Nextwave Personal Communications Inc.	\$4,201,186,654	56
DCR PCS, Inc.	\$1,426,762,891	43
Gwi PCS, Inc.	\$1,059,657,750	14
BDPCS, Inc.	\$873,783,913	17
Omnipoint PCS Entrepreneurs, Inc.	\$509,133,256	18
PCS 2000, L.P.	\$344,293,125	15
Chase Telecommunications L.P.	\$175,090,520	11
21st Century Telesis Joint Venture	\$98,192,838	17
Carolina PCS I Limited Partnership	\$92,660,091	9
Aer Force Communications, L.P.	\$87,336,004	12

Source: FCC.

Table 10 - PCS C Block Auction Final Results: Top 10 markets by Net\$/POP

MTA	BTA	Market	Net \$/POP	High Bidder	Net High Bid
47	222	Kahului, HI	\$77.13	CH PCS, Inc.	\$7,752,000
25	491	US Virgin Is.	\$76.45	Windkeeper Comm.	\$7,797,750
27	347	Phoenix, AZ	\$73.92	BDPCS	\$177,768,000
24	413	Seattle, WA	\$73.50	BDPCS	\$199,111,635
7	101	Dallas, TX	\$67.21	DCR PCS	\$291,023,250
2	245	Las Vegas NV	\$66.58	DCR PCS	\$57,118,576
4	389	Sacramento, CA	\$65.70	GWI PCS	\$108,832,500
47	192	Honolulu, HI	\$64.09	DCR PCS	\$53,594,250
24	331	Olympia, WA	\$63.81	BDPCS	\$16,524,000
4	372	Reno, NV	\$63.29	PCS 2000	\$27,802,575

Source: FCC.

• **Block C Re-auction** (July 3 - July 25, 1996)

Auction Net Revenue: \$904,607,467

Re-auction of the 18 licenses defaulted on by BDPCS and National Telecom PCS, Inc.

Table 11 - PCS C Block Re-Auction Final Results

Bidder name	Net \$ of high bids	# of High Bids
NextWave Personal Communications Inc.	\$542,461,396	7
CH PCS, Inc.	\$213,807,750	1
Magancom Wireless, L.L.C.	\$108,519,750	5
Mountain Solutions, Ltd., Inc.	\$23,619,778	2
Cook Inlet Western Wireless PV/SS PCS	\$9,202,500	1
Redwood Wireless Corporation	\$6,826,043	1
Westel, L.P.	\$170,250	1

Source: FCC.

- **Block D, E, F:** Auctions began on August 26, 1996 and are still being held.

1.3.5. Technology and standards

1.3.5.1. How PCS works

As we have noted already, PCS is nothing but cellular in a different frequency band. As a matter of fact, PCS systems operate at higher frequencies —1900 MHz instead of 850 MHz. PCS systems use digital technology. Because of the higher frequencies and the use of the new digital technology, PCS systems use the spectrum more efficiently and operate at lower power levels. Because of the digital technology, they can offer advanced services not available on the analog cellular systems, and transmit clearer calls.

In the absence of a standard set by the FCC, many technologies are open to PCS licenses. As a matter of fact, PCS has thirteen different air interfaces, yet in the US most carriers have chosen either CDMA, TDMA or GSM. We will study the standardization issue in details in the following paragraph. It is important to note however that some technologies

have adopted a microcell approach, meaning that instead of providing broad coverage similar to cellular, they will deploy smaller cells for a patchwork kind of coverage. In order to cover entire urban areas, the carriers can increase the number of these cells, deploy an overlay or layer of cell sizes or interconnect with other carriers. A combination of **macrocells**, **microcells** and **picocells** can provide ubiquitous coverage and support different ranges of mobility. Microcells will provide primary coverage to serve high density on-street traffic areas, macrocells will provide extended radio coverage and picocells will support indoor wireless communications.

Cellular systems also have evolved toward microcells in an attempt to increase capacity in areas of high user density, to improve coverage of shadowed areas, to lower transmitter power, and to have lower complexity base station. However, because PCS operates at higher frequencies, they have made microcells more attractive.

Different technologies will respond to different needs of PCS providers. From the provider's point of view, the needs, objectives and constraints can be expressed in terms of mobility, coverage, roaming, demographics of markets, etc. The corresponding technologies can be divided in two groups: **high-tier** and **low-tier** systems. Low-tier systems using microcells will be appropriate for high density areas. Two low-tier systems have been developed in the US: **WACS** (Wireless Access Communications System) and **PACS** (Personal Access Communications System). High-tier systems will be more appropriate for high-speed mobility, and wider coverage areas. High-tier systems are PCS-1900, IS136 (Digital AMPS), IS95 (CDMA).

1.3.5.2. Standards

There are a number of standard setting organizations and likewise there are many issues concerning standardization in the field of wireless communications, such as how to design the systems for keeping track of calls for billing purposes. However the most debated issue is the standard for PCS **multiple access technique**. The PCS Primer illustrates this issue: “The digital PCS and cellular standard committees have not agreed on one common standard. Instead they have agreed on a number of choices. In other words, they have agreed to disagree.” The competing technologies for multiple access of broadband PCS and cellular are FDMA, CDMA and TDMA . Each of these technologies gives rise to many different standards. Whereas some parts of the world use TDMA for their GSM standard, the standard modified to work at US PCS frequencies is called PCS-1900. Another standard for TDMA in the US is IS-136 TDMA. These standards vary in channel size and method for call splitting over time.

The FCC has decided that it would not adopt any particular standard for air interface for PCS, leaving it up to the standard setting bodies of the industry to collaborate on the major issues of **interoperability and roaming**. As a result, the absence of nationwide technology standards gives rise to **endless debates** as was noticeable in the presentations by various equipment manufacturers and service providers at the National Communications Forum in Chicago in October. Discussions raged over the myriad of new technologies during these presentations; at the heart of every discussion was the uncertainty over which of these new technologies will eventually dominate the industry. While GSM and CDMA advocates would all have figures proving that their technology is

dominating in the market, others decided to avoid the issue arguing that there was no best technology but only a right technology for each individual business plan.

Each of these different technologies have their set of problems. For instance, while CDMA had a late start it is now catching up and holding tremendous promise. However, since most of these technologies are still evolving and since most of the discussions about them are biased, it is very difficult to assess their relative strengths and weaknesses. We will see later on the consequences of the technology issue on the competition in the PCS industry. It appears that while technology has been driving the industry it should not take a central role in the future: “digital is an enabler to competition” says Tom Elliott from Arthur Andersen’s Communications Industry Practice (reported by P. Rubin). And according to Peter Bernstein, “It is time to end the digital war. The technologies all work; they are all an improvement over analog cellular. Digital access methods will be of no significant consequence —except possibly to roaming users— by year-end 1997”.

1.3.6. Differences between cellular and PCS

We have seen that the question of the differences between cellular and PCS is a very controversial one. However, let’s try and outline unbiased differences between the two services.

The PCS Primer notes five basic differences between PCS and cellular. I will list them here as well as outline some important underlying issues.

- **The market areas.** Whereas cellular markets are based on Metropolitan Statistical Areas (MSA) and Rural Service Areas (RSA), the FCC defined market areas for PCS

based on the Rand McNally BTAs and MTAs. Some PCS areas are larger and encompass major economic center. According to the PCS Primer, this was done to encourage the development of regional and national services.

- **The initial digital technology.** Unlike cellular which is evolving from cellular to digital, PCS systems are digital from their inception. Although my point at this stage of the study is not to weigh the relative advantages of PCS and cellular, I will outline an important consequence of this technological difference. On the one hand cellular providers have an advantage because of their existing customer base. On the other hand, PCS have an advantage because they don't have the constraints of having analog cellular customers. As a matter of fact, cellular providers migrating to digital have obligations to maintain sufficient conventional service to meet existing demand, which makes the transition more difficult.
- **Weight of handsets.** PCS Primer contends that PCS handsets are lighter than cellular. This is not necessarily true now and is all the more difficult to assess as different PCS and cellular systems impose very different constraints on the weight of the handsets. For instance, PCS phones supporting different standards may be heavier. Similarly, cellular systems supporting both analog and digital technology may be handicapped.
- **Transmission frequencies.** While cellular operates in the 850 MHz, PCS operates in higher frequencies, at 1900 MHz. This position of PCS in the spectrum has several consequences. First it aligns broadband PCS with the international range for mobile services which will impact the competitiveness of the U.S. on an international basis. Second, because they operate at higher frequencies, PCS systems have different physical characteristics that affect their performance, their operations, and their cost structure.

As a matter of fact, **the higher frequency band allocated for PCS makes smaller cells more attractive**. Such cells, called microcells, require lower transmission power, provide larger capacity than macrocells, and ubiquitous coverage in high density areas. Unlike macrocells, predominantly used in cellular systems and supporting high speed and vehicular mobility in large cells, microcells are good for urban, high traffic areas, and indoor coverage. These differences induced by the frequency band allocated to PCS has consequences in terms of network build out, costs, cell siting issues, but also on the strategy and business plans of the service providers.

- **Service requirements** within five years imposed by the FCC. The FCC requires that within five years after the granting of broadband PCS licenses, the service providers must reach specific benchmark for the availability of service: one-third of the population in a 30 MHz license area, and one-fourth of the population in a 10 MHz license area must have service available. Providers with 10 MHz blocks have an alternative—they can demonstrate to the FCC “that they are providing substantial service.” There is also a ten-year benchmarks: two-thirds of the population must have broadband services available in this time frame (PCS Docket, Memorandum Opinion and Order, ¶ 155-156, page 63).

More differences could be outlined between cellular and PCS, although some might be little more than consequences of the previously noted differences. However I will try to tackle some differences as well as highlight their limits. In an effort to stay unbiased, I will focus on the intrinsic characteristics of PCS that make it fundamentally different from cellular.

- **Network economics.** Economic realities are very different for cellular and PCS providers. PCS providers do not represent a homogenous group in that regard, each of them facing different realities depending on the type of licenses they own, the size and type of their markets, their technology choices, etc. However, for many reasons including the issue of frequency allocation tackled earlier, PCS network economics are clearly different from cellular. This will have important consequences on the strategy of PCS providers, on their cost structure, etc.
- **Technology.** We could argue that PCS offers better service, higher quality, more features, less fraud, and so on. However, these technological improvements based on the new digital technology can be deployed for cellular as well. As a result, I believe this should not be stressed as a difference.
- **Timeline.** What makes PCS and cellular look so different today is the time frame in which they have been developed. Cellular providers are incumbents while PCS providers are new entrants, creating a difference in experience, product or brand recognition, deployment of networks, etc. As matter of fact, if PCS seems to provide more features today, cellular on the other hand provides national coverage. And these differences most likely will have disappeared within a few years. Contrarily, some economic realities which tend to prove that PCS could compete with wired phones—for instance the Wireless Local Loop— will lead to other fundamental differences which are still very difficult to forecast today.

In conclusion, I would like to emphasize that although some differences exist between PCS and cellular that are based on intrinsic characteristics of each, we have to be very careful not to overestimate or underestimate them. To that purpose, we should take particular care to be precise on what we are talking about, which is very difficult in a domain in which names have very vague meanings. The following quotation exemplify the likelihood of misunderstandings. “In spite of all the references to cellular, PCS should be considered distinctly different. PCS must be viewed in terms of what it offers in vision and in technology that cellular cannot. The benefits of PCS over cellular. PCS has several advantages over existing cellular telephone service. They include better service quality through the use of digital technology, more compact radio interface equipment, increased mobility, enhanced service features and price.” This would be accurate if we compared the PCS of tomorrow and cellular of yesterday. In other words, this is denying the evolution of cellular and assuming that the expected potential of PCS is achieved already. To put it in a nutshell, only **meaningful comparisons based on intrinsic attributes of each of the services studied in a dynamic environment will provide some basis for the analysis of the mobile communications market place.**

1.3.7. The PCS market

1.3.7.1. Perspective

PCS being in its infancy, we can make industry projections but there is not past to look at. As a matter of fact, no more than four providers have made their service commercially available, and as a result, there is not much data about the market yet. Furthermore, we

must be cautious not to be influenced about subjective opinions coming from over-enthusiastic participants in the industry.

The early success of PCS caused analysts at Donaldson, Lufkin and Jenrette to revisit their market projections and adjust their wireless estimations upward. By year-end, the company expects PCS subscribers to total 245,000 and then jump to nearly 2.8 million by the end of 1997. By 2004 or 2005, DL&J predicts a slightly larger incremental market share for PCS operators than for cellular.

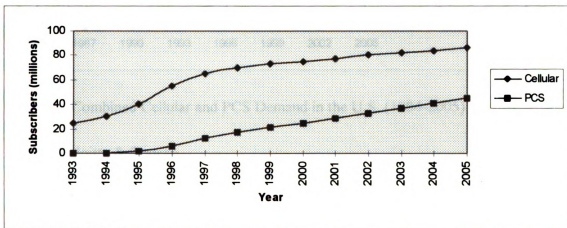


Figure 1 - U.S. Wireless Communications Industry - Basic Penetration Model

Source: Donaldson, Lufkin and Jenrette

The projection for market growth is based on the assumption that prices will decrease in the industry due to increased competition and lower costs structure thanks to the new technologies. As a consequence, the cellular market will shift from a business-oriented to **a consumer market**. A study by Deloitte and Touche shows that the average revenue per wireless customer will decrease overtime. This issue will be very important in terms of

competitive analysis and strategy formulation. Strategies will be very different from what they used to be in the duopolies. “The bottom line seems to be that there’s a very **strong orientation toward understanding the market and being responsive to customer needs.**”

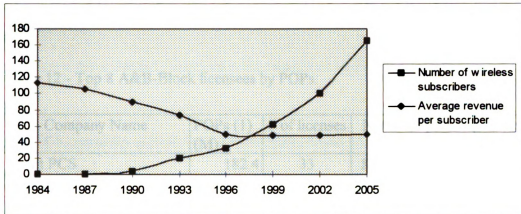


Figure 2 - Combined Cellular and PCS Demand in the U.S. (1984-2005)

Source: Deloitte & Touche

Note: Number of subscribers in millions and average revenue in dollars per subscribers per month.

Finally, it is very important to keep in mind that PCS customers will not be only cellular users. The study concludes that marketing efforts must extend beyond traditional boundaries. “It focuses on taking the wireless market to the next level —going from cellular customers to a much broader range of people.”

1.3.7.2. Players

The players in the PCS market are the companies who have been awarded licenses in the A&B, and C block. 18 licensees own the 102 licenses of the A&B blocks. However, some companies who appeared as separate bidders in the auction have then created alliances

that make them even stronger players. For instance Sprint PCS which appears as the biggest player in the market is a venture of Sprint, Comcast, Cox and TCI. Furthermore, competitors in the market change names regularly, which makes it all the more difficult to keep track of who is who. For instance, Sprint recently changed its name from Sprint Spectrum to Sprint PCS.

Table 12 - Top 8 A&B-Block licensees by POPs.

Company Name	POPs (1) (M)	# of licenses	Net Bid (\$M)	Average Price (\$ / POP)
Sprint PCS	182.4	33	\$2,110(2)	14.56
AT&T Wireless	107.1	21	\$1,684	15.73
PCS PrimeCo	57.2	11	\$1,107	19.36
Pacific Bell Mobile	31.0	2	\$695	22.41
American Portable Telecom	25.9	8	\$288	11.11
GTE Macro	19.4	4	\$398	20.56
Western Wireless	13.7	6	\$144	10.50
Powertel PCS	9.0	3	\$124	13.85

(1) POP: Potential subscribers in millions.

(2) does not include the cost of its two pioneer's licenses.

Source: FCC.

There are about a hundred licenses in the C-Block. As for A&B, the bidders have then formed alliances and sometimes changed names. On top of that 18 licenses of the C block have been re-auctioned after they were defaulted on by their initial bidders.

The major players in the C block after the re-auction, ranked by POPs are:

Table 13 - Top 4 C-Block licensees by POP.

