Study of Change of Power Balance in Mobile Telecom Value Chain
by
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Submitted to the Alfred P. Sloan School of Management
in Partial Fulfillment of the Requirements for the Degree of
Masters of Science in the Management of Technology
at the
Massachusetts Institute of Technology
June 2003
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ARCHIVES
Study of Change of Power Balance in Mobile Telecom Value Chain
by
Takashi Uchida

Submitted to the Alfred P. Sloan School of Management on May 9, 2003 in Partial Fulfillment of the Requirements for the Degree of Masters of Science in the Management of Technology

Abstract

The 3rd Generation mobile telecommunications industry, which changes rapidly, is one of the best examples for the study of the balance of power in the value chain. Three dynamic factors are keys that can change the balance of power in the mobile operator's industry: sociopolitical factors, technological factors, and alliance factors. These factors collectively increase the bargaining power that mobile operators have over vendors. In addition they impact how vendors compete with each other.

This thesis advances the discussion of power with an analysis of the Vodafone Group. It also explores the idea of how network suppliers respond to the increase in the bargaining power of buyers, through a discussion of Nokia. The focus of this thesis is not whether, but how the mobile telecommunications value chain, and specifically the bargaining power of buyers, has evolved thus far and will continue to evolve over the next few years.

Thesis Advisor: John M. de Figueiredo
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Biography of the Author

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EDUCATION

MIT Sloan School of Management  Cambridge, MA, USA
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• Active in Global Management of Technology, Management Consulting Club, Asian Business
  Club, Japan Club, International Program in Ireland, UK, and France

Hokkaido University  Sapporo, Japan
Master of Science in Nuclear Physics  03/1997

• 3.9 / 4.0 GPA

• Published Thesis – “Nuclear Reaction Mechanism of Quasi-Free Scattering” in Nuclear Journal
  1997, awarded top honor in department

Bachelor of Science in Nuclear Physics  03/1995

• Awarded Gold Prize in mathematics competition three times

PROFESSIONAL EXPERIENCE

NEC Corporation  Tokyo, Japan
Strategist, Assistant of Mobile Business Planning Division, NEC Corporation
12/2000-present

Play central role in providing strategic direction to NEC’s industry leading mobile
telecommunications networks business in new position created for me; reform business processes
across company lines

Copyright: Takashi UCHIDA, MIT Sloan School of Management
• Developed NEC’s mobile business strategy after harmonizing and negotiating information between more than ten mobile business-related divisions as an “Information Hub”; streamlined information sharing to let executive officers make correct, speedy decisions

• Presented strategy and gained cooperation of management and business units while setting example for establishing future business strategies in individual group businesses

• Negotiated and completed further alliance on 3G Mobile Business with Siemens AG.

• First employee transferred to head office from a subsidiary in one hundred year company history

• Fully sponsored MBA scholar representing NEC (one of two out of pool of 12 applicants)

**NEC Communication Systems Ltd.**  
Tokyo, Japan

*Senior Software Engineer, 1st Software Dept., Eng. Division*  
04/2000-12/2000

• Sole NEC group company representative to be a member of *corporate* mobile IP Network Committee to design ideas for future mobile infrastructure and technical strategies

• Negotiated with Indian IT software company to ally on mobile location systems; made presentation to the president and representatives of the company

• Supervise 8 junior programmers

*Software Engineer, 1st Software Dept., Eng. Division*  
04/1998-03/2000

• Led team of 10 contract programmers while training and counseling them on problems

• Designed, programmed and tested telecommunication services

---

**AWARDS/PERSONAL INFORMATION**

• Awarded top honor at 1999 All Japan Modeled U.N. Society Conference for presentation representing Australia

• Award-winning social dance competitor (Rumba, Tango); write Tanka (Japanese poems); biking, hiking, tennis, squash, oversea trips

• Fluent in English and Japanese

• Volunteer for mentally handicapped children

• Very active for networking
Acknowledgement

Finishing this thesis and the MOT program would not have been possible without the love and support of my parents, Sadaaki and Masako. The work behind this document and my life and success are dedicated to their full support for my dream.

I would like to special acknowledge the support of Kiyoshi Kato and Hitomi Yoshida at Hokkaido University, who guided me when I was in difficulty. I will never forget their support and love as well as my father and mother do.

I would also like to acknowledge their unfettered support of my transfer to NEC Corporation and of my selection as a fully sponsored employee to study at MIT Sloan School of Management: Mr. Tetsujiro Arano, Mr. Yuichi Shimojo, Dr. Botaro Hirosaki, Mr. Harumi Kato, Mr. Tsuyoshi Ohtoshi, Mr. Hirofumi Okuyama, Mr. Toshiro Arima and Mr. Kazuhiko Baba. Without their support, I doubt that I could have reached any career and personal success.

I would also like to acknowledge Mr. Koji Motonaga, and Dr. Yoshiko Takahashi, who gave insightful advice for my thesis and strategic skills.

I would also like to acknowledge the support of Professor John M. de Figueiredo. His guidance, brainstorming, patience, and advice were instrumental in providing me with the focus needed to complete this work.

I would really like to acknowledge the unsparing support of Paul Konasewich (MBA2003). His appropriate advice led my contents into the right direction.

I would also like to acknowledge the support of Libby Lin (MBA2003), Mavis Chong (MBA2003), George Hsigh (MOT2003), Jin Seong Hwang (MOT2003), my teammates, all other MOT and MBA classmates, and faculty who support my efforts and give special counsel.

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Finally, dedicated to H.A.

UCHIDA, Takashi
Cambridge, MA
May 2003
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1. INTRODUCTION

The mobile telecommunications industry is one of the best examples for studying of the balance of power in the value chain. The balance of power in the industry changes unexpectedly and rapidly. Changes in the power balance influence the way industry players compete, and sometimes lose, competitive advantage. Hence it is of paramount importance that a company in the industry adapts to this change. Analysis of the change of the power balance is also important because the change shifts power not only among industry rivals but also among buyers and suppliers.

The typical five forces model only provides a structural analysis and static outline of an industry, including its participants and characteristics. The model identifies the profit potential of an industry, uncovers the forces that would harm profitability, indicates how to drive for profit, and clarifies the factors that protect competitive advantage. Although these external forces will harm industry profitability, companies can extend competitive advantage by favorably influencing these forces and proactively anticipating changes in industry structure.

The 3rd Generation (3G) mobile telecommunications industry changes very rapidly. Changes in the mobile operator’s industry influence the profitability of network suppliers. Network suppliers must therefore do dynamic analysis of the buyer’s industry in order to build an effective strategy. To sufficiently understand the industry we need to extend beyond the five forces model to include several other key factors. In this thesis I will analyze three dynamic factors that can change the balance of power in the buyer’s industry: the sociopolitical factor, the technological factor, and the alliance factor. I will further explain how these factors change the game in the supplier’s industry. The focus of the thesis is not whether, but how, the mobile telecommunications value chain, and specifically the bargaining power of buyers, has evolved thus far and will continue to evolve over the next few years.

Competition has been increasing in the 3G mobile telecommunications industry. Market expansion from regional competition (GSM in Europe, PDC in Japan, and ANSI in US) to global competition is based on global standards such as WCDMA and cdma2000. Entry barriers from other markets have been lowering because of global standardization.
In the mobile infrastructure business only four major suppliers are likely to survive: Ericsson, Nokia, Nortel, and Siemens/NEC. European vendors could access the Japanese market because Japanese mobile telecommunications operators have applied WCDMA, whose core network technology is based on evolved GSM. Likewise NEC could enter the European market via an alliance with Siemens in the network infrastructure business, and by providing i-mode systems and handsets to regional mobile operators such as Hutchison 3G, KPN, and Telecom Italia Mobile.

However 3G technology lags behind IP technology. IP systems and products like routers have begun to disrupt legacy switching systems and enable new entrants such as Cisco and Juniper to access the mobile infrastructure market. Because prices for routers are much lower than legacy switching systems, IP technology has been reducing the bargaining power of network vendors against buyers.

The 3G license auctions are also keys to understanding recent changes in the balance of power. The 3G spectrum rights are especially vital for mobile telecom operators, since if they fail to obtain spectrum rights or even participate in the license auctions, the financial markets will regard these operators to have given up on telecom service, and will dump their shares. Thus, telecom operators have no choice but to try to obtain spectrum rights allocated by the government. The 3G spectrum auctions led to severe capital constraints on telecommunications operators, which in turn triggered the emergence of financing solutions from network vendors. Network operators requested that network vendors provide a certain amount of vendor financing in their business proposals. Network vendors had little choice but to offer these financial incentives because of fierce competition within the industry. Because of strong competition, the bargaining power of network vendors has been reduced.

The emergence of global mobile telecommunications operators has led to increased competition. Aggressive alliances and M&A by Vodafone have increased its bargaining power against network suppliers because network suppliers have fewer customers to sell to, thus making every sales opportunity much more critical.

In this thesis, through the specific case study examples, I would address the following thesis questions.

**Thesis Questions**

- Why is it important to study the buyer's industry and their increasing power? (Chapter 3)
- What exogenous factors do we need to take into consideration for the analysis of
the change of the power balance in the value chain? (Chapter 3)

➢ Why do we need to consider these factors? (Chapter 3)
➢ What factors are most important for the change of the power balance in the mobile telecom industry? (Chapter 3)
➢ How do mobile telecom operators use these factors to increase their bargaining powers? (Chapter 3 and 4)
➢ What do we learn from the analysis of the Vodafone Group? (Chapter 4)
➢ How are network suppliers responding to the increased bargaining power of buyers? (Chapter 4)
➢ What can we learn from the case study of Nokia? (Chapter 4)

**Document Structure and Research Framework**

The research for this thesis is grounded in several important specializations of recent business and economic research relating to innovation and non-marketing strategies in firms and industries.

In Chapter 2, I will summarize 3G technology and the current market trends. In particular I’ll cover the trends of the 3G global market, including 3G auctions, vendor financing, and global alliances and M&A. The chapter will provide a foundation for understanding the mobile telecommunications industry.

In Chapter 3, I will explore the theoretical framework, including the Porter’s five forces model and other exogenous forces and determinants that change the power balance in the value chain. This chapter will focus on the buyer’s industry and explain why the analysis of the buyer’s industry is most important. I will apply three exogenous factors that increase the bargaining power of buyers into my theoretical framework: the sociopolitical factor, the technological factor, and the alliance factor. Finally, I will apply these theoretical frameworks to the 3G mobile telecommunications industry.