Company Name	POPs	# of licenses	Net \$ B	\$ / POP
Nextwave	102.6	63	\$4,743	46.22
DCR PCS	33.6	43	\$1,426	42.44
GWI PCS	17.9	14	\$1,059	59.16
Omnipoint	13	18	\$873.8	39.16

Source: FCC.

Nextwave was awarded 7 licenses in the re-auction and BDPCS disappeared.

The PCS competitors have very diverse background and strategies. While A&B licensees are mostly big companies; some seek national coverage while others have regional strategies. This is reflected by their attitude in the auctions process. In the C-block, the companies are more diverse. They are entrepreneurs. Among the biggest bidders we find some companies supported by foreign equipment manufacturers (such as Sony or LC Group).

Chapter 2

STRUCTURE AND CHARACTERISTICS OF THE CELLULAR INDUSTRY

2.1. Theory: The Structural Analysis of industries by M. Porter.

2.1.1. Context of strategy formulation

The formulation of competitive strategy has to be related to a company's environment. Studying the environment is a large task including looking at social and economic factors. However, the first and most important step is to analyze the industry in which the company competes.

2.1.2. Structural determinants of the intensity of competition

According to Porter, the intensity of competition in an industry is rooted in its underlying economic structure and goes well beyond the behavior of current competitors. It depends on five basic competitive forces which determine the profit potential in the industry. Profit potential is measured in terms of long run return on invested capital.

- Definition of the industry

Porter adopts the working definition of an industry as the group of firms producing products that are close substitutes to each other.

- The five competitive forces

The five competitive forces —entry, threat of substitution, bargaining power of buyers, bargaining power of suppliers and rivalry among current competitors— exemplify a competition that goes well beyond the established players. The combination of these forces determines the intensity of industry competition and profitability. However, a company will take into account the strength of each force taken separately to formulate its strategy.

Each firm will have a different set of strengths and weaknesses in dealing with industry structure. This structure will change over time. However, understanding industry structure is the starting point for strategic analysis.

Other short run factors may have some tactical significance. However, the structural analysis must focus exclusively on the basic characteristics of an industry rooted in its economics and technology. Porter analyzes the important economic and technical characteristics of an industry that are critical to the strength of each of the five forces.

2.1.2.1. Threat of entry

The threat of entry into an industry depends on the existing barriers to entry, coupled with the expected reaction from current competitors. If barriers are high and/or the newcomer can expect sharp retaliation from entrenched competitors, the threat of entry is low.

Major existing barriers to entry:

- **Economies of scale:** “economies of scale refer to declines in unit costs of a product (or operation or function that goes into producing a product) as the absolute volume per period increases”. To avoid repetition, the term “product” refers to “product or service”.

⇒Barrier: If entrants choose to enter at a large scale they risk to face a strong reaction from the established players. If they choose to come in at a small scale, they will face a cost disadvantage. Scale economies can be found in every function of a business.

- **Product differentiation:** “Product differentiation means that established firms have brand identification and customer loyalties which stem from past advertising, customer service, product differences or simply being the first into the industry.”

⇒Barrier: Entrants will have to make important investments up-front to take customers away from the existing competitors. This effort in building a brand name will be long and risky.

- **Capital requirements:** “the need to invest large financial resources in order to compete”.

⇒Barrier: This is all the more deterring if the investment is risky or unrecoverable.

- **Switching costs:** “one-time costs facing the buyer of switching from one supplier’s product to another”.

⇒Barrier: Entrants must offer significant cost or performance improvement to justify the switch.

- **Access to distribution channels:** Access to distribution channel can be difficult if they are already saturated with existing products or if distributors have strong relationships with their suppliers.

⇒Barrier: Entrants will have to spend money and efforts to gain access or they will have to create their own distribution channels.

- **Costs disadvantages independent of economies of scale:** “Established firms may have cost advantages not replicable by potential entrants no matter what their size and attained economies of scale”. Among them: proprietary product technology, favorable access to raw materials, favorable locations, government subsidies, learning or experience curve.

- **Government policy:** Government can limit or even foreclose entry to industries with such controls as licensing requirements and limits on access to raw materials.

Expected **retaliation** can be estimated according to a few signals:

- History of retaliation in the industry;
- Resources of incumbents to fight back;
- Incumbents with commitments to industry and illiquid assets;

- Slow industry growth.

The threat of entry into an industry can be summarized by the concept of “**entry deterring price**: the prevailing structure of prices which just balances the potential rewards from entry with the expected costs of overcoming structural entry barriers and risking retaliation”. Yet the conditions determining the barriers to entry change. The reasons for change can be outside the firm’s control or not, and different firms have different abilities to overcome them.

2.1.2.2. Intensity of rivalry among existing competitors

Intensity of rivalry depends on a number of interacting structural factors:

- **Numerous or equally balanced competitors**: The probability of presence of mavericks hoping to go unnoticed increases with the number of competitors. Equally balanced competitors create instability as they fight each other and no discipline is imposed by a few leaders.
- **Slow industry growth**: creates a market share competition more volatile than a growth situation where efforts are concentrated on industry expansion.
- **High fixed or storage costs**: creates pressure to fill capacity and cut prices when excess of capacity is present.
- **Lack of differentiation or switching costs**: creates pressure for intense price and service competition and thus volatility.
- **Capacity augmented in large increments**: creates chronic over capacity and price cutting situations.

- **Diverse competitors:** With diverse strategies, origins, and relationships to parent companies, competitors will have different goals and competitive strategies and may “continually run head on into each other in the process”. This lack of homogeneity will create confusion and difficulties to set the rules of the game for the industry.
- **High strategic stakes:** Firms having high stakes in achieving success increase the volatility of rivalry. Their diverse goals and potential willingness to sacrifice profitability will destabilize the industry.
- **High exit barriers:** they are economic, strategic and emotional factors which prevent competitors from leaving the industry even though they are not profitable anymore. Some examples are: specialized assets, strategic interrelationships, emotional barriers, government and social restrictions. High exit barriers can affect the profitability of the entire industry.

Like entry barriers, rivalry changes and can be impacted by a company's strategic decisions.

2.1.2.3. Pressure from substitute products

All firms in an industry are competing, in a broad sense, with industries producing substitute products. Substitutes limit the potential returns of an industry by placing a ceiling on the prices firms in the industry can profitably charge. The impact of substitutes can be summarized as the industry's overall elasticity of demand. Substitutes are products that can perform the same function as the products in the industry and can come from businesses far removed from the industry. Sometimes collective action is undertaken by the industry to position itself vis-à-vis substitutes.

Substitutes that are subject to trends improving their price-performance tradeoff with the industry's product or that are produced by industries earning high profits have to be watched closely.

2.1.2.4. Bargaining power of buyers

Buyers also compete with the industry in what Porter calls an “extended rivalry”. They bargain for lower prices, higher quality and better service and play competitors against each other. This harms the industry's profitability.

The power of buyers depends on their market situation and the relative importance of their purchases from the industry compared with its overall business. The following circumstances are sources of power for a buyer group:

- It is concentrated or purchases large volume relative to seller sales.
- The product it purchases from the industry represents a significant fraction of the buyer's costs or purchases.
- The product it purchases from the industry are standard or undifferentiated.
- It faces low switching costs.
- It earns low profits.
- Buyers pose a credible threat of backward integration.
- The industry's product is unimportant in relation to the quality of the buyer's products or services.

- The buyer has full information.

These sources of power can be attributed to consumers as well as to commercial and industrial buyers. Only the frame of reference has to be modified. Consumers for instance will be more price sensitive for products that are undifferentiated, expensive relative to their income or when quality is not very important to them.

Time and strategic decisions can alter these factors and the resulting power of buyers. Buyer selection which consists of choosing buyers that have the least influence can improve a company's strategic position. The bargaining power of buyers has to be viewed as a crucial strategic issue.

2.1.2.5. Bargaining power of suppliers

Suppliers also compete with the industry. They bargain to impose higher prices or lower quality for their products. When participants in the industry can not recover these cost increases by raising their prices, the industry's profitability decreases. The following circumstances are sources of power for a supplier. They tend to mirror those listed for buyers' power.

- It is dominated by a few companies and is more concentrated than the industry it sells to.
- It is not obliged to contend with other substitute products for sale to the industry.

- The industry is not an important customer of the supplier group.
- The supplier's product is an important input to the buyer's business.
- The supplier group's products are differentiated or it has built up switching costs.
- The supplier group poses a credible threat of forward integration.

Like the power of buyers, suppliers' power changes and is often out of the firm's control. However, a company sometimes has the ability to improve its situation toward suppliers thanks to strategic decisions.

2.1.2.6. Government as a force in industry competition

Government as a supplier or a buyer has a strong potential to influence industry competition. As a regulator, it can affect the position of the industry vis-à-vis substitutes. It can also affect rivalry among competitors by influencing industry growth, the cost structure, etc.

Porter highlights the impact of government policy on competition. However, he prefers to analyze how governments affect competition through the five competitive forces rather than consider it as a force in itself.

2.2. Structural analysis of the cellular services industry

2.2.1. Industry definition

To introduce his framework for structural analysis, Porter chose the working definition of an industry as "the group of firms producing products that are close substitutes for each

other”. Yet he notes that in practice, there is often a great deal of controversy over the appropriate definition, centering around how close substitutability needs to be in terms of product, process, or geographic market boundaries.

Defining the relevant industry is a crucial step in competitive strategy formulation and the debate over it is mostly motivated by a fear of overlooking latent sources of competition. Yet according to Porter, because structural analysis looks at “extended rivalry” and goes well beyond existing competitors, the decision of where to draw the boundaries becomes more or less irrelevant to strategy formulation.

Porter also notes that definition of an industry is not the same as definition of where the firm wants to compete (defining its business). This distinction eliminates needless confusion in drawing industry boundaries.

2.2.1.1. The wireless communications industry

In a competitive analysis of the cellular communications industry which dates back to 1993, the OTA maps the communications industry presenting PCS as a subset of cellular telephony. This presentation may be challenged and would most likely be different today. Chances are that PCS would appear at the same level as cellular telephony and be a new subset of the wireless communications industry.

Two main reasons account for the endless debates about how to map the wireless communications industry. First, as I said in Part I, there is no single definition of PCS. Second, wireless communications is a very complex industry which is very difficult to segment.

In a paper entitled Cellular to PCS: A Wireless Primer, the Telecommunications Industries Analysis Project presents the potential range of competitors and technologies for wireless services in 1994 as follows:

Table 14 - Potential range of competitors and technologies for wireless services.

Service:	Spectrum allocation:	Type of technology:	Analog or Digital
Specialized Mobile Radio (SMR, ESMR)	806-824 MHz 900-901 MHz	TDMA	Analog
Radio-based Networks		Packet-Switched Radio	Digital
Cellular Analog	824-849 MHz	Cellular Microwave	Analog
Cellular Digital Packet Data (CDPD)	869-894 MHz	TDMA CDMA	Digital
Broadband PCS	1850-1900 MHz	TDMA, CDMA, GSM	Digital
Narrowband PCS	901-902 MHz 930 MHz 940 MHz	CDMA	Digital
Mobile Satellite Service above 1 GHz	1610-1626.5 MHz 2483-2500 MHz	TDMA, CDMA, LEO Satellite	Digital
Fixed Satellite Services (FSS)	3.7-4.2 GHz 5.925-6.225 GHz 11.7-12.2 GHz 14-14.5 GHz	GSO and LEO Satellite	Digital
Wireless Cable (Multichannel Multipoint Distribution Service or MMDS)	2500-2690 MHz	Microwave	Digital
Cellular TV (Local Multipoint Distribution Service or LMDS)	28 GHz	Imm wave/ Microwave, Microcellular	Digital

Source: PCS Primer.

Donald C. Cox highlights the difficulty of segmenting the wireless communications industry. “There are many different ways to segment the complex topic into different applications, modes, functions of coverage, extent of mobility [Cox, 1992; Padgett, Hattori, and Gunther, 1995]. The complexity of the issue has resulted in considerable confusion in the industry, as evidenced by the many different wireless systems, technologies, and services being offered, planned or proposed.”

Rather than looking at the different wireless systems and technologies, Cox proposes a segmentation method based on competing **mode of communications**.

Table 15 - Segmentation by mode of communication.

Mode of communications	Description	Represented by:
Messaging	communication by way of message transmission, storage and retrieval	voice mail, fax, email
Real-time 2-way communications		telephone, cellular mobile radio telephone; interactive text (and graphics) exchange over data networks; 2-way video phone?
Paging	broadcast with no return channel, alerts a paged party that someone wants to communicate with him.	Like a ringer on a phone w/o the capability for completing the communication
Agents	high-level software application, finds information in data network and returns it	

Source: Cox.

Many different segmentation methods can be used based on buyers' needs and preferences. According to Cox: "what is being sought by users, and produced by providers, can be categorized according to the following two main characteristics:

- Communications **portability** and **mobility** on many different scales:
 - * Within a house or a campus (cordless telephones, WLANs)
 - * Within a campus, a town, or a city (cellular radio, WLANs, wide area wireless data, radio paging, extended cordless telephone)
 - * Throughout a state or a region (cellular radio, wide area wireless data, radio paging, satellite-based wireless)
 - * Throughout a large country or a continent (cellular radio, paging, satellite-based wireless)
 - * Throughout the world?

- Communications by many different **modes** for many different **applications**:
 - * Two-way voice
 - * Data
 - * Messaging
 - * Video?"

The wireless communications industry is undoubtedly a very complex one. Furthermore, its complexity is likely to increase as technologies are converging and businesses are becoming more global. However, for the purpose of the analysis it is necessary to agree

upon which segment of the industry we will focus and clearly define that segment. Porter's theory for structural analysis gives us a relative freedom regarding where we want to draw the boundaries of the industry.

2.2.1.2. Boundaries of the cellular communications industry for the purpose of the analysis

An activity or segment of an industry is a subdivision of the industry that is more homogenous in terms of purchase behavior, costs structures, technical constraints, etc. Our goal here is to define the segment of the wireless communications that will be most relevant to the purpose of our study—to analyze the entry strategies of PCS operators in the wireless communications industry.

The segmentation method presented by Cox based on modes of communications does not enable us to identify segments relevant for our study. As a matter of fact, PCS offers the different modes of communications (messaging, 2-way voice, paging) all-in-one. Yet, Cox's segmentation method based on portability, mobility, communications modes, and applications seems more appropriate. If we look at the range of potential competitors in the wireless industry and use a chain of substitutability, we can define "a group of firms producing products that are close substitutes for each other" which is the definition of an industry in Porter's framework.

We can apply Cox's segmentation method to the range of competitors listed by PCS Primer:

Table 16 - Segmentation of wireless communications.

	portability/mobility	modes/applications
Broadband PCS	state or region (today)	2-way voice (quality) + paging + messaging
Cellular tel. digital	country or continent	2-way voice (quality)
Cellular tel. analog	country or continent	2-way voice
ESMR	region	2-way voice
Cordless	limited to a house or campus	2-way voice
Narrowband PCS	state or region	paging, messaging
Paging	country or continent	paging
Messaging	country or continent	messaging
Satellites	country or continent	
MMDS	not available	
LMDS	not available	

Source: Own construct.

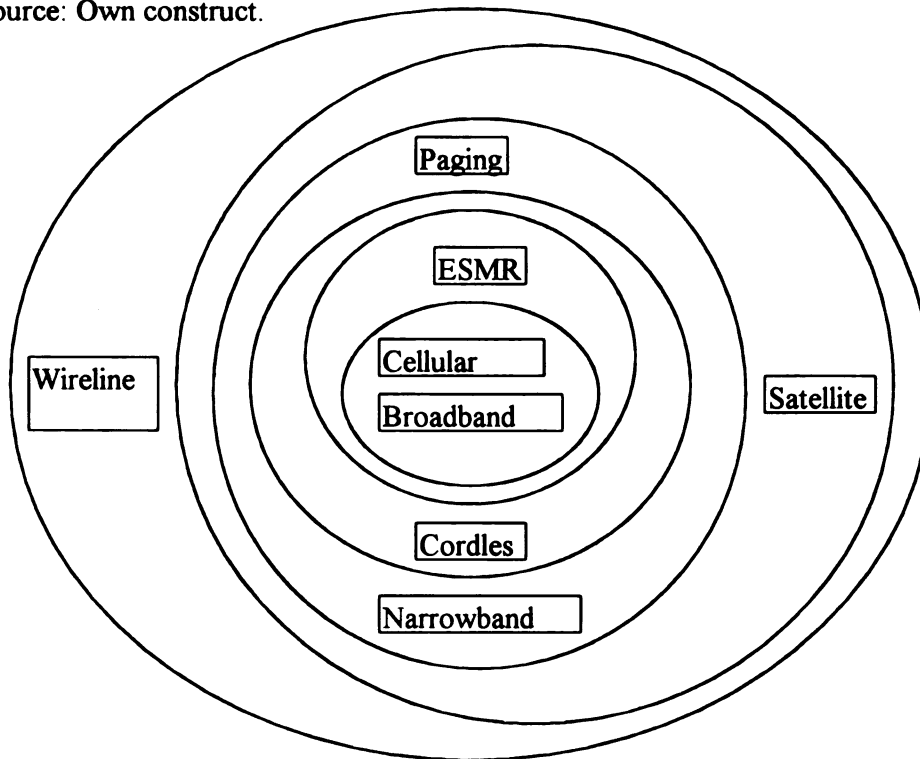


Figure 3 - Chain of substitutability.

Source: Own construct.

All of the services cited above are potential substitutes for each other. We could have also included wireline services for which PCS is a potential substitute. However, according to our criteria for segmentation, the closest substitutes to broadband PCS are the existing analog and digital cellular services. Narrowband PCS which offer mostly paging and messaging services are competing in a different segment.

As a result, the boundaries of the industry under analysis will comprise analog and digital cellular telephony services and broadband PCS. In Porter's framework for structural analysis they will be the "industry competitors". The rest of the wireless services will be the "substitutes".

We have seen in Part I the confusion that reigns around the term PCS. PCS is cellular, only in a frequency band different from that of the existing cellular carriers. As a result, the industry we are looking at is the cellular communications industry. However, when we talk about the players, cellular will refer to the existing cellular carriers in the 800MHz frequency band and PCS will refer to the new licensees in the 1900MHz frequency band.

2.2.2. Industry form and environment.

It is necessary before starting the structural analysis of cellular communications to note the particularities of the industry form. First, to participate in the industry—which is regulated by the Federal Communications Commission—one needs to own a cellular license. Second, the number of licenses are limited and each license covers a specific

geographic area. As a result, competition for cellular in the US is not homogenous and all players do not compete against each other. Rather, competition will be defined on a per market basis. In each geographic market, the cellular and PCS licensees will compete against each other and against their substitutes. In the markets where they cannot compete—the markets where they do not have licenses—some players seeking extended coverage may form partnerships with their so-called competitors. Other competitors may pursue different strategies such as providing regional coverage only thus choosing not to interfere in markets outside their licensed areas.

Another particularity of the industry is that although all the licenses have been awarded (two for cellular and six for PCS in each market), all potential competitors have not really entered the market yet. Today, only three of the PCS licensees in the A and B blocks have made their services commercially available. Most of the other licensees in the A, B and C blocks have started building their network and have announced the commercial launch of their products. The D, E and F block auctions are still being held. As a result, all these licensees are not really “current competitors” but still more than “potential competitors”. We will tackle this issue later as we consider the threat of new entrants and the rivalry among current competitors. For the purpose of the analysis these impending competitors will be considered as existing players. Yet we will keep in mind that the strategies they are developing are “entry” strategies.

Other particularities of the industry environment will be outlined as we analyze in more details the characteristics of emerging industries from the standpoint of strategy formulation.

2.2.3. Forces of competition

2.2.3.1. Entry barriers

There are two ways to consider the threat of entry in the cellular business today. The first one consists in saying that the industry is regulated by the FCC and one needs a license to enter the industry. As a result, threat of entry is null today since all PCS auctions have been completed and no additional spectrum is planned to be allocated for cellular services. However, this should not exclude the possibility of new spectrum allocations to be decided by the FCC in the future.

The second approach also consists in looking at the cellular communications industry today. Yet this time we will look at the active players in the industry that is to say the companies who have made their services commercially available. All PCS licensees that are currently building their network and preparing for commercial launch can be considered as potential entrants in the industry. They represent a threat to the incumbents. However, as I said earlier, they are —at least for most of them— more than potential entrants. They have overcome the regulatory barrier and are in the early phase of their entry in the industry.

No matter where we draw the boundaries —once again, Porter's theory sets us free— the impending competitors will have to work their way to obtain a market share. The threat of entry is limited to a certain number of competitors and the incumbents know who they are. But the barriers to entry are double: once the regulatory one has been overcome, the structural barriers remain for the entrant to overcome.

As shown by the early failure of some of the C-block winners to pay for their licenses and their resulting elimination of the industry, it appears that not all of the entrants will materialize as competitors.

Major entry barriers in the cellular industry other than the regulatory one.

- **Capital requirements** are a major barrier to entry in the cellular industry. They are composed of three elements:

- * **Cost of licenses.** Radio spectrum for cellular use is allocated to carriers by the FCC.

While the first licenses for cellular were distributed at very low prices in the mid 1980s, the new auction process decided by the FCC in 1993 for the allocation of additional radio spectrum for commercial use was designed to generate the highest revenues for the government. As a result, entering the market required very important investments to acquire the licenses. For the A & B blocks, the price for licenses had to be paid as the licenses were awarded while licensees in the C block have the possibility to pay back over a ten year period. The 18 companies in the A&B block have paid \$7.7 billion for 99 licenses. In the block C, the price per pop reached \$50.

- * **Network and operations set-up costs:** PCS service providers entering the industry have to face very important costs to build out their network. PCS systems which are characterized by a larger number of smaller cells —compared to cellular— will have to set up radio equipment and networking equipment. Support operations for billing and customer service will also have to be established. This represents very high investments and the capital requirements are all the more important as the networks

have to be built very rapidly. Although PCS infrastructure is cheaper than cellular, its cost remains a high barrier to entry. Estimated buildup costs range from \$17 to \$32 per pop according to Lucent Technology. PrimeCo for instance has spent \$31 per pop, excluding the cost of the licenses, against \$17 originally budgeted.

- * **Relocation of incumbents.** The spectrum allocated for PCS was previously reserved for microwave use by pipeline companies and public utility services. PCS licensees moving in are responsible for negotiating with the incumbents and must pay them to put them somewhere else. This constraint happens to be even more costly than initially expected. As a matter of fact, some incumbents which Jason Meyers calls “the pirates of PCS” are taking advantage of their potentially lucrative position.
- **Economies of scale.** As in any telecommunications network, economies of scale are very important. Fixed costs for infrastructure deployment are very high. Once the network is installed, every additional customer or minute of airtime generates revenues at low marginal costs. Economies of scale will also be found in functions such as marketing and promotion.
- **Product differentiation:** “In a crowded communications marketplace, brand recognition and loyalty will be the key.” In order to justify his statement Thomas Elliott highlights the level of noise in the communications industry resulting from frequent and intense competing marketing messages. This phenomenon urges confused customers to choose the brand they know and stick with it. As a result, brand leadership becomes an important barrier to new competitors. Yet many of the entrants in the cellular industry already have brand names in other segments of the telecommunications industry. This will ease their entry in the cellular market with reduced marketing costs.

Other structural barriers exist such as access to distribution channels, technology, or experience. However, the most likely to deter potential competitors from entering the market are the huge capital requirements and economies of scale. The re-auction by the FCC of the licenses that were defaulted on in the C-block proves that this financial constraint has eliminated some players despite their efforts to enter the market.

Retaliation can be all the more vigorous as the existing competitors know who the entrants are (because the result of the auctions are public, the degree of information about the competitors is very high). Besides, they have been aware of their arrival for several years and have had time to prepare. Furthermore, the incumbents have important commitments to the industry and illiquid assets.

However, some factors may keep retaliation from being too severe. The industry growth being very high, current competitors are more likely to concentrate their efforts on increasing their share of the expanding market rather than spend efforts to fight back new entrants. Moreover, established players will have to face important challenges —such as moving from analog to digital— to keep up with the competition of the PCS entrants. As a result, chances are that they will not have the resources to fight back —with a price war for instance.

As a conclusion, **entry barriers are relatively high** in the cellular market. The licensees that have been given the legal right to enter the marketplace will have to overcome important structural barriers to become a player and a winner. They will have to face some

retaliation from the incumbents. However, the high industry growth will probably enable many new competitors to successfully enter the industry.

The condition of entry in the cellular communications industry can be summarized thanks to Porter's concept of **entry deterring price**. The entry deterring price is defined as the prevailing structure of prices which just balances the potential rewards from entry with the expected costs of overcoming structural entry barriers and expecting retaliation. In the case of the cellular industry, the **very high entry costs are balanced by very high potential rewards**. Because of the spectacular growth perspective in the cellular industry, the entry deterring price appears to be lower than the current price level and as a result **entry is occurring**.

2.2.3.2. Rivalry among existing competitors

According to our working definition of the industry and the boundaries we have drawn, the existing competitors are the cellular and the broadband PCS operators. As many of the PCS licensees are in the process of entering the market, the number of players is growing daily.

- **Numerous competitors:** There is a very large number of cellular and PCS licensees.

The cellular market is composed of ten major players and a large number of smaller players. Similarly in PCS, although only 18 licensees shared the 102 A&B licenses, over 100 competitors share the 493 C block licenses. However, competition takes place on a

per market basis. In each market, there will be up to 8 competitors which is a significant increase after the duopoly era. This large number of competitors is a source of volatility.

- **Diverse competitors.** There are three major types of cellular carriers: long distance carriers, RBOCs, and independent cellular carriers. Deregulation and the auctions for PCS licenses introduced many new players in the field. Players are local and long distance carriers, RBOCs, cable companies, independent carriers, international consortia supported by foreign equipment companies, etc. These players differ by the nature of their primary business, their size, their origins, their personalities, the importance of their cellular activities relative to their overall business, their relationships to their parent companies, etc. As a result, they have different goals, stakes, and strategies. This will make it all the more difficult for the players to clearly understand their competitors' intentions. The volatility of the competition will also hinder the establishment of "rules of the game" in the industry.
- **Lack of homogeneity.** Adding to the confusion in the marketplace is the fact that competition is not homogenous. Rather, because of the structure of the cellular industry, competition will vary from market to market and from carrier to carrier.
- **High fixed costs.** As we have seen earlier, fixed costs in the cellular industry are very high. This will create a strong pressure for competitors to fill capacity. There is an urge to gain customers which may lead to intense competition through price cutting or intense marketing efforts.
- **High strategic stakes.** The strategic stakes in achieving success in the cellular industry vary from carrier to carrier. However, they will probably be high in most cases. Some players will simply see the strategic stakes in being present in the fastest growing

segment of the communications industry. Other carriers may seek a presence in the industry to further their overall corporate strategy —such as bypass of the local loop or “one-stop-shopping” marketing strategies. Such strategic stakes increase the intensity and volatility of rivalry.

- **Lack of differentiation.** The cellular communications market is an overcrowded and noisy one. As a result, most consumers have difficulties understanding the differences between the various products they are offered. In this situation, they tend to base their choice on price and service which creates pressures for intense price and service competition. These forms of competition are very volatile.
- **Lack of switching costs:** Cellular subscribers used to face switching costs since they were locked in long-term contracts with their providers. These switching costs will decrease as PCS operators introduce the concept of subscription with “no strings attached” as Sprint puts it. With immediate activation over the air and the absence of long-term contracts consumers will give more attention to prices thus increasing the risk of competitive warfare.
- **Rapid change and uncertainty in the industry.** First, the cellular communications industry is experiencing an extraordinary growth due to the government’s decisions to expand the market and allocate more spectrum for commercial use. This artificially stirred growth generates a pace of change in the industry that is difficult to keep up with. Not only does this create a lack of visibility in the industry but also a great technological uncertainty. As a matter of fact, competitors are forced to build or upgrade their network as technology is being developed. As a result, competitors are forced to take high risks since they do not know which technology will dominate the

industry —and this is a critical issue for purposes of interoperability and roaming. Finally, greater uncertainty stems from the fact that the cellular industry is developing in the context of a newly deregulated telecommunications marketplace —although limited competition already existed in cellular services.

This uncertainty which is characteristic of an emerging industry will be analyzed in more details later.

- **The “PCS vs. Cellular” phenomenon.** Another issue builds on the confusion reigning in the industry and increases the intensity of competition. We have seen in section I that PCS is a term that remains very vague. No definition was really agreed upon and people tend to use the words as best suit their interest. As a result, beyond a classic competition opposing two rivals, a war is being fought yet without a clear understanding of who is whose enemy. This war is mostly a marketing one. We will study it later as we come to the issue of positioning the various cellular services as it relates to the different competitors.

Exit barriers

The height of the exit barriers can be debated. On the one hand, the importance of the initial investments made by cellular providers may represent a high exit barrier. On the other hand, if we think in terms of sunk costs in case of exit, the barriers may appear lower. Considering the pace of growth and the attractiveness of the industry, competitors desiring to quit the industry should be able to sell most of their assets thus limiting their sunk costs. Licenses can be sold and should find all the more buyers as they are a limited

and indispensable resource. Investments in infrastructure may more difficult to recover yet there are possibilities for resale.

My opinion is that, at this point in time, exit barriers are relatively low. However, the degree of uncertainty is very high in this emerging yet fast growing industry. In other words, for all the promises the industry holds, would there be a reversal of fortune in its evolution for any unpredictable reason, the sunk costs of leaving the industry may become enormous and the exit barriers very high.

		Exit Barriers	
		Low	High
Entry Barriers	Low	Low, stable returns	Low, risky returns
	High	High, stable returns	High, risky returns

Figure 4 - Barriers and profitability

Source: Porter, M.

At this point in time, we are in the best case from the view point of industry profits. Because entry barriers are high and exit barriers are low, entry will be deterred and unsuccessful competitors will leave the industry. However, we must keep in mind that this situation may change as the industry matures.

In conclusion, many factors favor an **intense rivalry** in an **industry** that is expected to be very **profitable**. Section IV will be devoted to the analysis of the forms that competition may take.

2.2.3.3. Pressure from substitute products

Identifying substitutes is a matter of searching for other products that can perform the same function as the product of the industry. While defining the boundaries of the cellular communications industry, we have looked at the potential range of competitors in the wireless industry. The chain of substitutability enabled us to determine how close each of these competitors was to the cellular services.

ESMR has been identified as being the closest substitute to cellular services. As a matter of fact this new technology developed by Nextel is experiencing an important growth. ESMR offers services very close to those proposed by cellular and PCS providers (instant conference calling, voice mail, and text messaging in one unit) and is a threat to the cellular and PCS competitors. However, ESMR faces problems of spectrum scarcity and the digitalization of the cellular and PCS networks threatens to negate the advantages of ESMR carriers.

Porter tells us that the substitutes that deserve the most attention are those that (1) are subject to trends improving their price-performance tradeoff with the industry's product, or (2) are produced by industries earning higher profits. None of the above seem to apply to the case of ESMR services. Actually, ESMR, cellular and PCS have very similar cost structures. Furthermore, the great uncertainty about technological developments in the field of wireless communications make any significant and sustainable competitive advantage based on technology very unlikely.

Finally, because there is only one ESMR licensee per market, in which coexist two cellular and six PCS licensees, ESMR appears to be just one more competitor. Although ESMR competition has to be taken into account it does not represent a major threat.

Other competitors in the wireless market like satellite communications, paging, etc. can also be considered as potential substitutes. However they do not answer the same consumer needs and as a result do not exert a significant pressure on the industry. In conclusion we can say that pressure from substitute products is medium. We could have extended the analysis to the issue of the substitutability of cellular communications for wireline services. According to many people, this is where the future of cellular communications is. However, this is more of a long term growth perspective. In the time frame to which we are looking, wireline and wireless still appear as very remote substitutes.