In Chapter 4, I will further advance the discussion with an analysis of the Vodafone Group. I will explore the idea of how network suppliers respond to the increase in the bargaining power of buyers, through a discussion of Nokia.

Finally I conclude in Chapter 5 by showing how the above framework will serve as a guideline for understanding the future market environment and building a business strategy to effectively handle the changing balance of power.

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2. OVERVIEW OF MOBILE BUSINESS

In Chapter 2, I describe overview of mobile business trend. For readers to understand mobile business' history, market and technological trend, and to provide thesis questions are essential to follow my analysis. Thus, in this chapter, first, I will describe the technological trend from the 2G\(^1\) to the 3G\(^2\) mobile systems. Second, it will draw current market trend in each regional market. Third, I will describe the mobile network vendor's industry by providing their contracts results and brief strategies. Fourth, I will raise political aspects of the business: the 3G licensing auctions and vendor financing. Finally, I will address several thesis questions to follow the next chapter.

2.1 What is 3G?

According to the International Telecommunication Union (ITU) International Mobile Telecommunications 2000 initiative ("IMT-2000") third generation mobile ("3G") system services were scheduled to be initiated around the year 2000, subject to market considerations. Table 1 describes some of the key service attributes and capabilities expected of 3G systems: "Competitive features of 3G systems are a high degree of commonality of design worldwide, compatibility of services, use of small pocket terminals with worldwide roaming capability, Internet and other multimedia applications, and a wide range of services and terminals\(^3\)."

\(^1\) 2nd Generation Mobile Technology: This is mainly represented as GSM, PDC, and IS95, whose markets are mainly each in Europe, Japan, and United States.

\(^2\) 3rd Generation Mobile Technology: This has five authorized technology such as WCDMA, cdma 2000, and TD-SCDMA.

\(^3\) http://www.3gnewsroom.com/html/what_is_3g/index.shtml
Table 1  Service Features and Speed Specification of three generations

<table>
<thead>
<tr>
<th></th>
<th>2G Wireless</th>
<th>2.5G Wireless</th>
<th>3G Wireless</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The technology of most current digital mobile phones</td>
<td>The best technology now widely available</td>
<td>Combines a mobile phone, laptop and TV</td>
</tr>
<tr>
<td>Features</td>
<td>- Phone calls</td>
<td>Features includes:</td>
<td>Features includes:</td>
</tr>
<tr>
<td>includes:</td>
<td>- Voice mail</td>
<td>- Global roaming</td>
<td>- Global roaming</td>
</tr>
<tr>
<td></td>
<td>- Receive simple email messages</td>
<td>- Send/receive large email messages</td>
<td>- Send/receive large email messages</td>
</tr>
<tr>
<td>Speed:</td>
<td>10kb/sec</td>
<td>Speed: 64-144kb/sec</td>
<td>Speed: 144kb/sec</td>
</tr>
<tr>
<td>Time to download</td>
<td>MP3 song: 31-41 min</td>
<td>Time to download MP3 song: 6-9min</td>
<td>Time to download MP3 song: 11sec-1.5min</td>
</tr>
</tbody>
</table>

2.2 Technology Trend

Major 3G standards, WCDMA and cdma2000

"The International Telecommunication Union, ITU, the UN's official organization to authorize telecommunications standards, gave five standards family for 3G mobile communications systems. These networks must be able to transmit wireless data at 144

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4 Newsweek
5 Gartner Dataquest, Mobile Communications World Wide, Methodology and Definition 2002, 27 Feb, 2002

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Kbps at mobile user speeds, 384 Kbps at pedestrian user speeds and 2 Mbps in fixed locations (peak speeds). The International Telecommunication Union (ITU) seeks to coordinate 3G standards through its International Mobile Telecommunications-2000 (IMT-2000) project, enhancing international roaming. IMT2000 will play a key role in creating a mass market for high-quality, wireless multimedia communications. It mainly comprises two separate standards that will be widely commercialized, WCDMA and cdma2000: wideband code division multiple access (WCDMA) for the paired frequency bands using frequency division duplex (FDD). Time division CDMA (TD-CDMA), which is used in the unpaired time division duplex (TDD) bands. Cdma2000 system is a set of standards (1xRTT, 1xEV, 1xDV and 3X) offering enhanced voice capacity (over IS-95A/B) and increased data speed (up to 2 Mbps, peak). It was developed by Qualcomm. Table 2 and 3 describes the details of features for three mobile generations, 1G, 2G, and 3G, and five 3G standards.”

<table>
<thead>
<tr>
<th>TECHNOLOGY</th>
<th>FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1G</strong></td>
<td></td>
</tr>
<tr>
<td>AMPS</td>
<td>Analog voice service</td>
</tr>
<tr>
<td></td>
<td>- No data service</td>
</tr>
<tr>
<td><strong>2G</strong></td>
<td></td>
</tr>
<tr>
<td>CDMA</td>
<td>Digital voice service</td>
</tr>
<tr>
<td>TDMA</td>
<td>- 9.6K to 14.4K bit/sec</td>
</tr>
<tr>
<td>GSM</td>
<td>CDMA, TDMA and PDC offer one-way</td>
</tr>
<tr>
<td></td>
<td>data transmissions only</td>
</tr>
<tr>
<td>PDC</td>
<td>Enhanced calling features like caller ID</td>
</tr>
<tr>
<td></td>
<td>- No always-on data connection</td>
</tr>
<tr>
<td><strong>3G</strong></td>
<td></td>
</tr>
<tr>
<td>W-CDMA</td>
<td>Superior voice quality</td>
</tr>
<tr>
<td></td>
<td>- Up to 2M bit/sec, always-on data</td>
</tr>
<tr>
<td>CDMA-2000</td>
<td>Broadband data services like video and multimedia</td>
</tr>
<tr>
<td></td>
<td>Enhanced roaming</td>
</tr>
</tbody>
</table>

6 http://www.3gnewsroom.com/html/intro_3g/index.shtml
7 http://www.cellular-news.com/3G/3g_technology.shtml
<table>
<thead>
<tr>
<th>CDMA Direct Spread</th>
</tr>
</thead>
<tbody>
<tr>
<td>This interface is called the Universal Terrestrial Radio Access (UTRA) Frequency Division Duplex (FDD) or WCDMA. FDD operations require paired uplink and downlink spectrum segments. The radio access scheme is direct-sequence CDMA with information spread over a bandwidth of about 5 MHz with a chip rate of 3.84 Mcps. Modulation is dual-channel QPSK.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CDMA Multi-Carrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>This radio interface is also called cdma2000 and operates in FDD. The radio interface is a wideband spread spectrum system that uses code division multiple access (CDMA) technology and provides a 3G evolution for systems using the current TIA/EIA-95-B family of standards. RF channel bandwidths of 1.25 MHz and 3.75 MHz are supported at this time but the specification can be extended to bandwidths up to 15 MHz.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CDMA TDD</th>
</tr>
</thead>
<tbody>
<tr>
<td>This radio interface employs a direct-sequence CDMA radio access scheme. There are two versions: UTRA Time Division Duplex (TDD) that uses a 5 MHz bandwidth and a chip rate of 3.84 Mcps, and TD-SCDMA that uses 1.6 MHz bandwidth with a chip rate of 1.28 Mcps. TDD systems can operate within unpaired spectrum segments. The UTRA TDD specifications were developed to provide commonality with UTRA FDD. In addition, the specifications were developed based on an evolved GSM-MAP but include capabilities for operation with an evolved ANSI-41 based network.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TDMA Single-Carrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>This radio interface also is called Universal Wireless Communication-136 (UWC-136) and is an FDD system. It was developed with the objective of maximum commonality between TIA/EIA-136 and GSM General Packet Radio Service. The radio interface is intended for evolving TIA/EIA-136 technology to 3G. This is done by enhancing the voice and data capabilities of the 30 kHz channels, adding a 200 kHz carrier for high</td>
</tr>
</tbody>
</table>

---

8 http://www.cellular-news.com/3G/3g_technology.shtml
speed data (384 kbits/s) for high mobility applications and adding a 1.6 MHz carrier for very high speed data (2 Mbits/s) for low mobility applications.

<table>
<thead>
<tr>
<th>FDMA/TDMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>This radio interface also is called Digital Enhanced Cordless Telecommunications (DECT) and is defined by a set of European Technical Standards Institute (ETSI) standards.</td>
</tr>
</tbody>
</table>

Figure 1 shows the current transition of wireless technology in major countries and region. In the year 2001, NTT-DoCoMo started its first WCDMA commercial service in the world, whose total systems were supplied by NEC and Fujitsu. Korea completed its smooth migration plan through cdmaOne network into 3G services. “By the end of 2003, most market will have begun 3G services. The WCDMA system is likely to eventually occupy 75-85% of the total 3G market by 2006, with cdma2000 following with 15-20%. China will take its own TD-SCDMA system in its half market, and Chinese government may expect to export its TD-SCDMA system into other Asian markets. By the year-end 2005, 3G wireless voice/data services will be deployed in 50 percent of worldwide 2G coverage areas, and by 2004, the average penetration of data-enabled mobile phones in nearly all developed markets will exceed 70 percent of the economically active population.”

---

9 Strategic Analysis Report, Internet and Telecom in Asia/Pacific, Contrasts with Innovation and Development, Sep 2001
2.3 Regional Market Trend

This section will describe market trends, specifically three major markets, Asia, Europe, and the US.

The 3G market trends in Asia: Japan, Korea and China

Japan: The first 3G launch and Vodafone’s acquisition

"The next-generation cellular service licenses were granted to three operators: NTT DoCoMo, J-Phone acquired by Vodafone, and KDDI. The first two carriers have launched WCDMA services and KDDI, whose brand name is “au”, has cdma2000 1x services. Table 4 shows service deployment plans of three operators. After the great success of i-mode service, NTT DoCoMo has tried to launch the first 3G service to consolidate its market dominance and technological advance. But its WCDMA service, called Freedom of Multimedia Access (FOMA), have only 300,000 users two years after its

launch, while KDDI has succeeded in capturing 2.65 million users for its cdma2000 1x service in only six months since its launch in April 2002. Vodafone Japan has started its WCDMA service in December 2002 on an equal footing.