To put in a nutshell, at the time being, the pressure of substitutes is not very strong in this fast-growing industry. However, we have to keep in mind that this situation may change as rapidly as the industry evolves. And in the long term, the cellular industry may have to fight against substitutes like copper wire.

2.2.3.4. Bargaining power of buyers

The buyers of cellular services vary from large business users to individuals for personal use but there is no real powerful buyer group pressuring the cellular industry. However,

some factors tend to make the buyers more price sensitive —at the expense of the industry's profitability. Although the buyers of cellular are not considered as *consumers* yet, the industry is evolving in that direction.

- The products are undifferentiated in the buyer's mind. As we have seen already, consumers are overwhelmed with contradictory marketing messages. Moreover, purchasing cellular services implies very complex choices which make it all the more difficult for buyers to understand the differences between the offers. What's more, in this high-tech industry, technology is transparent to the user. What matters to the consumer is the features supported by the product, the quality, etc. However, they are easily lured by technology arguments such as "digital quality" which are not always accurate. Finally, the introduction of PCS for which no definition has been agreed on increases the noise in the marketplace. All these factors increase the risk of competitive warfare. Yet on the other hand, the lack of information or understanding of the industry that the buyers suffer from, because of the noise, will diminish their power.
- The buyers face few switching costs which —as we have seen in the previous paragraph— enhances their power.
- The products are expensive relative to buyers' income. This makes them very price sensitive. However, because of technology improvements and the introduction of competition, prices are expected to go down. As a matter of fact, the cellular industry is targeting its expansion toward the mass market. On the one hand price sensitivity will decrease as the products become less expensive, but on the other hand there is a risk of increase of price sensitivity as the products becomes a commodity.

In conclusion the buyers have some power yet this does not represent a major source of competition in the industry. The bargaining power of buyers is still relatively low.

2.2.3.5. Bargaining power of suppliers

Cellular service providers need two kinds of supplies: network equipment and phones. They can either get both from the same equipment manufacturer or choose different suppliers. The suppliers can exert some power over the participants in the industry for at least two of the reasons listed by Porter: the suppliers' product is an important input to the buyer's business, and the suppliers' product groups are differentiated or it has built up switching costs.

Network equipment is more than just an input for the service providers. It will determine their quality, cost structure, etc. As a result, it is very important to the buyer's business. Moreover, a vendor's choice for network equipment or phones often reflects a technology choice and switching costs are extremely high. Because of the technological uncertainty in the wireless market, this issue is even more critical. However, although suppliers can gain a significant power over the industry competitors, this phenomenon is reciprocal. A service provider is usually a very important customer for the equipment manufacturers, and losing him could be critical.

We can observe several trends in the market that will limit the competitive pressure from the suppliers. First, the operators are evolving toward open architectures for their networks. Second, they usually choose more than one equipment provider, which is made

easier by the open architecture solutions. Finally, service providers insist on having partnership relationships with their suppliers.

2.2.3.6. Government as a force in the industry

Needless to say that the government has a very strong influence on the level of competition in the cellular industry. The government, through the decisions of the Federal Communications Commission, almost determines the level of competition. Two landmarks in the evolution of cellular communications exemplify the crucial role of the government. Urged to reassess the level of competition in the industry, which was considered insufficient with the duopoly structure, the FCC decided in 1993 to increase competition by allowing more players in the market. Later on the Telecommunications Act of 1996 opening the whole communications industry to enhanced competition also contributed to increasing competition in the cellular industry.

Despite deregulatory trends, the wireless communications industry is and will remain under control of the government. The FCC being responsible for the allocation of the necessary radio spectrum resources it has the power to decide who will be allowed to play in the industry. The government directly influences many aspects of the industry structure. As the licensing authority, it has the power to pose absolute barriers to entry. The regulation of the industry by the FCC also affects many of the components that determine the rivalry among competitors.

To conclude, the government plays a crucial role in determining industry competition for the present and the future. However, as recommended by Porter, we do not consider government policy as a force in itself. Rather, we consider how it affects competition through the five competitive forces.

Conclusion: intense competition

Porter's theory for the structural analysis of industries enabled us to assess the intensity of competition in the cellular services industry as well as identify the various competitive forces. In summary, the results are the following. Competition in the industry stirred by government policy —introduction of the new PCS players and deregulation of the telecommunications industry— has reached a very high level of intensity and keeps rising.

- The limited number of licenses poses absolute barriers to entry for further competition, and for those who were allowed in, very high structural barriers remain.
- Rivalry among numerous competitors —established players and new PCS entrants— can be expected to be very strong. The confusion reigning in this crowded and fast moving industry makes it even more volatile.
- Although some substitutes exert a pressure on the industry, this is not a major source of competition for the industry.
- Ill-informed or confused buyers do not have a real bargaining power on the industry although some new factors such as the absence of long term contracts will increase their price sensitivity.
- Suppliers have an important role in the industry yet they are seen like partners more than competitors.

We have assessed the intensity of competition in the cellular industry and diagnosed the forces affecting competition and their underlying causes. The cellular industry appeared as a very competitive one, promising high profits. However, this industry is experiencing a tremendous growth. As a result, the forces that determine competition are bound to change rapidly also. In fact, the competitive forces we have studied are those of an emerging industry and will evolve as the industry matures. Besides, the communications industry is one in which evolution is extremely fast paced which makes the time frame even shorter. This remark accounts for the fact that I decided not to develop here issues such as wireline substitutability —or wireless local loop— which belong to a relative long term horizon. The next section is devoted to a closer analysis of the characteristics of emerging industries and their implications for strategy formulation.

Chapter 3

COMPETITIVE STRATEGIES IN AN EMERGING INDUSTRY

3.1. Characteristics of emerging industries

We have analyzed the structure of the cellular communications industry following Porter's framework. However, according to his theory, some more characteristics have to be outlined relative to the particularities of the type of environment of the industry.

3.1.1. Definition

An emerging industry is a newly formed or re-formed industry, created by technological innovations, emergence of new consumer needs, economic or political changes, etc. which elevate a new product or service to the level of a potentially viable business opportunity. However, the problems of an emerging industry can also be present when an old business experiences a fundamental change in its competitive rules coupled with very high growth rates caused by the changes just described.

The essential characteristic of an emerging industry from the viewpoint of strategy formulation is that there are no or only few rules of the game.

3.1.2. Structural environment

3.1.2.1. Common structural characteristics

- Technological uncertainty. With different technologies being backed by different competitors, no one knows which will ultimately prove best.
- Strategic uncertainty. No right strategy has been identified and a variety of strategies are being tried with different product/market positioning, marketing, servicing and so on, and betting on different product configuration, technologies. Related to this is the poor quality of information about the market.
- High initial costs but steep cost reduction.
- Embryonic companies and spin-offs.
- First-time buyers have to be informed and about the new product and persuaded to buy it.
- Short time horizon in dealing with strategic problems caused by the pressure to develop customers.
- Subsidy for early entrants.

3.1.2.2. Early mobility barriers

According to Porter the barriers to entry change overtime. Early barriers will not be brand identification, economies of scale, or capital. They will not stem from the need to command massive resources but from the ability to bear risk, be technologically creative,

and make forward-looking decisions. As a consequence, established companies usually come later in new industries.

3.1.3. Problems constraining industry development

Emerging industries face growth problems due to their newness. Although most of the difficulties listed by Porter apply to the case of the cellular industry, most of them can be transposed. For instance, as we will see in part B, access to raw materials can be assimilated to the issue of cell siting. In other words, the resource sought here is space.

The difficulties that emerging industry are usually faced with are:

- Inability to obtain raw materials and components
- Period of rapid escalation of material prices
- Absence of infrastructure
- Absence of product or technological standardization
- Perceived likelihood of obsolescence
- Customer's confusion
- Erratic product quality
- Image and credibility with the financial community
- Regulatory approval
- High costs
- Response of threatened entities.

This last point deserves particular attention. A number of entities will feel threatened by the emergence of the new industry and will react differently. Entities threatened by substitution can sacrifice their profitability by lowering their costs or increasing marketing or invest to keep up with competition. Anyhow, the higher the exit barriers, the more aggressive the reaction of the threatened industries—in foregoing profits in pricing or in investing in cost reduction to hold volume.

3.1.4. Early and late markets

A very important question in emerging industries is to determine which markets will open up first. Not only is it crucial for product development and marketing purposes but also in terms of forecasting of the industry structural evolution. A number of criteria are crucial in assessing the receptivity of particular markets, market segments or particular buyers to a new product.

- Nature of the benefit: performance or cost advantage. Usually, the earliest markets purchasing the new product, other things being equal, are those in which the advantage is one of performance. Cost advantage is often considered suspicious for a new product.
- State of the art required to yield significant benefits.
- Cost of product failure for the buyer.
- Introduction of switching costs
- Support services
- Cost of obsolescence

- Asymmetric government, regulatory or labor barrier
- Resources to change
- Perception of technological change
- Personal risk to the decision maker

3.1.5. Strategic choices

In an emerging industry where the rules of the game have not yet been established, firms have great degrees of strategic freedom. The leverage of good strategic choices will be the highest, yet the uncertainty of an undefined structure and changing competition make strategic choices all the more risky. Some of the strategic issues are:

- Shaping industry structure
- Externalities in industry development
- Changing role of suppliers and channels
- Shifting mobility barriers
- Timing entry
- Coping with competitors

3.2. The cellular industry

3.2.1. An emerging industry

The cellular industry can be considered as an emerging industry in so far as it is a newly re-formed industry. As a matter of fact the introduction of PCS has caused fundamental change in the industry competition and growth rate. The rules of the game have changed and have to be re-established.

3.2.2. Structural environment

Most of the structural characteristics of an emerging industry can be found in the case of the cellular industry. The early mobility barriers however, seem to be different than those described by Porter.

3.2.2.1. Structural characteristics

- **Technological uncertainty: no “best” technology.** In the absence of a standard for PCS air interface, several technologies have been developed. As we have seen in chapter 1, CDMA, TDMA and GSM are competing; advocates of each of them are trying to prove that theirs will be the dominating technology. At the time when they are choosing their technology, PCS operators do not know which one, if any, will prove to be the “best”. This issue is critical as it affects network design, vendor selection, and will determine future alliances and roaming capabilities.

- **Strategic uncertainty.** A wide variety of strategies are being tried by the industry, and no “right” strategy has been identified. For instance, in terms of market positioning, it is not clear whether PCS will be assimilated to cellular or stand as a distinct competitor.
- **High initial costs but steep cost reduction.** This has been analyzed as we looked at the economies of scale in the entry barriers.
- **Embryonic companies and spin-offs.** This emerging phase of the industry is accompanied by the greatest proportion of newly formed companies. However, this phenomenon is only due to the new licenses awarded for PCS and particularly the special C-Band **Entrepreneur licenses** which encouraged the entry of small businesses and minorities. Furthermore, the FCC regulation that limits **cross-ownership** of PCS and licenses in the same market area was the cause of spin-offs in the industry. Companies like Sprint spun-off their cellular business to enter freely into the PCS market.
- **First time buyers.** Although switching to PCS is not a quantum leap for cellular users, buyers have to be persuaded to try the new technologies but mostly to put up with the short-comings of a nascent service —roaming for instance. They also have to convince non cellular user that there is something new for them.
- **Short time horizon.** For PCS entrants, the pressure to develop customers is so great that they may adopt short term solutions. We will discuss that in the section devoted to competitive strategies.
- **Subsidy.** In the PCS industry, subsidy for early entrants was given by the FCC who granted **Pioneer’s Preference licenses**. Not only were they awarded at a discounted

rate but also they enabled the licensees to develop their systems before the rest of the industry.

3.2.2.2. Early mobility barriers

The cellular communications industry may not be a typical emerging industry as described by Porter. As a matter of fact, as we have discussed earlier, PCS is not really a new service. There is an important continuity between the existing cellular services and the emerging PCS services. As a result, the barriers to entry that we have identified in the structural analysis in section II are different from what early barriers should be according to Porter. Furthermore, newly created companies are not the first to provide the new service. Rather, established companies tried it first. Yet, the peculiar regulatory environment can account for that phenomenon since no new company could afford to buy the A&B licenses. Their entry was encouraged later with the auction of the C-Block entrepreneurial licenses.

3.2.3. Problems constraining industry development

- **Raw materials.** The most difficult problem for PCS carriers is the **lack of space** to install their cell site equipment. Although they are much smaller than they used to be for cellular and do not require independent antennas, a larger number has to be installed. This comes at a time when authorities are very concerned about environmental issues, which worsens the situation.

- **Absence of standardization.** The absence of standards that we have discussed already accentuates problems in network buildout, roaming agreements, etc.
- **Customer's confusion.** Again the diversity and variety of information in the industry and the “PCS vs. Cellular” phenomenon may limit industry sales if customers decide to wait until they understand what's going on before they buy.
- **Image and credibility with the financial community.** We have seen the importance of the capital requirements to install a network and start operating it. Support from the financial community is difficult to get yet necessary to succeed. This is why most of the A & B licensees are big companies. “Like almost all the PCS companies, Washington's Sprint Spectrum is backed by an awesome bankroll. The controlling shareholder, APC, is no financial Goliath. The limited partner, however, is a gigantic creature called Sprint Telecommunications Venture, which is a partnership of Sprint Telecommunications Inc., Comcast and Cox Communications. The partnership kicked in \$150 million for the Washington operation's network equipment and operating costs —and it is willing to wait years for a return on investment.” Others, like many of the C-block licensees found support from international consortia (Korean equipment manufacturers with strong financial support for instance).
- **High costs for start up.** This has been analyzed in the structural analysis.
- **Response of threatened entities.**

In an article entitled “Cellular Does Digital”, Paul Rubin highlights the reaction of existing cellular carriers to PCS competition. “PCS was cellular's wake-up call from a marketing as well as a technology standpoint. ‘The industry has been driven by engineering and technology and probably rightly so,’ Elliott says. But now there is a need for market —

and customer— focus as cellular gears up for hypercompetition, he adds. The original hype about digital cellular centered on the ability to add capacity rather than features, and on the technology's internal focus. But now, Elliott says, digital is an enabler to competition. Translation: Go digital, or go home."

According to Porter's model, it seems that the threatened industry —cellular— has chosen to aggressively invest to make its service more competitive. Although Elliott says the move to digital is motivated by marketing concerns rather than capacity, cellular carriers' investment in the new technology will also lower their costs in the future. In response to the competitive pressures, cellular providers are also lowering their prices. Some cellular carriers have chosen different options. They have added PCS to their array of service or more radically abandoned their cellular business to jump into PCS. We will look at these various strategies in more details in the analysis of competitive strategies.

3.2.4. Early and late markets

The most important criteria to assess the receptivity of market segments to new products is the **nature of the expected benefit**. In the case of PCS, the benefit are:

- **Performance advantage:** At the time being, the performance advantage of PCS is limited. As a matter of fact, although PCS offers the advantages of digital —clear signal, security, new features— it does not provide roaming which cellular does. And if PCS holds great promise for future performance—including roaming—, so does cellular which is upgrading to digital. However, the success of Sprint Spectrum in the Washington area proves that the customers have perceived a performance advantage

large enough to compensate for the current shortcomings. It appears that for users who are not roaming a lot but give a great importance to the capacity issue, PCS has a very good value. Be it for security or business purposes, a customer concerned about not getting a signal will not worry any longer about saturation. Small PCS phones are perceived as “more than cool”, “easy to use and sound great” according to Leonard Wiener.

- This performance advantage is coupled with a **service advantage**. PCS is user friendly, offers over-the-air activation and 24h customer care.
- **Cost advantage:** The performance and service advantages are complemented by the lower cost of PCS. Not only is PCS generally cheaper than cellular, “so far, calling rates for PCS minutes are running 15 to 20% cheaper than cellular in the same market”, according to Business Week, but also the first minute of incoming calls is free and there is no annual contract. However, PCS phones tend to be more expensive than the “low-end one-cent or \$9.99 phones frequently used to draw customers in long-term contracts” in the cellular case. “Don’t count to see such deals for PCS phones” says Leonard Wiener. Overall, there is a perceived cost advantage for PCS. Yet like the performance advantage, the cost advantage is limited by the reaction of the cellular carriers. “The established companies are beefing up technology, adding features, and cutting prices to head off the upstarts. Most have eliminated annual service contracts for new subscribers who buy their phones. And rates are dropping: Shortly before PrimeCo launched its PCS network in Chicago, Ameritech Corp. cut the price per minute of its cellular service by 15%” according to Business Week.