Table 4  Japan 2.5G / 3G Services Deployment Plan

<table>
<thead>
<tr>
<th>J-Phone</th>
<th>Technology</th>
<th>Service Name</th>
<th>Operator</th>
<th>Network Rollout Plan</th>
<th>Subscribers as of End of September 2002</th>
<th>License</th>
<th>Initial Service Launch Plan</th>
<th>Service Launched/Latest Service Launch Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>W-CDMA</td>
<td>W-CDMA</td>
<td>FOMA</td>
<td>NTT DoCoMo</td>
<td>Service launch 22; March 2002: 60; March 2003: 90; March 2004: 97</td>
<td>135,700</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-</td>
<td>cdma2000 1x</td>
<td>Serviceldai Keitai cdma 2000 1x (In English: next-generation cellular cdma 2000 1x)</td>
<td>au</td>
<td>Service launch 54; September 2002: 85; December 2002: 90</td>
<td>2,652,400</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-</td>
<td>cdma2000 1x EV/DO</td>
<td>October 2003 with trial service from April to September 2003</td>
<td>-</td>
<td>Service launch: Kanto area including Tokyo March 2003; To be expanded to Chubu and Kansai areas including Nagoya and Osaka</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>W-CDMA</td>
<td>W-CDMA</td>
<td>FOMA</td>
<td>-</td>
<td>December 2002 with trial service from June to November 2002</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Gartner Dataquest (October 2002)

There are four reasons that NTT DoCoMo failed to attract customers; First, insufficient network coverage has reached only 70% of population. This is not enough density of base station to let customers switch from 2G to 3G. Second, short battery life of mobile phones compared to 2G failed to attract customers. Third, the FOMA handset’s prices are high. It cost 400US$ initially. Finally, its poor marketing strategies failed to distinguish difference from its newest PDC handsets.

KDDI has well captured new 3G users, because first it provided its 3G network that could connect the 2G network, second, it supplied the same battery life as cdmaOne service with reasonable handset prices, and third it has the same brand name to reduce entry barrier for cdmaOne users.

11 December, 2002.
Most consultant reports expect that Japanese 3G service will take off by 2004. First, NTT DoCoMo and Vodafone’s WCDMA network coverage is expected to be as dense as their PDC networks by 2004. Second, technology development let their battery life longer and learning curve model contribute to reduce its cost and price. Third both companies are expected to stop introducing new models for PDCs when battery life, network coverage and prices for WCDMA handsets reach the same levels as those of PDC handsets.12

Vodafone Group, formed in 1984, entered Japan market by increasing shares own of Japan Telecom and its mobile business wing, J-Phone in 1999. In 2002, Vodafone announced a plan to sell Japan Telecom, fixed operator, and to fully acquire J-Phone and change its name to Vodafone. Vodafone has aggressively accessed to Japanese market. In chapter 4, I will describe how Vodafone’s entry influences Japanese mobile telecommunications market, and domestic network vendors business.

South Korea: cdma2000

"South Korean carriers are subject to the same technical and commercial issues facing 3G operators worldwide, but their strategies are also shaped by unique domestic considerations, especially the regulatory environment and national information technology policy. From a definitional standpoint, cdma2000 has long been recognized in South Korea as 3G. The Korean government has driven a longstanding national effort to build South Korea’s position as a developer and producer of leading-edge wireless technologies. This has evolved through the implementation of cdmaOne, the early deployment of IS-95B and subsequently, cdma2000 1x RTT and 1x EV-DO services. Following the launch of cdma2000 1x services by SK Telecom in October 2000 (See Figure 2), however, the evolution of wireless services took some confusing turns. The natural migration path from GSM or personal digital cellular (PDC) to W-CDMA did not apply to South Korea and the carriers had already begun to offer so-called 3G services using established cdma2000 platforms.13"

13 Gartner Dataquest, 3G in South Korea, October 2002

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China: Third standard, TD-SCDMA

China has already become the largest market for mobile phones, with 200M subscribers, 15% of the world total. Most global carriers and network vendors regard its 3G market as cash cow, but the market remains opaque due to not only its political system but also its technology standard. Chinese government also wants to run the third 3G standard, TD-SCDMA, China's home-grown standard, even though global deployed standard such as W-CDMA and cdma2000 seemed preferable for strategic expansion of Chinese operators. Thus, supporters of both standards have been furiously lobbying the Chinese government.

This new standard was derived from an earlier technology developed by Siemens, a German conglomerate. It was a candidate to become European 3G standards, but lost against W-CDMA. The China Academy of Telecommunications Technology, which has spent five years refining the standard in conjunction with both Siemens and Datang, a state-owned Chinese technology firm, then took it up.

The reason that China wants its own standard is to reduce its dependence on international giant vendors and their technology, and to make a room for domestic vendors and new ventures. Only Siemens, which has spent over 50M Euro a year, will be able to play TD-SCDMA business but a single European company cannot cover all TD-SCDMA

http://www.cellular-news.com/

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service of giant China without support of domestic ventures. Focusing attention on this point, Motorola, Royal Philips Electronics, and Samsung Electronics have announced that it has begun to develop TD-SCDMA technology\textsuperscript{15}.

Another advantage of TD-SCDMA may be that the other two 3G technologies rely on intellectual property belonging to Qualcomm. TD-SCDMA suppliers, most of them are expected to be domestic companies, need not pay license fees to Qualcomm, making TD-SCDMA equipment cheaper and re-investing more attractive.

Mr. Lamprecht, president of Siemens Information and Communication Mobile, said, "Chinese government will try to push the technology both at home and in neighbor countries, but the year 2003 may be critical to see whether it will success or not\textsuperscript{16}.

Another likely option would be for the Chinese government to bless more than one technology: perhaps W-CDMA and TD-SCDMA. The problem with this, however, is that China's current two mobile operators, China Mobile and China Unicom, are both partially privatized. If an operator is forced to adopt TD-SCDMA by the government, its stock price will fall because the rival will compete with global standard WCDMA services. Thus, Chinese government is likely to give China Mobile WCDMA license and China Unicom cdma2000 license and give TD-SCDMA license to third or fourth green field operator such as China Netcom and China Telecom.

\textit{3G market trends in Europe: Licensing Auctions}

3G licensing auctions for the 3G spectrum caused a huge impact on the delay of launching 3G services in Europe. 3G licensing auctions could well be seen as a turning point in the fortunes of the mobile telecommunications industry. In the late 90s and in 2000 many European countries used auctions to allocate new spectrum rights. High expectations for 3G services increased bids by operators. Telecommunications industry was growing exponentially. Investors were welcomed to join the consortia of operators, and banks and retail companies joined in the auctions too. Under threat from potential new entrants, mature incumbent operators appeared to have to win at all costs. Mobile telecommunications operators invested more than 120B$ for spectrums.

Table 5 shows an original and delayed 3G launch plan among major European mobile

\textsuperscript{15} Press Release, Jan/23/2003
\textsuperscript{16} At MIT Sloan School of Management, Feb 10, 2003
telecom operators. Most of them originally planned to start new wireless services in fall of 2003 or at least by year 2004. However, 3G licensing auctions, huge acquisition costs, no killer application services, and technological problems delayed its launch.

Table 5  Original and Revised 3G Launch Plan in Europe

<table>
<thead>
<tr>
<th>Country</th>
<th>Wireless Operator</th>
<th>Delayed?</th>
<th>Orig. Launch Date</th>
<th>3G Revised Launch Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>3G Mobile</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belgium</td>
<td>KPN Orange (KPN NV / Orange JV)</td>
<td>Yes</td>
<td>autumn 2002</td>
<td>autumn 2003</td>
</tr>
<tr>
<td>Belgium</td>
<td>Molistic (majority France Telecom's Orange)</td>
<td>Yes</td>
<td>autumn 2002</td>
<td>autumn 2003</td>
</tr>
<tr>
<td>Belgium</td>
<td>Proximus Belgacom, Vodafone (majority 25%)</td>
<td>Yes</td>
<td>autumn 2002</td>
<td>autumn 2003</td>
</tr>
<tr>
<td>Finland</td>
<td>Radiolinja</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Finland</td>
<td>Sonera</td>
<td>Yes</td>
<td>Sept. 26, 2002</td>
<td>2003?</td>
</tr>
<tr>
<td>Finland</td>
<td>Suomen</td>
<td>3G</td>
<td>Yes</td>
<td>TBD</td>
</tr>
<tr>
<td>France</td>
<td>SFR (holding company Cegedel)</td>
<td>Yes</td>
<td>2H03</td>
<td>2004 or late</td>
</tr>
<tr>
<td>Germany</td>
<td>Group 3G/Quam (Sonera / Telefonica Moviles JV)</td>
<td>Yes</td>
<td>2003</td>
<td>exit</td>
</tr>
<tr>
<td>Germany</td>
<td>MobiCom</td>
<td>Yes</td>
<td>1H02</td>
<td>2H02 (2003)</td>
</tr>
<tr>
<td>Germany</td>
<td>T-Mobile (Deutsche Telekom unit)</td>
<td>Yes</td>
<td>2H02</td>
<td>2H03</td>
</tr>
<tr>
<td>Germany</td>
<td>Viat Interkom (mtn2unit)</td>
<td>No</td>
<td>mid-2003</td>
<td>-</td>
</tr>
<tr>
<td>Germany</td>
<td>Vodafone D2</td>
<td>Yes</td>
<td>4Q02</td>
<td>early 2003</td>
</tr>
<tr>
<td>Netherlands</td>
<td>Vodafone Libertel</td>
<td>No</td>
<td>1H03</td>
<td></td>
</tr>
<tr>
<td>Norway</td>
<td>Tele2</td>
<td>Yes</td>
<td>2H02</td>
<td>exit</td>
</tr>
<tr>
<td>Poland</td>
<td>All 3: PTC, Polkomtel and PTK Centertel</td>
<td>Yes</td>
<td>January 2004</td>
<td>January 2005</td>
</tr>
<tr>
<td>Portugal</td>
<td>Onisway</td>
<td>Yes</td>
<td>May 2002</td>
<td>winter 2002</td>
</tr>
<tr>
<td>Spain</td>
<td>Vodafone</td>
<td>Yes</td>
<td>2H02</td>
<td>2004 or later</td>
</tr>
<tr>
<td>Spain</td>
<td>Xfera</td>
<td>Yes</td>
<td>2H02</td>
<td>2003 or later</td>
</tr>
<tr>
<td>Sweden</td>
<td>Hi3G</td>
<td>Yes</td>
<td>3Q02</td>
<td>4Q02</td>
</tr>
<tr>
<td>Sweden</td>
<td>Orange</td>
<td>Yes</td>
<td>4Q02</td>
<td>2005?</td>
</tr>
<tr>
<td>UK</td>
<td>mtn2 (BT spin-off)</td>
<td>Yes</td>
<td>2H02</td>
<td>1H03</td>
</tr>
<tr>
<td>UK</td>
<td>Vodafone</td>
<td>Yes</td>
<td>4Q02</td>
<td>early 2003</td>
</tr>
<tr>
<td>UK &amp; Italy</td>
<td>Hutchinson Whampoa</td>
<td>Yes</td>
<td>3Q02</td>
<td>4Q02 (2003)</td>
</tr>
</tbody>
</table>

NA = Not Available, JV = Joint Venture, Source: Morgan Stanley Research

17 Source, Morgan Stanley, 2001
UK

A green field operator, Hutchison 3G UK claimed a soft launch of its 3G services in October 2002, followed by a big marketing push later in the year. However, mainly due to technological problems of Nokia’s base stations and significant delay to deliver, Hutchison 3G UK decided that NEC would now take over the network rollout in the South East of England, with Nokia swapping to handle the later rollout in the North of the country. As the network is to be rolled out in the South first, due to the higher population density, it was necessary that Nokia not be late with its equipment. They will start its first Europe 3G service in March 2003 under the brand “3”.

Biggest global mobile operator, Vodafone has announced its launches in the UK will take place 1H 2003, which is in line with the plans for Germany’s D2 Vodafone. I will describe Vodafone’s market and strategy in chapter 4.

Germany

T-mobile, a subsidiary of Deutsch Telecom, has announced that they will delay their 3G service launch from 2H 2002 to 2H 2003. Its main rival, D2 Vodafone has committed to commercial service launch during 1H 2003, but does not count on substantial revenues from 3G services until 2005. BT’s subsidiary, mmO2, commits to their plans to launch 3G services mid 2003. I will describe German market, T-Mobile’s alliance strategy and Vodafone’s entry in chapter 4.

Portugal

Portugal mobile carriers have demonstrated that they would like to delay the launch of 3G services. They believe that commercial service launch would occur in the 2004-2005 timeframe. The reason for the delay is the lack of available equipment, especially lack of reliable and attractive handsets.

Spain

Spain Telefonica is continuing ahead with its rollout in Spain, where it is the incumbent operator. However, the company is not yet giving any dates for its service launch in Spain. The operator has met the initial requirement to cover major urban areas by June 2002, but commercial launch of commercial services is expected to be delayed to 2003 and Spanish government approved them to postpone their rollout plan. I will
describe Telefonica strategy and Vodafone's entry in chapter 4.

**Austria**

Spanish based giant global operator, Telefonica, announced its 3G plans to freeze, and a deferred or withdrawn launch is expected. Telefonica has made no new commitments on service launch now by March 2003, and it is still to be decided if and how operations will continue.

**Finland**

A member of group 3G, Sonera, has postponed its launch of the 3G until 2003. Sonera stated that handsets’ availability and network interoperability were two main reasons for the delay. Sonera claims that the technology is being not mature enough to start a commercial pilot.

**Italy**

Vodafone has announced delayed 3G service launch in Italy until 2003, which is in line with Vodafone’s updated 3G commitment. Telecom Italia Mobile’s alliance strategy against Vodafone and Nokia will be described in chapter 4.

**US market: Wi-Fi as a Substitute**

The US market probably has a different migration path towards wireless broadband. In 2003 it will be active. Wi-Fi networks use radio technologies called IEEE 802.11b or 802.11a to provide secure, reliable, fast wireless connectivity. A Wi-Fi network can be used to connect computers to each other, to the Internet, and to wire networks (which use IEEE 802.3 or Ethernet). Wi-Fi networks operate in the unlicensed 2.4 and 5 GHz radio bands, with an 11 Mbps (802.11b) or 54 Mbps (802.11a) data rate or with products that contain both bands (dual band), so they can provide real-world performance similar to the basic 10BaseT wired Ethernet networks used in many offices without any regulation and licensing fees. US people prefer using PCs to using cell phones to the Internet access. Thus, US market will have very different migration path to the mobile Internet access.

2.4 **Network Vendor Trend**
In 2G and 3G businesses, there are seven major vendors (See Figure 3), and four of them, Ericsson, Nokia, NEC/Siemens, and Nortel, are likely to lead in the WCDMA business. Competition is increasing in the 3G business. Unlike the early days of GSM during around 1990-92, there will be a handful of WCDMA vendors in Europe, led by Ericsson and Nokia, Siemens/NEC (See Figure 4). The reason that a handful of suppliers dominate the market is, first, these vendors led 3G standardization through 3GPP\textsuperscript{18} activity. Second, international standardization reduces the entry barrier to other countries, so from the perspective of economies of scale, a handful of giant vendors are likely to dominate whole European countries. Third, global standardization accelerated the emergence of the global telecom operators like Vodafone Group. A supplier that only succeeds in building close relationships with them can survive.

\textbf{Figure 3} \hspace{1cm} \textbf{Viable WCDMA Big 7 Supplier Constellations}

\begin{quote}
\textit{Viable WCDMA supplier constellations (2000-02)}
\end{quote}

\begin{center}
\includegraphics[width=0.8\textwidth]{figure3}
\end{center}

\textsuperscript{18} The 3rd Generation Partnership Project (3GPP) is a collaboration agreement that was established in December 1998. The collaboration agreement brings together a number of telecommunications standards bodies which are known as “Organizational Partners”. The current Organizational Partners are ARIB, CWTS, ETSI, T1, TTA, and TTC. (See: http://www.3gpp.org/About/about.htm)
Three main players, Ericsson, Nokia, and NEC/Siemens, plus Nortel are intent on bidding aggressively in the first round of supplier selection. This is the result of "strategic pricing" competition and generous vendor financing embedded in the contract arrangements. This caused low margins for network vendors and augmented business risks (especially intensive magnitude of the costs for acquiring 3G spectrum in Europe; for example, 35B$ for the UK alone). I will describe the detail in 3G auctions and vendor financing in the following chapters.

"Figure 5 shows supplier's ratings in WCDMA, which is calculated by several criteria such as product performance, customer relationship, delivery capability, R&D resources, pricing and after-sales services and support. Ericsson gains the highest mark on a scale from 1 to 5, followed by Siemens/NEC at 4, Nokia and Alcatel-Fujitsu at 3.5, Lucent at 3, Nortel at 2.5 and Motorola at 2.19." This ranking ought to be considered the fact that operators prefer multi-vendor selection under some uncertainty in quality of their products. European operators want NEC/Siemens, because NEC has already serviced the first WCDMA service for NTT-DoCoMo. Figure 6 shows that Nokia's revenue will lower than NEC/Siemens. Nokia lost main supplier's positions for Hutchison 3G,

19 Dresdner Kleinwort Benson, WCDM Rivalry in Europe, May 2000

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Hutchison Hong-Kong, and Vodafone Japan due to its poor quality of products and delay of delivery\textsuperscript{19}. 

**Figure 5** Supplier Rating for WCDMA: Siemens/NEC in 2nd\textsuperscript{20}

![Supplier ratings for WCDMA (scale from 1 to 5)](image)

Source: DRH/DSB estimates

**Figure 6** European Mobile Network Revenue Forecast: WCDMA2004 vs. GSM2000\textsuperscript{21}

![European mobile network revenue forecasts: WCDMA 2004 versus GSM 2000](image)

Source: DRH/DSB estimates

\textsuperscript{20} News Release, Wall Street Journal March 18, 2002:

\textsuperscript{21} News Release, http://www.3gnewsroom.com/3g_news/mar_02/news_2016.shtml

\textsuperscript{22} Dresdner Kleinwot Benson, WCDM Rivalry in Europe, May 2000

\textsuperscript{23} Dresdner Kleinwot Benson, WCDM Rivalry in Europe, May 2000

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2.5  3G Spectrum Auctions

The 3G spectrum auctions in Europe could well be seen as a turning point in the fortunes of the mobile telecommunications industry. For example Vodafone paid 9.4BUSH$ for a UK license, 7.6BUSH$ for a German license and 2.1BUSH$ for an Italian license (See Table 6). Vodafone and its rivals believed that they had no choice but to bid. Spectrum rights are especially vital for them, since if they fail to obtain the rights or even participate in the license auctions, the financial markets would regard the operators as giving up on telecom service. Furthermore, the 3G is the global standard that aims to set a unified global service with the same handsets, thus pushing mobile operators to obtain spectrum rights in not only their local country, but also in other major markets. If they don’t, they cannot commercialize their global service, and they will lose their competitive advantage against rivals. Vodafone aggressively bid in the 3G license auctions in Europe and acquired several mobile operators such as Japan Telecom in other areas. These huge investments constrained operators’ financial leverage.

<table>
<thead>
<tr>
<th>Company</th>
<th>Country</th>
<th>Cost (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Vodafone</td>
<td>UK</td>
<td>9,400,000,000</td>
</tr>
<tr>
<td>2 T-Mobil</td>
<td>Germany</td>
<td>7,700,000,000</td>
</tr>
<tr>
<td>3 VIAG Interkom</td>
<td>Germany</td>
<td>7,670,000,000</td>
</tr>
<tr>
<td>4 Quam</td>
<td>Germany</td>
<td>7,630,000,000</td>
</tr>
<tr>
<td>5 Mannesmann Mobilfunk GmbH (Vodafone)</td>
<td>Germany</td>
<td>7,630,000,000</td>
</tr>
<tr>
<td>6 E-Plus Mobilfunk GmbH &amp; Co.KG</td>
<td>Germany</td>
<td>7,620,000,000</td>
</tr>
<tr>
<td>7 MobilCom Multimedia GmbH</td>
<td>Germany</td>
<td>7,600,000,000</td>
</tr>
<tr>
<td>8 W2N</td>
<td>Canada</td>
<td>7,160,000,000</td>
</tr>
<tr>
<td>9 Hutchison 3G Limited</td>
<td>UK</td>
<td>6,900,000,000</td>
</tr>
<tr>
<td>10 Orange 3G Limited</td>
<td>UK</td>
<td>6,440,000,000</td>
</tr>
</tbody>
</table>

Table 6  Highest License Costs

24 http://www.3gnewsroom.com/3g_licenses_db/index.shtml
<table>
<thead>
<tr>
<th></th>
<th>License Fee Cost per Person (U.S. Dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>United Kingdom</td>
<td>595</td>
</tr>
<tr>
<td>Germany</td>
<td>565</td>
</tr>
<tr>
<td>Italy</td>
<td>175</td>
</tr>
<tr>
<td>Netherlands</td>
<td>160</td>
</tr>
<tr>
<td>Portugal</td>
<td>35</td>
</tr>
<tr>
<td>Spain</td>
<td>12</td>
</tr>
<tr>
<td>Switzerland</td>
<td>18</td>
</tr>
</tbody>
</table>

Source: Gartner Dataquest (June 2002)

The spending frenzy on licenses through high-cost auctions and investment-heavy "beauty contests" led to more than 120B$ spent in Europe. Table 7 provides an overview of the cost per household for some countries in Europe.