According to Porter, the nature of the expected benefit is the most important determinant of the buyer receptivity to a new product or service. Also according to him, the earliest markets purchasing a new product, other things being equal, are usually those in which the advantage is one of performance. In the case of PCS, there is a perceived performance, service and cost advantage. As a result, it is difficult to tell which first attracted the customers. Furthermore, there was no real pressure on customers to buy the new service to improve its own competitiveness nor specific risks in adopting it.

The lack of available data about PCS subscriber does not allow us to determine exactly who are the early users of PCS —cellular or non-cellular users, business users or consumers, etc. What we can tell is that they are users who place higher value on sound quality, new features and capacity than on roaming capabilities. As cellular catches up with PCS, the advantages of PCS over cellular will be less distinct. However, these new kinds of services —PCS or digital cellular— seek to achieve an overall performance and cost advantage over previous services that will open the mass consumer market.

3.2.5. Strategic choices

The introduction of PCS has fundamentally changed the competitive rules in the cellular industry which we consider as a newly re-formed or emerging industry. Strategic choices in this early phase will have important impacts on the performance of the firms. Some of the strategic issues are the following:

- **Shaping the industry structure.** Through their choices, new entrants in the PCS industry will try to set the rules of the game in areas like marketing approach and pricing strategy. However, this is limited by the fact that competition occurs on a per market basis and the actions of a player in a specific market will not necessarily impact the shape of competition elsewhere. Nevertheless, it seems that PCS industry is being shaped following the orientation adopted by the early entrants. The marketing approaches for instance seem to have common characteristics —no long term contract, users buy the phones, etc. Cellular is also following that path.
- **Externalities in industry development.** In the absence of standards, there is a need for firms to cooperate for the sake of the industry development. But firms may resist standardization in order to pursue their own market position, thus creating confusion in the market. This question of balance between industry outlook and firm outlook is critical in the cellular industry. As a matter of fact, because they have not agreed on a common image for PCS, let alone on standards, the growth of PCS will suffer. A good example is the use by AT&T of Digital PCS as the name for its digital cellular service.
- Another implication of externalities in industry development is that firms may have to compete initially with a strategy it ultimately does not want to follow. These temporary actions may be necessary to develop the industry but can be dropped later to achieve a better position.
- **Changing role of suppliers and channels, shifting mobility barriers.** As we have seen already, firms must anticipate the evolution of structural conditions as the industry grows.

- **Timing entry.** This is a critical choice for competing in emerging industries. On the one hand being an early entrant in the PCS industry creates advantages in terms of customer development, image, learning process, etc. On the other hand, early entrants will face greater risk and uncertainty. For instance technological choices will be more risky for early entrants than for followers. Furthermore, early entrants will have to cope with the shortcomings of systems that are not yet fully developed.
- **Coping with competitors.** It is critical for pioneers to balance their efforts devoted to fight competition with those devoted to building their own strengths. It may even be appropriate to encourage certain competitors which may help in technological development for instance.

Conclusion

This section, which was aimed at highlighting the particularities of cellular as an emerging industry, comes to an important conclusion. The cellular industry is very dynamic, and the position of PCS in it is not yet well defined. The relations between PCS and cellular will evolve over time.

In this emerging industry, competition will be intense. However, “overall, the growth of wireless acceptance to date portends a lucrative market for a large fleet of competitors. A lot of people will win,” says Meyers in “Navigating Wireless Waters”.

Chapter 4

COMPETITIVE STRATEGIES

4.1. Generic competitive strategies

4.1.1. Three generic competitive strategies

Competitive strategy consists in taking offensive or defensive actions to:

- create a defensible position in an industry,
- cope successfully with the five competitive forces, and thereby
- yield a superior return on investment for the firm.

Porter identifies three potential successful generic strategic approaches to outperforming other firms in an industry: overall cost leadership, differentiation and focus.

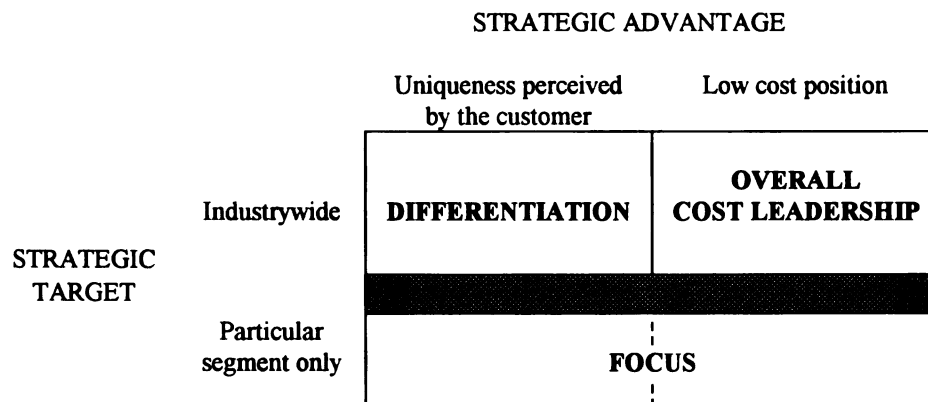


Figure 5 - Generic Competitive Strategies

Source: Porter, M.

4.1.1.1. Overall cost leadership

This strategy consists in being *the* low-cost producer in the industry. The company's target is usually broad, which is often important in its cost advantage. The sources of cost advantage are varied and depend on the industry structure. A cost leader however, must achieve parity or proximity on the basis of differentiation relative to its competitors to be an above-average performer.

The strategic logic of cost leadership requires that a firm be *the* cost leader, not one of several firms vying for this position. When there is more than one aspiring cost leader, rivalry among them is fierce and the consequences for the long-term profitability of the industry can be disastrous.

4.1.1.2. Differentiation

This strategy consists in seeking to be unique in the industry along some dimensions that are widely valued by buyers. The firm is rewarded for its uniqueness with a premium price. The differentiation can be based on different attributes which vary depending on the industry —the product itself, marketing approach, service, etc. A successful differentiation strategy requires that the price premium be greater than the cost of differentiation. As a result, in order to achieve above average performance, a differentiator will aim at cost parity or proximity relative to its competitors..

Unlike cost leadership, differentiation strategies can be adopted by more than one competitor in the industry. However, in order to be successful, they will have to be based on different attributes.

4.1.1.3. Focus

This strategy consists in choosing a narrow competitive scope —a particular buyer group, segment of the product line, or geographic market —within the industry. The idea is that by tailoring its strategy to serve the targeted segment very well, the company will be able to serve its narrow strategic target better or more efficiently than competitors who are competing more broadly. This strategy has two variants. The cost focus in which the company seeks a cost advantage in its segment is based on differences of cost behavior in some segments. Differentiation focus, whereby a company seeks differentiation in its target segment, exploits the special needs of buyers in some segment.

Focus strategy will not succeed unless the target segment is different from other segments in the industry. Furthermore, the segment has to be structurally attractive for the focuser to be an above average performer in its industry.

Focus strategies can be adopted by more than one competitor in the industry provided that they choose different target segments.

4.1.2. Risks of the generic strategies

Table 17 - Risk of generic strategies

Risk of cost leadership	Risks of differentiation	Risks of focus
Cost leadership is not sustained • competitors imitate • technology changes • other bases for cost leadership erode Proximity in differentiation is lost	Differentiation is not sustained • competitors • bases for differentiation become less important to buyers Cost proximity is lost	The focus strategy is imitated The target segment becomes structurally unattractive • structure erodes • demand disappears Broadly-targeted competitors overwhelm the segment • the segment's differences from other segments narrow • the advantages of a broad line increase
Cost focusers achieve even lower cost in segments	Differentiation focusers achieve even greater differentiation in segments	New focusers sub-segment the industry

Source: Porter, M.

4.2. Entry strategies for PCS providers

4.2.1. Early trends vs. long term strategies

In an advertisement published in Telephony, Lucent Technology makes the following statement: "Despite the projected success, wireless is still a brutal battleground with many different competitors vying for customers and facility space. The pressure is on for PCS providers to make great strides in a very short time. They'll be doing so at both the expense of and thanks to inroads made by their cellular counterparts."

This reminds us of the fierce competition that we have diagnosed in the cellular industry with the emergence of PCS. But more importantly, this advertisement stresses the importance of the time dimension. The short-term horizon is often an issue for strategy formulation in emerging industries. In the cellular industry, competitors vying to play in the emerging PCS services segment are formulating **entry strategies** which will evolve as the industry matures. The competitors for the existing cellular services are developing strategies to cope with the new competition. In the long-term, the perspective will be very different. It is too early to tell what competition will look like in the future.

As we look at the different competitive strategies, we will see that some trends such as competition price are not predicted to last, although they will be dominant in the early phase of the industry.

4.2.2. PCS vs. Cellular

At the time being, PCS is a new service entering the cellular industry. We have seen in our definition of the cellular industry that it becomes the closest substitute to the existing cellular services. We have also seen the differences that exist between PCS and cellular. Based on these differences, PCS and cellular will compete. Some industry participants and observers contend that PCS and cellular will become so much alike in the future that the distinction will no longer exist. Some even say that this has happened already although this is true only from a customer's perspective. For now, the constraints underlying economics and resources of PCS and cellular systems are different.

In every market, PCS licenses will develop entry strategies, cellular will develop defensive strategies, and those who have both will have mitigated strategies. Based on the industry analysis we have performed, I will look at the various entry strategies that may be developed and assess their strength and weaknesses to provide a defensible position in the industry. This analysis will not be based on the characteristics of the various players but rather on structural characteristics of the industry and market analysis. Analysis of particular competitors will be led in the next section.

Not a zero-sum game

“Fortunately for all participants, this is not a zero sum game. AIS forecast models indicate that robust growth in the overall wireless business will let cellular operators expand their subscriber rolls in current markets even as new entrants use PCS spectrum to gain a foothold,” says Hall in an article entitled “Cellular carriers are positioned for success in ear of PCS.”

4.2.3. Market Segmentation

“The company that can really figure out the right market segmentation and the ability to address these segments in the right way will really do well” says Alex Mandl, president and CEO of AT&T Wireless in an article entitled “Gathering of eagles’ advises carriers to focus on customers”. Knowing and understanding the market is indeed a critical step for strategy formulation. Before they can decide on whether to adopt a cost, differentiation or focus strategy, the competitors need to know their potential customers and decide on the

best ones for them to target. A number of characteristics can be used in customer profiling such as product/service orientation, demographics, geography, usage patterns, value, etc.

Findings like those of the Yankee Group's 1996 Mobile user survey give very valuable information such as usage and price sensitivity (cf. Table 5). In a study entitled "Wireless Voice of the Customers: Improving Wireless Customer Satisfaction and loyalty", Coopers & Lybrand Consulting also provides very useful data.

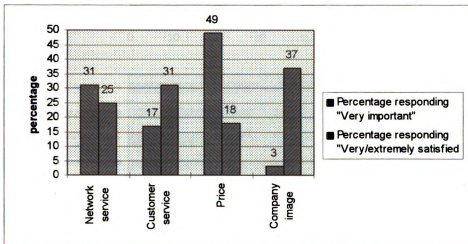
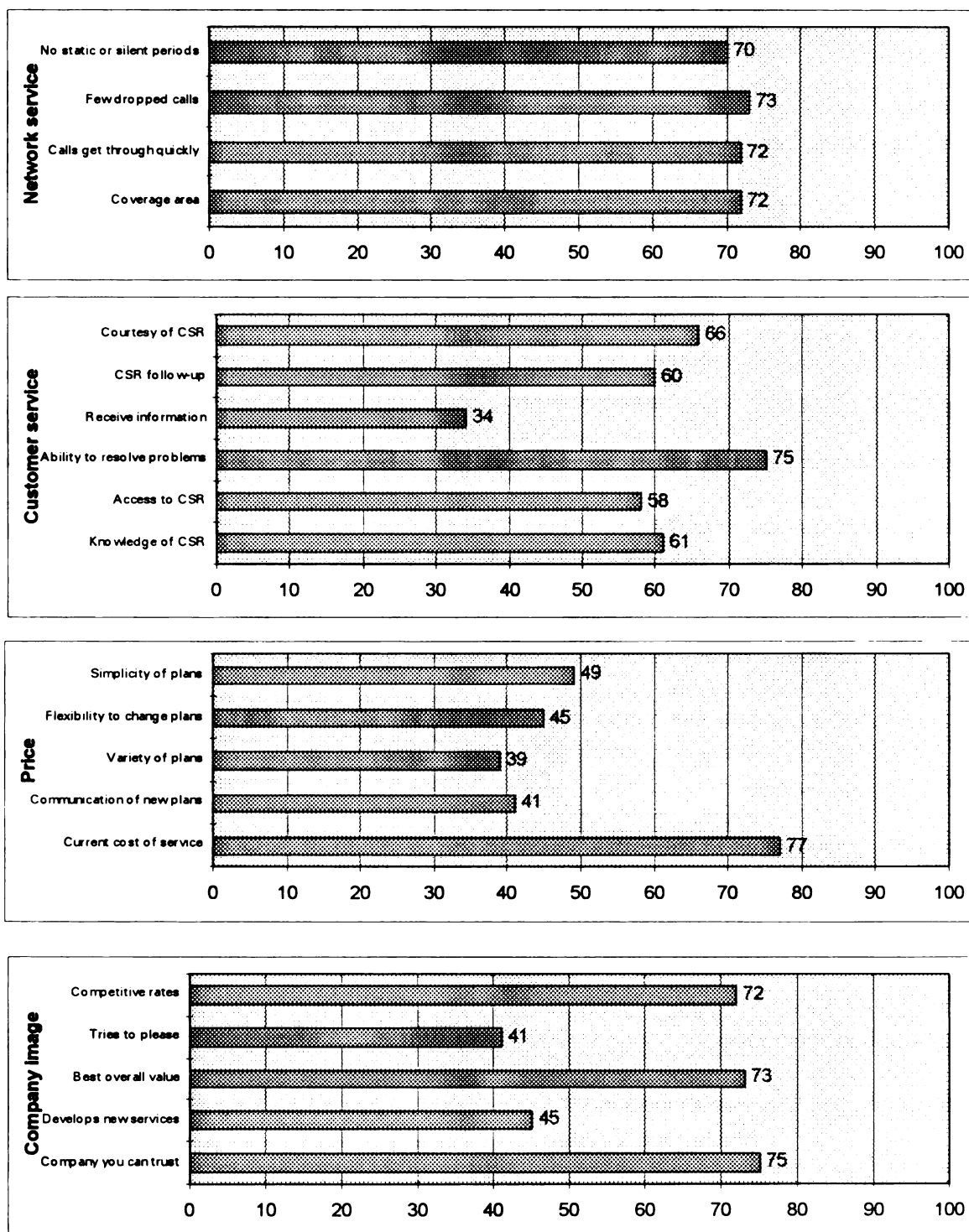


Figure 6 - Importance vs. Satisfaction.

Source: Coopers & Lybrand.



Percentage responding very important

Figure 7 - Customer reported importance of service attributes

Source: Coopers & Lybrand.

The study reveals some general perception about the nature of customers. They identify five need-based customer types:

- “Value seekers”: low monthly bill, usage based on specific needs and spending limits, extreme price sensitivity, limited usage experience and personal calling.
- “Productivity users”: mostly business users with the heaviest calling patterns and extreme sensitivity to price, rated the most likely to switch providers and demand high quality network service.
- “Safety and simplicity”: use wireless for emergencies, the least likely to call customer service, do not like the complications and restrictions of their calling plans, poorly informed of their service choices.
- “Cell phone as a perk”: users who have bill paid by an employer or a third party, mostly moderate users but also a few heavy users, the least concerned with price but interested in improved network and customer service.
- “Bargain hunters”: want flexibility in pricing plans, extremely price sensitive, extremely likely to switch providers, the most informed about their service choices.