At the time of the licensing awards, credibility of the business cases was suspect, because they relied heavily on high growth of data services revenue. In today's climate, these cases cannot persuade investors. This has led to operators refocusing their investments on core markets, reconsidering initiatives to establish regional footprints and dramatically reducing equipment spending. Recession occurred, in specific, in the mobile telecommunications infrastructure business. High growing companies such as Nortel, Ericsson, and Nokia suffered from recession mostly.
Figure 7  Revenue of major Network Suppliers

[Graph showing revenue of major network suppliers over time, with labels for Motorola, Nokia, Nortel Networks, Cisco Systems, Siemens, Ericsson, Lucent Technologies, and Alcatel.]

Source: Gartner Dataquest (November 2001)

Figure 7 clearly shows that this network downturn, telecommunications bubble, significantly hit network equipment vendors. Especially Nokia, Ericsson, and Nortel Networks were big winners in telecom sectors. Nokia dominated mobile handset market at nearly 35% market share worldwide. Ericsson led mobile infrastructure market, and Nortel Networks was strong in optical network market. However, all of them have suffered after year 2000. Eight leading vendors announced totally more than 100,000 job losses in two years. It is easy, particularly for European vendors, to rapidly decrease their workforce to address immediate cash concerns.

There are two methods for telecom operators to take to cover their huge licensing fees. First method is the equipment sharing with other mobile telecom operators so that they can reduce their significant investment on network infrastructure. Second method is vendor financing. I will describe network sharing in the following and vendor financing in the next section.

Equipment Sharing

"Equipment sharing is one area that operators can reduce significant investment on building their network, because huge part of whose investment was already used for..."
licensing fees. Equipment sharing enables operators to save from 20 percent to 40 percent of their equipment expenditure. But this is highly regulatory issue: mobile operators ask the government and regulators permission of equipment sharing.25

This consideration first appeared in Germany and the UK, top two countries for spectrum auctions fees. Deutsch Telecom and mmO2, the mobile division of British Telecom, announced its agreement: in Germany Deutsch Telecom will lend its radio base station to British Telecom, and in the UK the reverse relation will appear. This request was approved by both government commissions26.

Base station sites, towers and potentially radio equipments are the main targets for equipment sharing. Cutting down on the number of new base station sites they need to install, and reducing administrative, rental, support and equipment costs are desirable. Equipment sharing appears most attractive for operators to cut costs and save money. Technologically it is not so difficult. Sweden regulators accepted three operators to deploy a shared network in rural areas. Germany regulators also accepted a certain level of sharing.

Table 8 shows that many of the 3G license auctions, particularly those awarded using a range of selection criteria in beauty contests rather than in a straight auction, have strict launch dates and service coverage requirements.

26 Northstream, 3G roll out status, Oct/04/2002
### Table 8  3G License Allocation Method, Price and Coverage Requirements

<table>
<thead>
<tr>
<th>Method</th>
<th>Country</th>
<th>Price ($000s)</th>
<th>Coverage Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auction</td>
<td>Austria</td>
<td>610,000</td>
<td>25 percent of the population by 2003 and 50 percent by 2005</td>
</tr>
<tr>
<td></td>
<td>Germany</td>
<td>45,850,000</td>
<td>25 percent of the population by 2003 and 50 percent by 2005 Amsterdam, Rotterdam, the Hague and Utrecht by 1 January 2002, then all towns with more than 50,000 inhabitants and airports and motorways to Belgium and Germany by 1 January 2005</td>
</tr>
<tr>
<td></td>
<td>Netherlands</td>
<td>2,500,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Switzerland</td>
<td>120,000</td>
<td>50 percent of the population by 2003, 2008 and 2009</td>
</tr>
<tr>
<td></td>
<td>United Kingdom</td>
<td>35,500,000</td>
<td>80 percent of the population by 31 December 2007</td>
</tr>
<tr>
<td>Beauty Contest</td>
<td>Finland</td>
<td>Nil</td>
<td>No minimum coverage requirement</td>
</tr>
<tr>
<td></td>
<td>Norway</td>
<td>360,000</td>
<td>One year: 10 percent of the population in 12 areas; Three years: 40 percent of the population in 12 areas; Five years: 90 percent of the population in 12 areas.</td>
</tr>
<tr>
<td></td>
<td>Portugal</td>
<td>350,000</td>
<td>20 percent of population within 1 year; 40 percent within 3 years; 60 percent within 5 years.</td>
</tr>
<tr>
<td></td>
<td>Spain</td>
<td>480,000</td>
<td>95 percent of the population in two years</td>
</tr>
<tr>
<td></td>
<td>Sweden</td>
<td>44</td>
<td>In second phase of selection procedure, operators are to specify proportions of the population to be covered by 2003, 2006 and 2009.</td>
</tr>
<tr>
<td>Hybrid</td>
<td>France</td>
<td>550,000 plus 1 percent of revenue p.a.</td>
<td>Minimum coverage requirements as a function of data and percentage of population</td>
</tr>
<tr>
<td></td>
<td>Italy</td>
<td>10,100,000</td>
<td>Regional capital cities by 30 months after 1 January 2002; other major cities 30 months after that</td>
</tr>
</tbody>
</table>

Source: Gartner Research

"These strict conditions have been placed over the operators by the regulator before auctions or have been part of license-winning proposals submitted by the operators. At this time 3G licensing was so popular that regulators could easily ask strict condition on candidates. These targeted conditions are being reviewed with changed market conditions and the ability of operators to make the necessary network investments to launch 3G. In Norway, Broadband Mobile returned its 3G license rather than pay the penalty fines associated with failing to meet its network deployment targets, then its stock prices increase. Spain regulators found another solution; the launch commitments have been delayed from the initial target on August 2001 to June 2002, and again by the end of the
2.6 Vendor Financing

Vendor financing is the key strategy from the point of risk sharing between network vendors and telecommunications operators towards extreme uncertainty business market that requires enormous initial investments. Especially, severe capital constraints by 3G spectrum auctions triggered financial solutions, stretching from conservative approaches, like equipment leases and pay-as-you-grow arrangements, to more leveraged solutions, like risk-revenue sharing and direct equity participation. Mobile telecommunications operators request network vendors certain amount of vendor financing in their business proposals. Apart from supplier-operator accords, this grievous burden implies higher financial and commercial risks for telecom vendors.

Figure 8  Vendor Financing Demand and Combined Equity of Suppliers

<table>
<thead>
<tr>
<th>Vendor financing demand (US$ bn)</th>
</tr>
</thead>
<tbody>
<tr>
<td>70,000</td>
</tr>
<tr>
<td>60,000</td>
</tr>
<tr>
<td>50,000</td>
</tr>
<tr>
<td>40,000</td>
</tr>
<tr>
<td>30,000</td>
</tr>
<tr>
<td>20,000</td>
</tr>
<tr>
<td>10,000</td>
</tr>
<tr>
<td>0</td>
</tr>
</tbody>
</table>

Vendor financing @ 20%  Vendor financing @ 40%  Vendor financing @ 60%  Combined equity of European suppliers

1. The ratios (20%, 40% and 60%) refer to the proportion of planned 3G infrastructure spending in Europe during 2001-05.
2. Source: DIKOM estimates

27 Dresdner Kleinwort Benson, "Taxing the Industry", July 2000

Copyright: Takashi UCHIDA, MIT Sloan School of Management
Figure 8 shows enormous amounts of vendor financing at each proportion (20%, 40%, and 60%) of planned 3G infrastructure spending in Europe during 2001 – 2005. European telecom operators totally request around 56BUS$ against network suppliers as vendor financing. This severe financial restriction results from the fact that vendor financing is mandatory determinants for network vendors to gain new contracts\(^{28}\). This trend is expanding to Asian market except Japan, where there was no 3G spectrum auctions.

Figure 9 also shows vendor financing requirements in Europe by major four WCDMA supplier group, Ericsson, Nokia, Siemens, and Alcatel. I will analyze what kind of effects have network vendors by vendor financing, and describe how mobile telecommunications operators can increase in their bargaining powers against network vendors.

\(^{28}\) The author using the following URL as information estimates these amounts.
http://www.3gnewswire.com/3g_licenses_db/country_highest.php
Figure 9  Vendor Financing Requirements by Supplier

Vendor financing requirement by supplier

Vendor financing requirement 2001-06E (US$m)

= Vendor financing @ 20%  □ Vendor financing @ 40%  ▼ Vendor financing @ 60%

Ericsson  Nokia  Siemens  Alcatel  Other suppliers

Note: The ratios (20%, 40%, and 60%) refer to the proportion of planned 3G infrastructure spending in Europe during 2001-06.
Source: DEISF estimates

Vendor financing requirement by supplier category

<table>
<thead>
<tr>
<th>Financing ratio</th>
<th>Total (US$m)</th>
<th>Ericsson (US$m)</th>
<th>Nokia (US$m)</th>
<th>Siemens (US$m)</th>
<th>Alcatel (US$m)</th>
<th>Other suppliers (US$m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20%</td>
<td>18,500</td>
<td>5,560</td>
<td>2,775</td>
<td>3,145</td>
<td>2,290</td>
<td>4,810</td>
</tr>
<tr>
<td>40%</td>
<td>37,000</td>
<td>11,100</td>
<td>5,550</td>
<td>6,290</td>
<td>4,440</td>
<td>9,690</td>
</tr>
<tr>
<td>60%</td>
<td>55,500</td>
<td>16,650</td>
<td>8,325</td>
<td>9,435</td>
<td>6,690</td>
<td>14,430</td>
</tr>
</tbody>
</table>

Note: The ratios (20%, 40%, and 60%) refer to the proportion of planned 3G infrastructure spending in Europe during 2001-06.
Source: DEISF estimates

Several Approaches for Vendor Financing

In this section, I will describe several approaches for vendor financing: Equipment Leases, Pay as You Grow, Revenue Sharing Plans, Risk Revenue Sharing, and Direct Equity Participation.