The identification of specific trends may **give carriers some clues as how to formulate new service strategies**. However, although knowing the wireless users and particularly their tendency to switch is important for new PCS entrants, it is equally important to know the **non wireless users**. As a matter of fact, the **mass market** is considered as a very important growth opportunity and while PCS may seek to attract some cellular users, they will most importantly try to develop new customers. This is all the more true as many PCS players are playing on both sides.

4.2.4. Potential and limits of cost, differentiation and focus strategies

4.2.4.1. Cost leadership strategy

First of all, we have seen that there can be no more than one cost leader per market, otherwise a price war would start and market profitability would collapse. Several reasons lead me to think that overall cost leadership strategies are not likely to be pursued by PCS licensees to enter the cellular industry. This does not mean that competitors will not compete on price. According to Dan O'Shea, "early indications are that many PCS operators will try to compete heavily on price". However, this is only a short-term strategy and does not necessarily reflect the nature of the long term strategy adopted by the competitors.

- **Structural reasons**

Several factors outlined in the structural analysis make price competition look unlikely. First, although competition is intense, the growth rate in the industry is very high. As a result, even if a competitor develops lower prices, the competition will not necessarily have to follow. Second, entry barriers are high but exit barriers are low. Competitors having difficulties are not likely then to stay in the industry and price their services below the competitive level in order to limit their loss. Thirdly, the competitors are very diverse and as a result have different cost structures which limit the risk of price war. Since there can be only one cost leader per market, adopting such a strategy is risky. And given the

industry context, there is no real pressure to do so because many other opportunities exist. Nevertheless, many niche cost strategies are possible.

- **Importance of price**

- Although the study by Coopers & Lybrand shows price as very important, it also predicts that **price will be less significant in the years to come** according to O'Shea in "Looking for little satisfaction". "We are estimating that it will drop out of the equation over the next five years" says Patberg. Other elements of wireless service are expected to emerge as the significance of price wanes. "Brand image, customer service and network quality, especially in terms of coverage and reliability will pick up the slack".

- The first three regional PCS networks in operation —Sprint Spectrum in Washington DC, and Western Wireless' VoiceStream in Hawaii and Salt Lake City— all offer consistently **lower prices** than existing cellular carriers in these markets. According to President Philip Alford of Tekelec **PCS will be launched as a lower-cost alternative to cellular, but will quickly evolve into something more significant**, says Lannon in "Rings of Change". Cellular operators are pushing their investment in digital technology to meet the strategic challenge of PCS. As a matter of fact, the improvements brought by digital technology have drastically reduced the cost of PCS networks, and the same will happen to cellular. Increased competition will also lead to decrease in the prices of wireless, but this does not mean there will be a price war.

- New lower prices will not start a price war. An article entitled "Price as a PCS edge" studies the question of how much will price matter in the Cellular Vs. PCS competition.

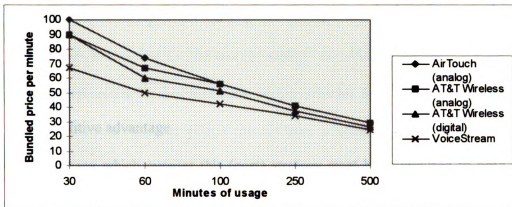


Figure 8 - Comparison of Salt Lake City wireless tariffs at 70% peak and 30% off-peak pricing. (activation fees not considered)

Source: The Yankee Group.

“The Yankee group predicts that the new carrier’s (Voice Stream) plan will not start a price war but will serve to stimulate overall wireless subscribership and usage minutes in the Salt Lake city area.” This statement reflects two underlying ideas in the industry. First, new lower prices are not aimed at merely stealing customers from cellular, but at developing customers in the **mass market**. Second, a very important idea in the wireless industry is that what is important is to increase air time. **“For the first time in the wireless industry, it is no longer the quantity of customers that counts as much as the quality of customers.”** The profile of the potential new user is diversifying and average monthly revenues are decreasing according to Donaldson, Lufkin and Jenrette.

“While cost may be the initial attraction of PCS, the marriage of lower cost and higher voice quality seeks to reverse current calling trends. For wireless to succeed, usage has to go up.” says Bob Sellinger, Lucent Technologies’ director of personal communications systems. Furthermore, according to Coopers & Lybrand’s market segmentation, the most price-sensitive customers are not necessarily the customers of the best value.

- Finally, a trend toward bundling of services may make prices of services less important separately.

- Competitive advantage

- “A company which pursues this (cost) strategy must be committed to both radical and continuous improvement across all of its business processes... All areas of operating costs must be evaluated and minimized, but particular attention must be given to the cost of acquiring customers” says Carl Aron. The question then is whether PCS entrants are better positioned to develop a competitive advantage on cost. I will discuss this issue in more details in the competitor analysis in the next section. However, what we can say is that PCS operators do not necessarily have a cost advantage although they benefit from the lower costs of the new technology. As a matter of fact, cellular operators have advantages due to their incumbency. Their networks are already in place and they have a subscriber base. Yet they have to face a costly transition from analog to digital to stay competitive.

- Most competitors have no interest in competing on prices and thereby risking to start a price war. According to a BRG study, although PCS operators are under great pressure to get customers, “Carriers, however, are reluctant to compete too strenuously on price while trying to recoup on their investments.” Furthermore, “if new entrants pursue a pure low-price market entry strategy, they could, in certain markets, find those prices being met by incumbent wireless providers reluctant to yield market share”. On the one hand cellular customers have recovered much of their capital investment and enjoy a strong cash flow that will permit them to respond to price competition. Yet on the other hand, they have a

pricing dilemma. “If digital service is priced aggressively to compete with PCS, prices may also have to be lowered for the current analog” says Hall. Another factor playing against price competition is the fact that many competitors are fighting on both sides. To put it in a nutshell, neither PCS nor cellular carriers have an interest in starting a price war, and we will see in the next paragraph that they have many other means to compete.

“Market segmentation plays a key role in the growth of the business. You have to know your customers —what they want and what they are willing to pay. Some new companies are probably going to underprice, and they may take a bath. People want good value for what they’re getting,” says Sprint Spectrum’s Battey in “Navigating wireless waters”. “It’s not necessarily a cheap price”.

4.2.4.2. Differentiation strategy

“If competition spurred the price decreases and drove the long-distance industry to become similar to a commodities market, then it was also competition that spurred the use of the long-distance network for things other than basic telephone service—other services and features that began to differentiate one company from the next.” says Felix in an article about enhanced services. The same thing is happening in the cellular industry. As matter of fact, before the introduction of PCS in cellular markets, the duopoly situation kept prices above the competition level and carriers did not need strong differentiation. Although there are many cellular carriers in the US, competition happened on a per market

basis and there were only two competitors per market. Now, with as many as 8 potential competitors in each market, prices have decreased and differentiation becomes a key issue.

Other factors make differentiation strategies very attractive. As we have seen in the structural analysis of the cellular industry, **differentiation is critical in a crowded or confusing market**. This is the case in the cellular market. We have noted already many reasons that make the cellular industry so confusing —introduction of PCS, deregulation, emerging industry, etc. This confusion is also due to the lack of information of customers, their difficulty to understand the new and vague concept of PCS. Moreover, as Sprint Spectrum's Battey puts it: "the incumbent cellular carriers will do their best to confuse the customer as to what PCS is." And this is blatant when we see AT&T digital cellular service named "Digital PCS". As a result, PCS entrants will try to educate their customers and differentiate their PCS services, yet for those who fight on both sides like AT&T, this will not be the case.

A second reason to adopt a differentiation strategy is the mass market approach that many PCS companies have chosen. **"Lower prices brought by increased competition will let wireless voice companies target the mass consumer market. In this arena, effective brand management and mass media advertising will be critical to succeed."** Furthermore, "Branding is crucial in a crowded field where providers are clamoring for business from the **non-techno-savvy masses**", says Krapf in an analysis of the California market of the future. "The shift to mass marketing approach seems to be gaining momentum" says Blake in an article entitled "Identifying Your Customers".

A BRG study —PCS: The Carrier Perspective— based largely on interviews with carriers in the fields of cellular, broadband PCS, satellite and narrowband PCS examined competitive strategies in wireless. It claims that carriers will try to **differentiate their services from their competitors primarily by keeping their services easy to use and through branding**. Fred Blanck, who is in the business of solving and helping avert marketing problems encourages its clients to take a proactive approach by differentiating themselves in the widely competitive industry.

Brand management is the art of communicating the unique qualities of a company and its products carefully and consistently over a long period of time. Furthermore, brand recognition is about attracting customers and brand loyalty is about retaining them. For service providers, there are a number of areas for differentiating themselves: quality, customer service, feature/function, etc. PCS clearly has a large basis for differentiation. As a matter of fact it offers many characteristics that were not available before, although cellular is catching up. Enhanced **quality**, security, portability, and numerous features provide a basis for a differentiation on quality. The new concept of **customer care** is also very important.

Although I am not going to look at all providers, let's take the example of PrimeCO developed by Meyers in "Past, Present and Future, PrimeCo focuses on melding the real world experience of its partners with its new vision of wireless". "We will differentiate ourselves based on quality —the total quality experience that our customers will have,"

says Karen Little, vice president of marketing at PrimeCo. “We believe there will be a distinct difference in the quality of our network.” The market being more segmented, there is room for many differentiation strategy in every market. Although we can observe a variety of messages, a few are recurring. Easy-to-use is one of them, and total customer care is another. Competition takes place on a per market basis, yet some competitors will seek national presence and higher profile names. This is the case for PrimeCo who seeks national presence through its partnership with Bell Atlantic, Nynex, Airtouch and U.S. West.

4.2.4.3. Focus strategy

Although overall cost leadership did not appear like an attractive or sustainable strategy to enter the cellular market while differentiation seemed much more attractive, both of these strategies are being developed on a narrower basis. There are several dimensions to narrow the scope of these strategies. First, there is the geographic one. Although competition happens on a per market basis, having a national leadership image can be a competitive advantage. It is not necessary though, and if one is not a Sprint or an AT&T, an RBOC bringing PCS in its home market can achieve a very strong differentiation advantage and lead a successful differentiation strategy in its regional market. The second dimension along which the carriers can narrow their competitive strategy is the market segmentation. As a matter of fact, although industry-wide cost strategy is unlikely, many focus cost strategy are being developed, targeting niches of the market. One of them is the low-tier approach which targets the low-mobility users. Another dimension for

differentiation is the breadth of the company image. For instance while some players like AT&T will position themselves as multiservice providers, others will differentiate them by focusing solely on wireless to be unique and stand apart as “pure-play” wireless.

Many factors favor the adoption of focus strategies. The first one is the geographic segmentation of the cellular industry. The number of markets —51 MTAs and 492 BTAs— give many opportunities for PCS entrants to tailor their geographic market to the type of strategy they want to adopt. While some will seek national coverage, others will focus on a particular region. Second, there are a variety of technologies for PCS which give the service providers very different cost structures. As a result, one service provider will be able to deliver one particular service at a lower cost. A third factor is the variety of licenses. While the A&B licenses are reserved to big players because of the price of the licenses, many smaller providers who benefited from the C-Block Entrepreneurial licenses are planning to fill in wireless niches by providing low-tier service that offers PCS functionality without extended mobility.

Lucent Technologies highlights some limits of niche strategies. “Survival may prove quite difficult for the small niche player that plans to go it alone and doesn’t align in some fashion with other carriers. Alliances are key because they greatly broaden the scope through roaming and give providers access to high-end products that will be advertised around the country.” Yet this problem will be offset if niche players manage to achieve a significant advantage in their targeted scope.

Because the market is very segmented there are many niche strategies. Flat-fee services, mall-based services and cordless extensions at home are some examples. Segmenting the market place and devising niche services for these segments will attract customers. “An example could be phones for kids says Osmo Hautanen, vice president and general manager-PCS for Nokia Telecommunications in “Wireless showdown” by Dziatkiewicz. “You’re looking at a completely different segment with existing technology”.

An example of cost and differentiation focus is U.S. Airwaves Inc., a startup founded by former U.S. West Inc. executive John DeFoe. With an aggressive goal to build a nationwide network, it was the largest depositor in the entrepreneur’s block. Although it has a view to build a national network by owning properties and creating an alliance where other companies can join in, it is still a small company. In an interview with Investor’s Daily, DeFoe says he wishes to compete with AT&T Wireless, PCS PrimeCo and Sprint. The question then is “can a small fry play the PCS game with PCS giants?” “We can do it by getting to a much lower operating cost, offering better economic value... If we have a national scope and alliance partners, that will give us scale and scope, allowing us to buy equipment at the same level the bigger player can.” Yet U.S. Airwave does not seek industrywide cost leadership. Its target is a mass market: small businesses, families and teen-agers. “We will build a simple talk-and listen product and unlock the market for people who make calls to express feelings. The cellular companies depend on business calls; ours is based on emotional content, where you can immediately express feelings about events that just occurred. We will provide a phone service at a very economical

level. That will allow people to makes lots of inexpensive calls. To customers, it will look and feel like a cellular phone, but our phones won't have as many sophisticated features."

Conclusion

What derives from this analysis is that in terms of competitive strategies, the introduction of PCS was a watershed in the cellular industry. Competitive advantages that had no reason for being sought before are becoming critical. Branding is one example. "Cellular carriers aren't very distinct. You can't look at any of them and see brand names. There aren't any," says EDS' s Goodstat in "Wireless showdown". And "no existing carrier has sufficient brand clout to carry it into expanded wireless markets." Although differentiation strategy is more likely than cost leadership, what we will mostly see is a combination of them and focus strategies. As a matter of fact, we have to keep in mind that cost leadership still implies a good level of differentiation as well as differentiation requires cost proximity with the competitors. Finally, given the number and the diversity of the competitors, what we will see is a myriad of different strategies based on the competitive advantages that are specific to each player. The next section is a competitor-based analysis of the various competitive strategies.

To put it in a nutshell, what we are seeing here is the emergence of new competitive strategies in response to a major shift in the industry. As the cellular industry is opening to the mass market and becoming a commodities industry, **the bottom line has become customer focus.**

Chapter 5

COMPETITOR ANALYSIS

5.1. Theory and scope of the competitor analysis

5.1.1. Porter's framework for competitor analysis

Michael Porter's competitive analysis is aimed at "developing a profile of the nature and success of the likely strategy changes each competitor might make, each competitor's probable response to the range of feasible strategic moves other firms could initiate, and each competitor's probable reaction to the array of industry changes and broader environmental shifts that might occur." There are four diagnostic components in Porter's framework: future goals, current strategy, assumptions, and capabilities.

5.1.2. Scope of the analysis for the purpose of our research

According to Porter, perceptive competitor analysis is a central aspect of strategy formulation. My goal here is not to formulate a competitive strategy. Rather, I have the role of an industry observer whose goal is to examine competitive strategies in the cellular

industry. More particularly, my analysis is aimed at **determining the nature of the entry strategies of PCS operators in the wireless market**. Since only a few of them have commercialized their services, and only very recently, this analysis is mostly a “potential competitor” analysis.

Although following Porter’s framework and systematically looking at all the competitors would yield very interesting results, this goes beyond the scope of my study. As a matter of fact, as I highlighted in the paragraph about the rivalry among competitors) there is a score of competitors, with very diverse backgrounds and complex interrelationships. Furthermore, since this is an emerging industry, there is very little data available for the analysis. On top of that, strategy being a confidential issue, any information likely to give clues about strategy is kept secret. As a result, I am going to do a limited analysis which will lead me to limited assumptions concerning the strategic choices of PCS competitors.

5.1.3. Method

The number and variety of competitors make it impossible to compare their relative strengths and weaknesses. However, we can compare strategic groups provided that we find a meaningful way to create such groups. Among other things, one characteristic of the nature of the competitors will have a significant influence on their strategy formulation. It is the fact that they are or are not a cellular player as well as a PCS competitor. Throughout this study, we have opposed PCS entrants to existing cellular carriers. We have also noted the consequences of having competitors playing on both sides.

I have studied in the previous section the likelihood of each of the generic competitive strategies to be adopted as entry strategies in the cellular market. However, I am unable in the context of that study to make such predictions based on individual competitors. Instead, based on a simple criteria that allows me to group the competitors, I will look at how they will position their services and assess their relative strengths and weaknesses.

Two examples will illustrate this analysis: Sprint and AT&T.

5.2. PCS Competitor analysis

5.2.1. A variety of competitors

First of all, we have to keep in mind that although some competitors are seeking to provide national coverage through alliances, competition takes place on a per market basis. In each market, we there are up to six PCS and two cellular carriers. Only three of the six licenses have been awarded in each market so far. With 18 licenses in the A&B blocks and about 100 in the C block, there is a great diversity among competitors.

The PCS competitors differ in several ways which will have an impact on their strategy formulation. Some factors are:

- **type of license:** A&B licensees are very different from C licensees. First, because the C block was reserved to designated entities, C licensees respond to specific economic criteria. Second, A&B licenses are based on larger territories. The price per pop in the C

block was much higher on average. These differences will lead the competitors to adopt different competitive strategies.

- **nature/origin of the company:** PCS licensees are LECs, IXC's (RBOCs and independent companies), independent cellular companies, cable companies, and alliances of different kinds of companies. According to their nature, the competitors will have different competitive advantages which explain their different strategies.
- **size:** PCS competitors range from giants to very small players.
- **corporate strategy:** PCS strategy is included in different overall corporate strategy. For instance, PCS can be an end in itself, or just a mean (like bypassing the local loop) to achieve a broader strategy.
- **cellular carrier:** Some PCS competitors have cellular operations while others are pure PCS. Although the FCC regulation prevents carriers from owning PCS and cellular licenses in the same market, the fact that competitors are cellular somewhere and PCS somewhere else will have important consequences. We will see that in the next paragraph.

The following graph compares some of the major players in the PCS industry. Although I have taken a reduced sample by choosing only big players, we can observe an important diversity. This reflects the diversity of the whole range of PCS players.

Figure 18 - Comparison of major A&B&C PCS providers

Company name	# of licenses	origin/nature of the company	targeted coverage	techno -logy	launch date	cellular	product
A & B							
Sprint PCS	33	partnership of cable companies (Comcast, Cox, TCI) and long distance (Sprint)	national	CDMA	Nov. 15 1995 (Wash./Balt.)	No	Sprint PCS
AT&T Wireless	21	formerly McCaw Cellular	national	AMPS	beginning 1997	Yes	
PCS PrimeCo	11	alliance of RBOCs (Bell Atlantic, Nynex, US West) and independent (Airtouch)	national	GSM	Nov. 96	Yes	TalkAlong (mass market) PowerBand (business)
Pacific Bell	2	RBOC	regional	GSM	beginning 97	No	
GTE	4	GTE subsidiary	regional	CDMA	beginning 97	Yes	
C							
Nextwave	63	Founded by former vice president of Qualcomm, supported by Qualcomm, Sony, Peco Energy, Triumph Capital Group and Korean companies (Pohang Iron and Steel, LG Group).	Build large network and resell volume	CDMA		No	
DCR	43	Founded by a former MCI executive, supported by Westinghouse Electric, Teleconsult, and an Asian consortium named Masa Telecom.		GSM		No	
GWl PCS	14	Supported by financial groups and Hyundai.				No	
BDPCS	default to pay for its licenses						
OmniPoint	18					No	

Source: Own Construct

Sprint Telecommunications spun-off its cellular business to be able to jump freely into PCS. It is present in 33 of the 52 MTAs yet it misses two important markets, Chicago and Atlanta, for which it will have to find partners. This national coverage strategy is part of an overall strategy that consists of offering integrated wireline, wireless, and cable services on a national basis.

After the acquisition of McCaw, AT&T positioned itself in the markets where McCaw did not have licenses, pursuing a strategy of filling the holes in its coverage.

PCS PrimeCo's strategy should be similar to AT&T's because of PrimeCo's important cellular presence. However, PrimeCo played on a smaller scale, buying only 11 licenses. Like Sprint PCS, PrimeCo is a consortium, yet these players are of a different nature.

Pacific Bell pursued a regional strategy in California: Los Angeles and San Francisco. GTE's four licenses broaden the presence it already maintained in cellular.

In the C block, Nextwave has adopted a niche strategy that consists of building a network and selling volumes to resellers or long distance carriers. Its system may become the third largest after Sprint's and AT&T's. Like Nextwave, DCR is an entrepreneur that is supported by Asian consortia. Omnipoint, which has 18 C licenses, already had a pioneer's preference license in New York.

5.2.2. Competitors strengths and weaknesses for each strategy

Let's divide the new competitors in the cellular industry in two groups: those who have PCS licenses only and those who have PCS and cellular licenses. This will enable us to

examine how each group tends to position their services, and to look at the competitors relative strengths and weaknesses. Since only a few services have been launched these are mostly assumptions about what is likely to happen.

5.2.2.1. PCS-only providers: true new wireless entrants

Although they may not be new to telecommunications, not even to wireless, I call the “truly newcomers” those that don’t have cellular licenses because they are entering a market in which they have no other presence. While incumbents may have advantages over them, the PCS entrants will benefit from their position in several ways.

First, thanks to their spectrum and technology advantage, they will be able to achieve fast and cost effective network buildout and provide differentiated enhanced services. As we have seen in the section I, PCS provides many features that cellular cannot. Second, PCS entrants will find it easier to position themselves in the market. Unlike competitors fighting on both sides they can differentiate themselves as offering a new service that is better than cellular. They have a brand new network but most importantly a fresh look, and a new customer-focused approach. Thirdly, they were not restricted in their license acquisitions by the regulation concerning cross-ownership.

On the other hand, they have to face important startup costs. They do not have infrastructure in place, nor distribution channels. They may also lack experience. Yet, this is not necessarily a burden, as they may have other resources. Another major drawback is the fact that roaming is not yet available for PCS.

An example of the “truly new entrant” is Sprint Spectrum. Having spun-off its cellular operations, it is free to jump in the PCS market. Furthermore, in the case of Sprint Spectrum, it has a lot of resources to facilitate its entry.

Positioning in the case of all-PCS companies will clearly present PCS as a new and distinct service.

5.2.2.2. PCS & Cellular providers: the “so-called” newcomers

PCS licenses who have cellular licenses in other markets have some advantages. They have experience, they have a customer database which is a very valuable resource in an era of customer focus. Their subscriber base gives them a cash-flow and some security. They can also benefit from their cellular presence to gain a national coverage.

However, because they fight on both sides, they will have problems to have a consistent image. Furthermore, their expansion is limited by the FCC regulation. They also face the difficulties of migration to digital in their cellular networks.

Providers who have both cellular and PCS will not position themselves in the PCS market as having a new, revolutionary offer. As a matter of fact, they don’t want to compete against themselves. As AT&T did, they might instead try to confuse the customer as to what PCS is.

5.3. The examples of Sprint PCS and AT&T Wireless

5.3.1. Sprint PCS

5.3.1.1. Company profile

Founded in 1994, the company became Sprint Spectrum L.P. in February 1996. It then changed its name again to Sprint PCS. It is a venture of Sprint Corp., Telecommunications Inc. (TCI), Cox Communications and Comcast Corporation. The partners invested \$2.1 billion to acquire PCS licenses in 32 combined MTAs. Sprint PCS's goal is to offer PCS to 182.4 million people in the US (70% of the entire population). In order to comply with the requirements of the FCC regarding overlaps between Sprint's cellular and PCS markets, it spun-off its cellular operations which became 360 deg. Communications. Sprint Spectrum was the first to offer PCS in the US. The service was first made available in Washington/Baltimore, through APC, an affiliate of Sprint Spectrum L.P. Sprint Spectrum will be offering these services in major markets beginning in late 1996. The objective is to substantially complete the remainder of its system by December 1998.

The four companies remain committed to the original vision of a **single, integrated offering** of wireless service, alternative local telephone service, and a long distance package with cable television service.

Sprint PCS owns a total of 33 licenses including 2 pioneer's preference. The 16 major markets are (highlighted are the Pioneer's preferences):

Table 19 - Sprint PCS's major markets.

MTA	POPs in millions
New York	26.4
Los Angeles	19.1
San Francisco	11.9
Detroit	10.0
Dallas	9.69
Boston	9.45
Philadelphia	8.92
Washington DC	7.77
Minneapolis	5.98
Miami	5.13
New Orleans	4.92
Saint Louis	4.66
Milwaukee	5.41
Pittsburgh	4.10
Denver	3.88
Seattle	3.82

Source: FCC.

5.3.1.2. The product

Sprint PCS's product now available in the new Washington/Baltimore area is presented as "The All-in-one Personal Communications Service." The service combines a personal phone, answering machine and pager all in one device that fits in the palm of your hand and offers these features:

- 100% digital state-of-the-art network
- answering machine and pager
- exceptional voice quality and clarity
- call privacy and security
- caller ID
- voice mail
- text messaging
- call waiting
- call forwarding
- call barring
- information service
- free 911 access

Other characteristics of the new service are:

- No long term service contracts required
- Hassle-free activation and service
- Personalized features and services
- Technology made simple.

5.3.1.3. PCS offer in Washington/Baltimore

Table 20 - PCS offer in Washington/Baltimore: Basic services.

Basic services*				
	free airtime included	monthly package price	activation fees	extra minutes
Cellular One	30 minutes off-peak	\$29 1-yr contract minimum	\$35	39¢ peak 19¢ off-peak
BANM	-	\$28.95 1-yr contract minimum	\$30	39¢ peak 19¢ off-peak
Sprint PCS	30 minutes anytime	\$25 no contract	-	31¢ peak 10¢ off-peak

Features	Cellular One	BANM	Sprint Spectrum
answering machine	\$5.95	\$5.95	free
numeric paging	no	\$10	free
caller ID	no	no	free
Call waiting	\$3.00	\$3.00	\$2.00
handset replacement	\$2.95	no	\$4.00
call barring	\$1.50	no	\$5.00
call forwarding	included in call waiting	included in call waiting	\$2.00
conference call	included in call waiting	included in call waiting	no
detailed billing	\$3.00	free	free
auto assistance	\$2.00	no	no
Total price	\$16.90	\$18.95	\$13.00

Source: Martin, P-Y.

* This comparative analysis is based on the services Peace of Mind from Cellular One, Flex Plus from BANM, and Talk 30 from Sprint PCS. Sprint PCS also proposes Talk 15 (15 minutes included), and BANM offers two other basic services (Flex Plan and Talk Along) with lower activation fees. They were not used in the analysis because they offer limited coverage. Similarly, Talk 30 was chosen instead of Talk 15 in order to have a more homogenous basis for comparison.

Table 21 - PCS offer in Washington/Baltimore: High-end services.

High-end services*				
	free airtime included	monthly package price	activation fees	extra minutes
Cellular One	1200 minutes 600 peak 600 off-peak	\$169 1-yr contract minimum \$159 (2-yr)	\$35	9¢ peak 10¢ off-peak
BANM	800 minutes 400 peak 200 off-peak	\$28.95 1-yr contract minimum	\$30	25¢ peak 10¢ off-peak
Sprint PCS	1200 minutes 600 peak 600 off-peak	\$150 no contract	-	25¢ peak 10¢ off-peak

Features	Cellular One	BANM	Sprint Spectrum
answering machine	\$5.95	free	free
numeric paging	no	\$10	free
caller ID	no	no	free
Call waiting	\$3.00	free	free
handset replacement	\$2.95	no	free
call barring	\$1.50	no	\$5.00
call forwarding	included in call waiting	free	\$2.00
conference call	included in call waiting	free	no
detailed billing	\$3.00	free	free
auto assistance	\$2.00	no	no
Total price	\$16.90	\$10.00	\$7.00

Source: Martin, P-Y.

* This comparative analysis is based on the following services: SuperSaver from Cellular One, Ultime Access Plus from BANM, and Talk 1200 from Sprint.

5.3.1.4. Strategy

Wireless '96 brought news that APC's Sprint Spectrum had garnered 60,000 customers since its launch in November. "We have created the fastest growing wireless system in the world," said Scott Schelle, CEO of APC in "Cellular renovation" by Meyers. What kind of entry strategy caused that success?

Sprint Spectrum presents itself as a cheaper alternative to cellular. And according to the comparison of prices in the Washington/Baltimore area, this claim seems to be legitimate. However, price does not play a major role in the strategy of Sprint PCS nor does it account totally for its success. And the fact cellular subscribers have also grown significantly although prices remained stable shows the secondary role of price.

The key of Sprint PCS's strategy is "customer focus". As we have seen as we looked at the various generic competitive strategies, the decrease in prices in the cellular industry caused by the introduction of PCS and more competition has opened the door to the mass market for cellular services. And although there still remains a business segment, there is a whole new segment to penetrate. And it is this new mass market approach that has created a need for customer focus. In other words, providing customers with good value is not enough. Competitors must take extra care of their customers to retain them. To that purpose it is critical to segment the market and respond to the demand of the various customer segments. "We oversimplify too often," said Ronald LeMay, president and CEO of Sprint. "There are a myriad of value propositions for different customer segments." Reports Meyers in "Cellular Renovation".

To meet the new demands of an industry in which the customer has to be the center of its concerns, Sprint PCS has adopted a differentiation strategy that is developed along several lines.

First, Sprint PCS proposes a **differentiated offer**: “Sprint Spectrum’s unique features”

- All-in-one communications
- 100% digital technology
- over the air activation
- “home phone” like service
- 24-hour customer care

and also:

- no contract
- free minute for incoming calls
- great rates on Sprint Long Distance
- choose your number, your billing cycle

Second, Sprint Spectrum develops a **new marketing approach**. Sprint is creating “new advertising methods, distribution channels and promotional techniques, all in the name of penetrating a new market segment for a traditionally business-oriented service,” says Meyers in “A Spectrum of Experience”. A good example of these new methods is the **alliance created between Sprint and RadioShack**. “This alliance will result in an unprecedented nationwide distribution of communications products and services through a retail channel,” said William T. Esrey, chairman and CEO of Sprint. “Sprint, Sprint Spectrum and RadioShack will offer to consumers a complete package of customized consumer products, simply and conveniently in a familiar store in their neighborhood.”

This alliance reflects two other important elements of Sprint's strategy that go hand in hand: **branding and nationwide service**. "The nationwide reach of RadioShack is a perfect complement for our national PCS service," said Andrew Sukawaty, CEO of Sprint Spectrum. Sprint-branded PCS products will be distributed in 300 RadioShack stores in 19 cities by year end, with the full line of Sprint products and services expected to be available in as many as 4,500 additional stores in 1997. "Sprint has a strong brand equity and this partnership extends that equity into the retail marketplace," said Leonard Roberts, president of RadioShack and Tandy Corporation. **"We believe that Sprint and RadioShack will redefine how consumers deal with communications providers for the next century."**

Sprint Spectrum is ahead of the pack because its brand name is already in use in the Washington/Baltimore market, and its presence in 29 markets will help distinguish it on a national scale. **"It's one of the few national brands in the telecom sector,"** Sukawaty said. **"There is a huge advantage to having a nationwide spectrum.** We're in the best position to offer nationwide service and make roaming truly seamless for the first time.

Finally, a last element of Sprint's strategy is a unique approach to service bundling given the company's affiliation with three cable TV operators. As a matter of fact, Sprint PCS will provide:

- nationwide PCS wireless service
- Residential wireline type services

- Sprint long distance services
- Entertainment products

Conclusion

Although the case of Sprint Spectrum is not representative of all the entry strategies of PCS providers—we have outlined their diversity— this analysis supports the conclusion drawn from the previous sections. Sprint's strategy reflects the important orientation that we have discussed. Although it has the lowest prices, Sprint does not seem to be leading a cost strategy. Or at least not cost only. As a matter of fact, Sprint develops a differentiation competitive advantage. Finally, its strategic choices reflect the change in the industry which has suddenly become customer-focused.