Equipment Leases

"Financial leasing is the most conservative approach among several approaches of vendor financing. Retaining the official ownership of the network equipment increases assets of telecommunications operators and reduces their cash flows. The supplier offers a lease (on or off balance sheet) which trends to bear a rental income (interest) as well as a
residual payment (at the end of leases)\textsuperscript{29}. Since the commercial lifetime of some mobile infrastructure especially such as base stations and antennas is limited to several years (less than ten years and replaced them to the newest models), suppliers run the risk of just receiving these years interests on the leases. The lease agreement can typically discount operators' financial risks and financial numbers in a balance sheet, income statement, and cash flow statement.\textsuperscript{30,31}

\textit{Pay as You Grow}

"As the name suggests, this approach allows the operator to defer payment for equipment until certain financial milestone have been met. For instance, revenue intakes certain amounts or number of subscriber reaches. Accordingly, if operators fail to successfully launch its service, the supplier is liable to incur write off costs for a substantial part of the whole amount of the receivables."\textsuperscript{31}

\textit{Revenue Sharing Plans}

"This approach allows the operator to accept buying its equipments with little money and allows the operator and its suppliers to share its revenue growth plan. This scheme gives a chance for operators to keep its cash, leverage its financial strategy, and reduce possibility of its down-rating by rating institutions. Accordingly if operators fail to successfully launch its service, the supplier is liable to incur write off costs for a substantial part of the whole amount of the receivables."\textsuperscript{32}

\textit{Risk-Revenue Sharing}

"In exchange for direct payments, the scheme allows the telecom suppliers to receive a certain percentage of the operator’s future revenue streams (often limited to a time period of 3 – 10 years). Compared with pay-as-you-grow, the more conservative approach, this arrangement increases the financial leverage of the network vendor, and dampens that of the operator. However, as with options in general, the financial terms are typically defined so as to offset the risk-adjusted cost for the operator. More importantly, this risk-revenue sharing approach ties the financial interests of a supplier to that of a given

\textsuperscript{29} Pratt, Financial Accounting, fifth edition, Wiley publisher, 2002
\textsuperscript{30} Dresdner Kleinwort Benson, “Taxing the Industry”, July 2000
\textsuperscript{31} Dresdner Kleinwort Benson, “Taxing the Industry”, July 2000
\textsuperscript{32} Dresdner Kleinwort Benson, “Taxing the Industry”, July 2000
operator. Therefore, it makes more difficult to win competing customers, so this approach is seldom performed by leading suppliers like Ericsson, Nokia, and Siemens.

**Direct Equity Participation**

"At the very extreme, the supplier becomes an owner of the operator. This provides through equity participation schemes. The economic interests of the supplier are integrally linked to that of the operator. An equity stake in an operator may be considered non-strategic and liable to be divested after a few years. It nonetheless often precludes the supplier from providing equipment or services to a competing carrier." This approach is more desirable for green field operators. There are two types of green field operators, one is purely new entrants such as Hutchison Wampoa Group, and the other is fixed telecom operators who entered the mobile business such as China Telecom. Thus, compared to existing 2G operators, there financial and business risks are relatively high, so they ask network vendors to own certain shares. Usually, the supplier may take a minority interest (a few million US$ to billion US$) in the wireless operator.

Figure 10 will summarize political and financial relationships under four vendor financing approaches, equipment leasing, pay-as-you-grow, risk-revenue sharing, and equity participation.

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2.7 Summary

In this chapter mobile telecommunications trends from various aspects such as technological, geographical, industrial, sociopolitical, and financial ones were described.

The 3G mobile communications systems have different features and potential services, which will disrupt current 2G systems. The 3G standards will be applied globally, which have changed business model of telecom operators and suppliers by decreasing entry barriers geographically and technologically.

Although the 3G is a global standard, there are still slight geographical difference in market evolution among Europe, Asian, and US. Technologically, all European and most of Asian operators have adapting WCDMA standard. Only Korea and KDDI, the 2nd largest carrier in Japan, have adapted cdma2000 standard. US will adapt cdma2000, but WiFi technology will be disruptive or complement for the 3G. China has different focus. The government wants to precede its own standard, TD-SCDMA, but operators want to

adapt WCDMA or cdma2000. The other aspect of Europe and Japan market is the entry of the Vodafone Group. The Vodafone Group has increased market share in major European and Japan markets, and formed strong ally within the Group. I will describe how alliances and M&A increase the bargaining power of operators in Chapter 3, and in Chapter 4 I will further advance the discussion with an analysis of the case study of the Vodafone Group.

Industry competition among network vendors has increased in the 3G. The reason that a handful of suppliers dominate the market is, first, these vendors led 3G standardization through 3GPP\textsuperscript{36} activity. Second, international standardization reduces the entry barrier to other countries, so from the perspective of economies of scale, a handful of giant vendors are likely to dominate whole European countries. Strong competition among four leading vendors allows global telecommunications operator increasing their bargaining power against vendors, which I will discuss in Chapter 3 and 4. In the later chapter, I will further advance the discussion with an analysis of the case study of the Vodafone Group and how the company has increased its bargaining power.

The 3G spectrum auctions in Europe could well be seen as a turning point in the fortunes of the mobile telecommunications industry. Spectrum rights are especially vital for operators, because if they fail to obtain the rights or even participate in the license auctions, the financial markets would regard the operators as giving up on telecom service. Furthermore, the 3G is the global standard that aims to set a unified global service with the same handsets, thus pushing mobile operators to obtain spectrum rights in not only their local country, but also in other major markets. If they don’t, they cannot commercialize their global service, and they will lose their competitive advantage against rivals. These huge investments constrained operators’ financial leverage.

The severe capital constraints by 3G spectrum auctions triggered financial solutions, stretching from conservative approaches, like equipment leases and pay-as-you-grow arrangements, to more leveraged solutions, like risk-revenue sharing and direct equity

\textsuperscript{36} The 3rd Generation Partnership Project (3GPP) is a collaboration agreement that was established in December 1998. The collaboration agreement brings together a number of telecommunications standards bodies which are known as “Organizational Partners.” The current Organizational Partners are ARIB, CWTS, ETSI, T1, TTA, and TTC. (See: http://www.3gpp.org/About/about.htm)
participation. Mobile telecommunications operators request network vendors certain amount of vendor financing in their business proposals. This severe financial restriction of mobile operators results in the fact that vendor financing is mandatory determinants for network vendors to gain new contracts.

In the next chapter, I will describe Porter’s Five Forces Model and what other factors may influence on changes of the balance of power in the value chain. I will also introduce three key determinants that significantly change the balance of power by showing several examples in various industries. I will further analyze the mobile 3G telecommunications industry that has emergence of these three determinants at the same time, which has more increased in the bargaining power of buyers against vendors than only one factor emerges. I will further advance the discussion with an analysis of the case study of the Vodafone Group and Nokia in Chapter 4.
3. Analysis of Power Pressure of Buyers

In this chapter I explore industry analysis with Porter's five forces analysis framework and industrial value chain model. Then I explain why buyer power is most important factor for analyzing an industry, and develop what forces in a buyer's industry affect buyer power. Finally, analyzing the mobile telecommunications industry, I describe how these forces in the buyer's industry affect competition and change the balance of power between buyers and the rest of the industry.

3.1 Porter's Five Forces Model

In practice, there are many features of an industry that determine the intensity of competition. Porter's Five Forces Analysis framework is the most effective framework to view how the power dynamic within an industry relates to relative profitability within that industry. Porter's Five Forces consist of three sources of horizontal competition: competition from new entrants, competition from substitutes, and competition from established internal rivals; and two sources of vertical competitive powers: the bargaining power of suppliers and the power of buyers.

The strength of each competitive force is determined by a number of key structural variables, as shown in Figure 11.

Threat of New Entrants

If an industry earns a return on capital in excess of its cost of capital, the industry is attractive for firms outside the industry. Entry barriers define the level of difficulty facing these firms considering competitive entry into the industry. If these barriers are low, new competition will add capacity to the industry and increase demand and prices for inputs, resulting in lower industry profitability. The threats of new entrants are defined by several determinants. Here are the most important determinants, namely economies of scale, capital requirements, and access to distribution channels.
Threat of Substitute products or services

The risk of market displacement by existing or potential substitutes is determined by switching cost, availability of close substitutes, and profitability.

Figure 11  Porter’s Five Forces and their Key Determinants

Barriers to Entry
- Economics of scale
- Product differentiation
- Brand identification
- Switching cost
- Access to distribution channels
- Capital requirements
- Access to latest technology
- Experience and learning effects
- Government action
- Industry protection
- Industry regulation
- Consistency of policies
- Capital movements among countries
- Customs duties
- Foreign exchange
- Foreign ownership
- Assistance provided to competitors

Power of Suppliers
- Number of important suppliers
- Availability of substitutes for the suppliers' products
- Differentiation or switching cost of suppliers' products
- Suppliers threat of forward integration
- Industry threat of backward integration
- Suppliers contribution to quality or service of the industry products
- Total industry cost contributed by suppliers
- Importance of the industry to suppliers profit

Power of Buyers
- Number of important buyers
- Availability of substitutes for the industry products
- Buyers' switching costs
- Buyers threat of backward integration
- Industry threat of forward integration
- Contribution to quality or service of buyers products
- Total buyers cost contributed by the industry
- Buyers profitability

Internal Rivalry between Established Competitors

For most industries, competition among the firms within the industry is the major determinants of the general level of profitability. In some industries, firms compete aggressively - sometimes to the extent that prices are pushed below the level of costs and industry-wide losses are incurred. In others, price competition is muted and rivalry focuses on advertising, innovation, and other non-price dimensions to differentiate. Intensity of competition is determined by market growth, cost structure, product
differentiation, switching costs among established competitors' products and services and so on.

**Bargaining Power of Buyers**

The firms in an industry operate in two types of markets: in the markets for inputs and the market for outputs. In input markets firms purchase raw materials, components, and financial and labor services. In the markets for outputs firms sell their good and services to customers (who may be distributors, consumers, or other manufactures or service providers). In both markets the transactions create value for both parties in the transactions. How this value is shared between them in terms of profitability depends on their relative economic power, including the buyer's price sensitivity.

The balance of power between the two firms in the value chain depends on the credibility and effectiveness with which each makes the threat. The key issue is the relative cost that each party sustains as a result of the transaction not taking place. A second issue is each party's expertise in leveraging its position through gamesmanship.

**Bargaining Power of Suppliers**

This force refers to the ability of the suppliers to influence the cost, availability, and quality of input materials to firms in the industry. This analysis of relative power between the producers in an industry and their suppliers is similar to an analysis of the bargaining power of buyers. The key issues are the ease with which the firms in the industry can switch between different input suppliers and the relative bargaining power of each party. Because raw materials, semi-finished products, and components are often commodities supplied by small companies to large manufacturing companies, their bargaining power is relatively low due to the size. For example, Toyota has contracts with 7,000 small and local components suppliers, but these suppliers lack bargaining power because they are small, and because as member of Keiretsu, they are obliged to only sell to Toyota. As we see with Intel and Microsoft, the existence of a monopolistic supplier along with strong forward integration into a customer industry can increase supplier power and depress profitability for other players in the value chain.
3.2 Five Forces Model of Mobile Telecom Industry

This section describes the mobile telecommunications vendor industry with the analysis of four of Porter’s five forces: threats of new entrants, threats of substitutes, competition among industrial rivals, and the bargaining power of suppliers. Then in the following sections, I will analyze the buyer’s industry, and describe the bargaining power of buyers, how they change and what causes these changes.

Threat of New Entrants: International suppliers

Entry barriers to network suppliers were relatively high compared to the fixed telecommunications industry. Several mobile infrastructure manufacturers have been dominating the market. However, the threat of new entrants will increase especially in the business market. There are two main reasons: the entrance of international suppliers like Ericsson and Nokia, and the entrance of Cisco with disruptive IP-based technology.

Most of the 3G specifications are global standards, so they let all manufacturers compete directly in the global 3G market. If we define the market regionally, new entrants are foreign suppliers who enter the domestic market. For example in Japan, whose market had been dominated by NEC and Fujitsu for a long time, Ericsson and Nokia entered via Vodafone, the second largest telecom operators in Japan. The Chinese market expects expansion of mobile services and cell phones, but the government wants to grow domestic suppliers like Huwai. In the mobile phone business Korean makers like Samsung are also taking an aggressive strategy against global leaders like Nokia and Ericsson. New venture companies in India and other places are also entering this business.

Threat of New Entrants: Disruptive Technology

The second factor increasing the threats posed by new entrants is that Cisco and Juniper, two global leaders in router industry, are entering the mobile core network market. IP (Internet protocol) systems and products like routers have begun to disrupt legacy switching systems. An all IP based architecture scenario, called post-3G, 3.5G, or 4G systems, is currently being discussed in the ITU and the 3GPP. This scenario would enable IP-based product suppliers to enter the mobile core infrastructure business. Cisco and Juniper lead this market and have begun to enter network infrastructure business via an alliance strategy with Ericsson, Nokia, Siemens, and Nortel. Originally Siemens tried to build its routers and keep the market by its acquisition of Unisphere; however they
announced that they would sell Unisphere to Juniper in 2002. When operators need all-IP systems, they will enter the mobile infrastructure business directly, not partially through an alliance strategy.

Threat of Substitute: WiFi

There are many real threats of substitutes. End users don’t care which wireless technology they use to access the network. A significant choice for wireless technology is WiFi. The CEO of Qualcomm stated that WiFi should not threat their cdma technology because it is just for the enterprise market segment and has yet to build the appropriate revenue business model. On the other hand, the president of Siemens ICM (Information and Communication Mobile) addressed that it might be a threat, but that they can develop both-band covered cell phones and pursue synergy with other Siemens divisions that supply transportation and airport information management systems which have hot spots for WiFi.

Threat of Substitute: PDA and Microsoft OS (and also Bargaining Power of Suppliers)

Future PDAs will also become threats of substitute against mobile phones. It is already a potential substitute, even if the volume isn’t there yet. This is a threat for handset suppliers to lose their advantage for value capture. If end users don’t distinguish PDAs from mobile phones, then these two products could evolve to be the same, meaning that mobile phone suppliers would have to compete with PDA suppliers like Palm and Sony. In particular these threats are related to the operating system competition between the Symbian operating system supported by mobile phone suppliers, and Microsoft’s Pocket PC operating system for PDAs. If Microsoft can dominate the market, their bargaining power against telecom vendors will increase. This is not just a substitution threat, but also a threat from component and operating software suppliers.

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37 See Chapter 2 for the Detail of WiFi. If you want to know WiFi technology, service, applications etc, see http://www.weca.net/OpenSection/index.asp
38 Irwin Jacob, CEO of Qualcomm, Special presentation for MIT Sloan School of Management, Mar/12/2003
39 Rudi Lamprecht, President of Siemens ICM, Special presentation for MIT Sloan School of Management, Feb/10/2003
Internal Rivalry between Established Competitors

The network vendors market is highly concentrated by several world leaders like Ericsson, Siemens/NEC, Nokia, and Nortel. In the 3G business, global competition among these established suppliers has become fierce, since the 3G standard is a global one. Some giants like Lucent and Alcatel are likely to lose their competitive market positions against leading groups such as Ericsson, Nokia, and Siemens/NEC.

Summary

The mobile telecom vendors industry is showing increased internal competition, and faces significant threats from new entrants, substitutes, and suppliers. However in the mobile telecom industry, the increased threat is from changes in the buyer’s markets.

In the following sections, I explore the idea that in the buyer’s industry the Porter’s five forces model is more of a determinant of profit. And then I will describe mobile telecom operators (buyers for network vendors), how their market situation changes, and how relative bargaining power of buyers increases. In addition I further developed three factors that shift power in the buyer’s industry.

3.3 Understanding Buyer’s Power

As long as purely free competition occurs, buyer’s bargaining power is relatively stronger than vendors’ power. If both parties are in the same part of the industry, for example in the buyer side, and if both parties have the same attributes, then the bargaining power of the two parties is the same. However, if one party sells their product or services to another party, generally, the buyer gains stronger negotiation power than the seller, unless the seller can increase their negotiating power with brand, monopoly position, product differentiation, lower price and so on. Buyers don’t lose their bargaining power unless they have same strength at least against sellers. Moreover, as Michael Porter describes, retailers can gain significant bargaining power over manufacturers when they

40 I learned it at the class, “Negotiation and Conflict Management” by Prof. Rowe, Kochan, and Shapiro at the MIT Sloan School of Management, Fall 2002.
42 Michael Porter, Note on the Structural Analysis of Industries, Harvard Business School Case
can influence consumers' purchasing decisions, as they do in audio components, jewelry, appliances, sporting goods, and other goods. Similarly, wholesalers also can gain bargaining power if they can influence the purchase decisions of the retailers or other firms to which they sell.

For manufacturers to overcome this point, suppliers need strong bargaining power over buyers to increase their bargaining power, as in the case of Intel and Microsoft\textsuperscript{43}.

In a technology based industry, innovation is one of the key determinants to produce profits to the innovator. However, customers (buyers) would gain around half of the value created by the innovation (See Figure 12). This figure shows that the value created by an innovation is distributed among a number of different parties. The innovators gain profits from the innovation. So too do the imitators who are able to copy and modify it: NEC, HP, Sony and other followers into the PC industry earned far more profit than the innovators like Apple. Suppliers may also be key beneficiaries: for example in the PC industry there are component suppliers like Intel in microprocessors, Quantum Corp in disk drives, Sharp Corporation in flat-panel displays, and Microsoft in operating software system. Finally, customers also are major recipients of the value created. As explained in the previous section, the bargaining power between buyers and sellers comes from several important determinants such as numbers of important buyers, availability of substitutes, buyers' switching costs, and buyers' threat of backward integration. However, the figure precisely shows that buyers generally gain value (profits) more than producers (innovator and imitators) and producers earn more value than material and components suppliers to the producers. Thus buyers' bargaining power is usually strongest among the value chain. The further downstream you go in value chain the stronger your bargaining power, and thus the more opportunity for gain.

\textsuperscript{43} See previous Section
Thus for suppliers to increase their revenue, it is important for them to understand the market performance and the bargaining power of buyers. In the profit equation, cost is much more controllable than revenue. A company can control cost by introducing internal cost reduction programs, laying off, and reducing the amount of purchased raw material and components. The company can also have somehow influence on its supply side by using its bargaining power against raw material and components suppliers. However financial performance, especially revenue, is sometimes beyond the control of a firm or even an industry since buyers have relatively stronger bargaining power against the suppliers. Furthermore if the buyer's industry is in recession, for example the current telecom industry, then most of firms in the industry will suffer from decreasing revenue. Thus poor financial performance of buyers can significantly impact an industry.

In the following sections, I explore several factors which change the balance of power between the sellers' and the buyers' industry, significantly changing the distribution of profits in the industry. So, understanding what kinds of factors affect the balance of power is important to the industry, especially for an industry where buyers have relatively stronger power.

Nowadays the rate of change is increasing in many industries. Dynamic analysis of

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44 Contemporary Strategy Analysis P335, Robert Grant, Blackwell publishing, 2002
the buyer’s industry becomes more important to building strategy. However with only the five forces model we cannot sufficiently understand the industry since buyers are influenced by several other key factors. In the following sections I analyze three dynamic factors that can change the balance of power in a buyer’s industry: sociopolitical factor, technological factor, and alliance factor.

3.4 6th Force, and how changes buyer’s industry

One of criticisms of Porters’ Five Forces model is that it only describes the static condition of the industry and lacks insight on dynamic change. Another criticism is its lack of explicit recognition of the importance of sociopolitical factors such as regulation and technological factor such as innovation and disruptive technology. Because the sociopolitical factor can totally change the industry, it is critical to understand.

6th Force: Sociopolitical Force

In many industries the government can be a buyer and supplier, and can influence industry competition and inter-industry competition in the value chain by its policies which it adopts. For example, the government is the main buyer in the defense industry, and is the main supplier in the timber and electricity industries. The government roles are more determined by political factors than by purely economic one. The government also sets regulation which limits the behavior of firms, changes their competitive environment, and sometimes takes away their competitive edges.

There are many sociopolitical factors that influence industry competition: industry protection, industry regulation, consistency of policies, capital movement among countries, customs duties, foreign exchanges, and foreign ownership in major oil companies in the Middle-east region.