5.3.2. AT&T Wireless

The case of AT&T will be developed in a different way to provide different results. We have seen in the competitor analysis that being a pure PCS player as opposed to a PCS-and-cellular player had an impact on the firm's competitive advantages and strategy formulation. Particularly, the positioning of PCS will be different. Usually, PCS is assimilated to cellular rather than standing as a distinct competitor. AT&T's market positioning for PCS is a case in point.

5.3.2.1. Company profile

AT&T Wireless Services Inc., formerly McCaw cellular Communications Inc., consists of four business groups which include cellular, messaging, wireless data, and aviation communications. The cellular group provides cellular service to more than 6.5 million customers in 107 license areas throughout the U.S. In addition, the company's network is connected to more than 5,000 cities throughout North America through the North American Cellular Network. In March 1995, AT&T spent \$1.7 billion for 21 broadband PCS licenses. With the addition of the new licenses, AT&T Wireless Services will serve 25 of the top 27 U.S. markets with more than 200 million POPs.

In October, AT&T Wireless Services launched its nationwide AT&T Digital PCS service. The new service includes caller-ID, PCS messaging, voice mail with message waiting indicator, longer battery life and fraud protection features.

Table 22 - Major PCS markets of AT&T Wireless.

MTA	POPs in millions
Chicago	12.07
Detroit	10.00
Charlotte	9.75
Boston	9.45
Philadelphia	8.92
Washington DC	7.77
Atlanta	6.94
Cleveland	4.94
Cincinnati	4.71
Saint Louis	4.66

Source: FCC

5.3.2.2. Strategy for PCS

AT&T has started an aggressive phase for the buildout of its PCS network. The technology chosen is TDMA IS-136. In the first phase, AT&T plans to build out the largest cities in each major trading area and the highways linking those cities, said Steve Hooper, president and CEO of AT&T Wireless Services. AT&T anticipates a fast buildout, with plans to deploy as many PCS sells in 18 months as it has deployed in the past 12 years in its cellular market, said Nick Kauser, executive vice president and chief technology officer. This will be possible thanks to partnerships with utilities and other entities that simplify antenna siting issues, and to the small footprint of digital equipment. The first phase is expected to last about two years he said.

As it builds its PCS markets, AT&T is also upgrading its existing cellular systems to TDMA in an effort to provide seamless digital wireless coverage to 80% of the country. According to AT&T, once the networks are in place, both PCS and cellular markets will offer similar feature sets that are transparent to users. "There will be no distinction between PCS frequencies and cellular frequencies," said Wayne Perry, vice chairman of AT&T Wireless. "Customers don't care what frequencies they are using.

AT&T's strategy with PCS clearly is to fill the holes in its cellular coverage in order to have a nationwide footprint. **"With an already broad-reaching cellular network presence that is being augmented by PCS property buildout, AT&T Wireless sees strength in numbers:** when its national network scheme is complete, the company's

network will be accessible to 81% of the U.S. population. The company sees its brand equity and solo efforts as a major force.” said Jason Meyer in Cellular Renovation.

Although this strategy seems perfectly clear, two questions come to mind. First, AT&T contends that users don’t care about frequencies—which is probably true—and presents PCS just as an extension of cellular. However, because PCS and cellular systems operate at different frequencies, the market may not be as homogenous as it seems. As a matter of fact, PCS users won’t be able to use their 1900MHz phones in an 800MHz area unless they have dual-frequency phones. If AT&T wants to integrate its PCS and cellular operations it will have to deal with the dual-frequency constraints.

The second issue is about the positioning of PCS and digital cellular. I will tackle it in the next paragraph.

5.3.2.3. Positioning issue: digital cellular vs. PCS

In October, AT&T realized the aggressive digital roll-out in its cellular markets by introducing enhanced services to customers in 40 cities at once. Until then, AT&T had provided TDMA service to about 1 million customers in a handful of markets. The new service, called AT&T Digital PCS uses the IS-136 TDMA service standard, equipped with a digital control channel. It will allow users with digital phones and eventually dual-mode AMPS/Digital phones to send and receive voice mail and receive numeric messages. Message waiting indicators will also be available and caller ID in certain markets.

As we have seen earlier, AT&T has also committed to deploy TDMA in the market for which it received PCS licenses. The PCS launches will start in the first quarter of 1997.

If analysts have noted the aggressiveness of the digital launch, the name of the service certainly generated the most questions. As a matter of fact, as Chris Bucholtz highlights, analysts were quick to note the **confusion in AT&T branding the launch as PCS service when it does not actually ride on the PCS frequency**. Some said the company is ignoring the actual frequency distinction between cellular and PCS in favor of a marketing ploy. “How significant is this announcement? It’s not,” said David Goodtree, director of telecommunications strategies at Forrester Research. “AT&T has been offering digital services since it acquired McCaw, and it’s reaching these new customers with its existing digital cellular, not PCS. It seems like a PR gambit that AT&T hopes will brace it for the arrival of Sprint, PrimeCo and a lot of other competitors.”

The announcement is playing on semantics and means little Bucholtz says. But AT&T chairman Robert Allen defended the move saying that service enhancements matter most. “We know that these services can be provided using regular cellular frequencies, as long as the provider is willing to provide the necessary capacity. Users don’t care about frequencies, they care about services.”

In a rather ironical editorial entitled “By Any Other Name”, Steven Titch says that the debate over whether AT&T’s digital upgrade is “genuine PCS” is symptomatic of an industry that loves to talk to itself rather than customers. According to him, success will

hinge on customer experience and perception, not on how it's classified. As a matter of fact, customers will be able to judge the service by themselves. However, in a period of high market confusion names can have a greater importance than Titch contends.

Conclusion

In terms of market positioning, while Sprint stands for the truly new entrant, AT&T is representative of those who have to face the challenge of being an entrant as well as an incumbent. For them, PCS is seen as a tremendous opportunity to expand in an emerging market, but also as a threat for their existing business. AT&T's example illustrates other issues that have been analyzed throughout this study. First of all, the cellular industry is a very dynamic one and the position of PCS in it is evolving. Second, "PCS vs. Cellular" may not be the only way to frame the issue as it concerns the arrival of the new entrants. Finally, AT&T's strategy illustrates and explains the confusion that reigns in the industry.

Chapter 6

CONCLUSION

6.1. Findings

The analysis of the shape of competition in the emerging cellular industry —newly re-formed with the introduction of PCS— led to the following conclusions:

- The competitive landscape has been fundamentally transformed by the emergence of PCS. Although recognized to be very promising for the industry as well as for the users, PCS remains a very vague concept which tends to be interpreted in a variety of ways. The growth perspective is very high and the future is seen in the mass market. The nature of the industry is evolving towards a commodities industry. The cellular industry is also not static and is evolving as PCS is being introduced (Chapter 1)
- Competition is very intense. However, the structure of the industry and its growth perspective promises high profits, and many competitors may continue to thrive. (Chapter 2)
- The industry is emerging which brings specific constraints and a great deal of uncertainty. The competitive analysis has to be made in the light of a very dynamic

context. As industry competition is being shaped, early moves may not reflect long-term strategies. (Chapter 3)

- Given the industry structure and the market perspectives, overall cost leadership as an entry strategy is unlikely. Contrarily, there seem to be many opportunities for differentiation. However, the strategies will most likely not be pure but combinations of the generic strategies identified by Porter. There will also be many opportunities for niche strategies. Finally, as the cellular industry is opening to the mass market, strategic vision is shifting and customer focus has become the key. (Chapter 4)
- The competitors are numerous and diverse. Each will formulate its strategy based on the competitive advantage it is best positioned to develop. While we cannot make a broad characterization of how competition will develop, because it will evolve differently from market to market, carrier to carrier, business plan to business plan, some trends can be outlined. Customer focus has become the key and differentiation is critical. Market positioning of PCS by the entrants will be very different for those who have cellular licenses. The cellular carriers who see opportunities as well as a major threat in PCS will try to confuse the markets as concerns what PCS really is. (Chapter 5).

6.2. Limitations and implications

This study enabled us to identify trends in the evolution of competition in the cellular communications industry and to assess the potential and likelihood of various competitive strategies. However, this study is limited in several ways. First, because of the confidentiality of strategic matters, all our conclusions remain very hypothetical. We can

make assumptions concerning the nature of the strategies that are developed but we have no way to know what the competitors have really in mind. Second, what we have studied here is the likelihood of different strategies to be developed. Although we have questioned their potential as we looked at the rationale for adopting them, we did not really assess their chances of success. It remains difficult to say who will succeed, and what competition will look like in the long run.

Despite these limitations, this study provides tools for understanding how the competition may evolve. The analysis of the potential and constraints of the various strategies for the different player will enable to identify and understand the competitive moves of the participants in the industry. Finally, by breaking down competition into the elements that determine it, this study provides a basis for industry forecasting.

BIBLIOGRAPHY

BIBLIOGRAPHY

Aron, Carl, R. An Ice Age is Coming to the Wireless World. EDS Management Consulting Services, 1995.

“A View of the Competitive Landscape,” Mobile Phone News (22 January 1996), sec. 4, vol. 14.

Bernstein, Peter, “E.T. Phone Home/Office” Telephony (2 September 1996), p. 24.

Bernstein, Peter, “Rethinking the ‘P’ in PCS” Telephony (7 October 1996), p. 45.

Bernstein, Peter, “Cellular’s Achilles’ Heel,” Telephony (5 August 1996), p. 24.

Blake, Jerry, “Competition, Not Capacity is Motive for Move to Digital Cellular,” Radio Communications Report (29 July 1996), p. 9.

Blake, Pat., “Identifying your customers,” Cellular Business (March 1995), p.28.

“BRG Study Picks Ease of Use and Branding as Main Competitive Tools,” PCS Week (28 August, 1996), sec. 35, vol. 7.

Bucholtz, Chris, “A Digital Storm,” Telephony (7 October 1996), p. 6.

Cellular One. "Cellular One Group Announces Future Direction of Cellular One ® Brand," Cellular One Press Releases (1 February 1996), <http://www.cellularone.com/releases/future.html>

Chinn, Robert, Levy, Mark, "Coming Together for CDMA," Telephony (8 July 1996) pp. 30-33.

Cox, Donald C. "Wireless Personal Communications." In The Mobile Communications Handbook, ed. Jerry D. Gibson. CRC Press, 1996.

Deagon, Brian, "Can Small Fry Play PCs Game with Giants?" Investor's Business Daily (19 December 1995), p. A8.

Dreher, Richard, C., GSM ready for success. NCF Infovision: 15 October 1996.

Dziatkiewicz, Mark, "Wireless showdown," America's network (1 February 1995), pp. 24-27.

Elliott, Thomas, "Brand Management, What's in Store?," Telephony (5 August 1996), pp. 30-33.

Elstrom, P., Barrett, A., Arnst, C., "Next Stop for Wireless: Shakeout City," Business Week (2 December 1996), pp. 103-104.

Federal Communications Commission, Wireless Telecommunications Bureau. Personal Communications Services (1995), <http://www.fcc.gov/wtb/pcssrv.html>

Federal Communications Commission, Wireless Telecommunications Bureau. Auctions Fact Sheet (1995), <http://www.fcc.gov/wtb/aucfct.html>

Felix, Michael, "Preparing the Market for Enhanced Service Implementations," Telephony (25 March, 1996), pp. 40-43.

"Gathering of Eagles' Advises Carriers to Focus on Customers," Mobile Phone News (1 April 1996), sec. 14, vol. 14.

Hall, Sim, "Cellular carriers are positioned for success in era of PCS," Radio Communications Report (30 January 1995), p. 53.

Halprin, Albert, May, Timothy, "Personal Communications Services: A Regulatory Perspective," Annual Review of Communications (1994-95), p. 208.

Henderson, Lisa, "My Dad Can Beat up your Dad," Telephony (30 September 1996), p. 32.

Kirkpatrick, John, "PCS Primes for Bloody Battle with Cellular D.C. May Prove Staging Ground for Dallas Skirmish," The Dallas Morning News (17 December 1995), p. 1H.

Krapf, Eric, "Wireless Competitors Set to Square Off in California," America's Network (1 May 1995), p. 16.

Lannon, Larry, "Rings of Change," Telephony (26 August 1996), p. 64.

Lucent Technologies, "Meeting the Promise of PCS," Advertisement in Telephony (1996).

Martin, Pierre-Yves, Les Mobiles aux Etats-Unis: du Cellular au PCS. Washington, DC: Les Notes des Postes d'Expansion Economique, May 1996.

McChesney, Tim, "Roaming for an answer," Telephony (25 March 1996), pp. 44-48.

Meyers, Jason, "Piecing Together the Wireless Model," Telephony (22 July, 1996), p. 20.

Meyers, Jason, "The Pirates of PCS," America's Network (2 October 1995), p. 9.

Meyers, Jason, "The Best Tools for the Job," Telephony (22 April 1996), p38-44.

Meyers, Jason, "Cellular Renovation," Telephony (22 April 1996), pp. 32-34.

Meyers, Jason, "Building the Perfect Beast," Telephony (4 March 1996), pp. 36.

Meyers, Jason, O'Shea, Dan, "Navigating Wireless Waters," Telephony (5 August 1996), pp. 10-14.

Meyers, Jason, "Past, Present and Future, PrimeCo focuses on melding the real world experience of its partners with its new vision of wireless," Telephony (13 May 1996), pp. 32, 33.

Meyers, Jason, "A Spectrum of experience," Telephony (19 August 1996), pp. 7, 16.

Meyers, Jason, "AT&T Wireless seals equipment deal," Telephony (13 May 1996), p. 8.

Modisette, Lisa, Huson, Steve, "Customer Knowledge is Power," Cellular Business (September 1996), pp. 92-100.

O'Shea, Dan, "Eyeing the Wireless user," (5 August 1996), p. 8.

O'Shea, Dan, "Looking for little satisfaction," Telephony (5 August 1996), pp. 15-19.

O'Shea, Dan, "PCS Event Bottles Industry Energy," Telephony (23 September 1996), p. 6.

“Price as a PCS Edge,” Telephony (5 August 1996), p. 6.

“Price Elasticity in Cellular will be Tested by Greater Competition,” Wireless Business and Finance (29 March 1995), sec. 1, vol. 2.

Porter, Michael E. Competitive Strategy. New York: The Free Press, 1980.

Porter, Michael E. Competitive Advantage. New York: The Free Press, 1985.

Rubin, Paul, “Cellular Does Digital,” Tele.com, The McGraw-Hill Companies, Inc. (1996).

Specific Information on PCS. Cyberpeak (1996),
http://www.cyberpeak.com/PCS/PCS_spec.html

Sprint Communications Company L.P., “One-stop telephone shopping returns to America! Sprint, Sprint Spectrum and RadioShack join forces,” Sprint Press Releases (11 September 1996), <http://www.sprint.com/press/releases>

Stewart, Alan, “Is PCS going Nowhere Fast?” Communications International (October 1996), pp. 18-21.

Titch, Steven, “By any other name,” Telephony (7 October 1996), p. 5.

TPG’s Telecom Lingo Online. Telecom Publishing Group:
<http://www.cappubs.com/tpg/lingo/p.html>, 1995.

United States General Accounting Office. Competition in the Cellular Services Industry (1 July 1992).

U.S. International Trade Commission. Global Competitiveness of U.S. Advanced-Technology Industries: Cellular Communications, Washington, DC, June 1993.

Weinhaus, Carol, and the Telecommunications Industries Analysis Project Work Group, Boston, Massachusetts. Cellular to PCS: A Wireless Primer, December 21, 1995.

Wiener, Leonard, "It's Mobile but it isn't Cellular," U.S. News & World Report (22 January 1996), p. 67.

"Wireless Warrior," Telephony (25 March 1995), pp. 74-78.

Yovnello, Christine, "Introduction to Personal Services Communications," Annual Review of Telecommunications (1994-95), p. 816-822.

Zarem, Hal, "The Key to PCS Success," Telephony (23 October, 1995), p80-84.

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