In some industries, like the bio-pharmaceutical industry, regulatory institutions play a key role for not only industry competition but also industrial survival. For example, in 1991 the Food and Drug Administration (FDA) rejected Centocor’s new drug, Centoxin, whose technology was based on monoclonal antibody technology. The drug was carefully

45 Graig Flesher and Babette Bensoussan, Strategic and Competitive Analysis, 2002
examined by several institutions and investors rushed into the market for this technology that had the potential to affect a wide range of industries, including pharmaceuticals and medical diagnostics, fish farming, agriculture, chemicals, textiles, household products, environmental cleanup, food processing, and criminal forensics. The rejection followed the rejection of seven companies' drugs. Therefore, the biotechnology roller coaster seemed headed downhill until the next boom in the late 90s. In fact, by 1991 the FDA had cleared fewer than 30 biotech-related drugs in ten years and rejected most of them. This rejection reduced investments in biotech.

In the telecommunications industry, regulation also plays a key role in many ways. The emergence of global telecom operators is regulated to the extent that local government allow foreign companies to merge with or acquire local telecom operators. Technological standards are also regulated by international organization such as the ITU, whose application is required to support telecom operators and telecom vendors. The 3G license allocation is also regulated by the government. The 3G spectrum rights are especially vital for mobile telecom operators, since if they fail to obtain the spectrum rights or even participate in license auctions, the financial markets will regard these operators to have given up on telecom service, and will sell their shares. Therefore, telecom operators have no choice but to obtain the spectrum rights allocated by the government.

The sixth force can influence both the buyer’s industry and supplier’s industry, and change the relative bargaining power between firms in the industry and buyers outside the industry. Figure 13 describes how the 6th force influences the bargaining power of buyers.
The mobile Telecommunications industry is a good example of change in the balance of power between producers and their buyers. The 3rd Generation License Auctions in Europe limited the financial leverage of telecommunications operators, such that vendor financing became a crucial determinant for network vendors to win the contracts. In Chapter 4 I will describe in detail how this force changes the balance of power between telecom operators and network vendors in the mobile telecommunications industry.

3.5 Disruptive Technology shock buyer's industry

Porters Five forces framework and the 6th sociopolitical force affect both the supplier industry and their buyer industry, and change the power balance between them. Other than these forces, there are exogenous shocks that can change the rules of the game, such as disruptive technology, industry recession, trends of strategic alliances and M&A, and external vendor financing. In this section, I will explore why disruptive technology is
important to understand and how it changes the rule of the game.

Disruptive technology, as from the name "disruptive," disrupts technological advantage that industry leaders have, and changes the whole business. Sometimes, it destroys a whole industry, as shown in several industries in the past. Especially in technology-based industry, disruptive technology and innovation can not only change internal competition and power relations in the value chain but it can also obliterate the industry itself. Table 9 shows that established companies with sustained profits typically don't respond to emerging technology, since the rules of competition are different.\textsuperscript{47}

<table>
<thead>
<tr>
<th>Domain</th>
<th>Established Technology</th>
<th>Disruptive Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environment / Industry</td>
<td>Manageable risk and uncertainty (a few discrete outcomes define the future)</td>
<td>Volatile and unpredictable (no basis to predict the future), high complexity and ambiguity</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Players (supplier, rivals, buyers, distributional channels etc)</td>
<td>Familiar</td>
<td>New or Unknown</td>
</tr>
<tr>
<td>Organizational Context / Climate</td>
<td>Well defined boundaries with a reliance on existing capabilities</td>
<td>No rules, accelerated decision making that puts premium on constructive conflict and intuition</td>
</tr>
<tr>
<td>Strategy Making</td>
<td>Focus on gaining advantage and leveraging resources</td>
<td>Focus on creating a robust and adaptive set of multiple strategies; real time, issue-oriented process, scenario development</td>
</tr>
<tr>
<td>Resource Allocation</td>
<td>Traditional discounted cash flow / pay back period or</td>
<td>Real option value</td>
</tr>
</tbody>
</table>

\textsuperscript{47} George Day, Paul Schoemaker, and Robert Gunther, Wharton on Managing Emerging Technologies, John Wiley and Sons, 2000
<table>
<thead>
<tr>
<th>Market Assessment</th>
<th>Shareholder value creation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development Process</td>
<td>Structured research in a defined context, identified trade-off and well-known competitors</td>
</tr>
<tr>
<td>People Management</td>
<td>Experimentation and probe-and-learn approaches; lead users analysis; focus on secondary demand</td>
</tr>
<tr>
<td>Development Process</td>
<td>Formal stage-gate process that aims for replicability, defined steps, fixed specifications, and time-to-market pressure</td>
</tr>
<tr>
<td>Appropriating the Gains</td>
<td>Adaptive process for early stage development through experimentation, carrying multiple alternatives forward and elastic time frame</td>
</tr>
<tr>
<td>People Management</td>
<td>Traditional recruitment</td>
</tr>
<tr>
<td>Appropriating the Gains</td>
<td>Novel emphasis on diversity, rule breaking, new compensation system</td>
</tr>
<tr>
<td>Appropriating the Gains</td>
<td>Gains appropriated through sustainable advantages based on durability, causal ambiguity, barriers to imitation, and credible threats</td>
</tr>
<tr>
<td>Appropriating the Gains</td>
<td>Gains appropriated through mechanisms such as patents, secrecy, lead time, and control of complementary assets</td>
</tr>
</tbody>
</table>

Therefore, if there is disruptive technology, established players sometimes lose their competitive advantage to emerging rivals who own the disruptive technology. Or their customers lose their market positions to new entrants with new technology and markets.

Established companies usually do not invest aggressively in disruptive technology for three reasons. First, disruptive products are simpler and cheaper so they generally promise lower margins. Second, disruptive technologies are typically first commercialized in insignificant markets. Third, leading firms’ most profitable customers generally don’t want products based on those technologies. By and large, disruptive technology is initially embraced by the least profitable customers in a market. Therefore, most established companies that listen to their best customers are rarely able to build a case for investing in disruptive technologies until it’s too late.

For example IBM dominated the mainframe industry in the 1970s but missed the

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emergence of minicomputers, which were technologically much simpler products. DEC successfully created a new minicomputer market with many followers like HP, Data General and Prime. However most of those players were in turn unable to catch the wave of the personal computer, whose market was initially created by Apple computer. Only HP can survive until now. Even innovative Apple computer faced difficulty with the emergence of Microsoft and Intel.

The disk drive industry also shows a similar dynamic. The established firms were able to initially keep their leading positions by listening to their most profitable customers who initially did not want low-productive disruptive technology, and thus ignoring disruptive technology. But by the time the disruptive technology became popular, it was too late for the established firms to decide to enter that new market.

In the computer and disk drive industries, established companies lost their competitive positions due to emergence of disruptive technology. However disruptive technology may also change the buyer’s market in some industries. Leading companies in a buyer’s market cannot afford to invest buying such technology. First, disruptive products are simpler and of lower quality than existing products, so they don’t attract and satisfy customers. Second, those established customers don’t want disruptive products since they cannot gain great profit from those smaller, cheaper, and lower quality products, since they don’t want to lose their current revenue stream from existing products. Therefore only small, emerging buyers want to buy disruptive technology.

Just as emerging companies can invest on producing such technology, to overtake established firms, buyers in an industry can do the same thing. Emerging companies may gain market share and customer satisfaction. This action can cause established customers to respond through M&A, strategic alliances, and strategic financing. Further alliances in the buyer’s industry can influence the power balance between those new, emerging buyers and suppliers. Therefore, we have to pay attention to market dynamics and the change of relative power through the emergence of disruptive technologies.

Some established producers also should also respond to market dynamics through M&A, strategic alliances, strategic financing, organizational changes, and technological strategic responses. From the point of view of technology strategy, there are four
potential responses to disruptive technology. First, established companies should focus on and invest in the traditional business. In the razor market, “price and easy of use” trends subjected by disruptors threatened Gillette’s razor business, but they responded by maximizing their price/performance which is their established business model and market. Gillette successfully retains 45% market share in the disposable razor market. Second, ignore the disruptive technology by regarding it as not our business, such as IBM did with the minicomputer market. Third, attack back and compete with the disruptive technology. Swiss watch manufacturers with strength in quality and accuracy were disrupted by Japanese watch manufacturers with strength in price and functionality. Swiss watch manufacturer responded to them by creating SWATCH, which pursued style and variety, and gained the reputation of the world’s most popular timepiece. Fourth, established firms can abandon their existing ways of playing the game and embrace the disruptive strategic innovation. However, as Clay Christensen mentioned, there are many cases documenting the failure of good companies to stay atop their industries when they confront certain types of market and technological change.

However, the strategic response for disruptive technology can be to create a cutting edge strategy to gain power against market change. I will describe this in the next chapter by introducing the emergence of the global mobile telecom operators like Vodafone, and examining Nokia’s global open and connecting strategy against Vodafone. But before this discussion, I would like to describe what kinds of roles global alliances plays in response to technology, especially disruptive technology.

3.6 Alliances and M&A to build competitive advantage in emerging technology and market

Alliances play a central role in the success of emerging technology and its market. Alliances and M&A let companies share resources and reduce risks associated with


developing costly new technology. There are three stages in the technological development and market penetration of new technology: ferment, take-off, and maturity stages. In fast moving, highly uncertain industries, companies are more likely to choose an alliance and M&A strategy at every stage in order to gain further competitive advantage. In the ferment stage, the company should use an alliance strategy as a window on emerging technology to monitor new developments and acquire knowledge. This strategy will help the firm further develop the technology and reduce uncertainty. In the take-off stage, the firm may still have some uncertainty regarding which technology will be the future winner and which customers and competitors may tip. Thus, firms use an alliance and M&A strategy to explore an option and gain the opportunity to access a future winning technology. In the maturity stage, a few particular technologies may be dominant in the market. Alliances and M&A are used to enhance the competitive position of the firm and its alliances partners. This positioning strategy can help the company further lower costs, influence market structure, gain access to markets, or better differentiate a product offering. Figure 14 describes the purpose of alliances and M&A in each of the three stages.

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The bio-pharmaceutical industry is a good example of the alliances in the ferment stage. Many bio-pharmaceutical companies have a very large number of alliances, particularly in basic research and development.

Intel explores options with many of its alliances, particularly with companies in developing Internet technology, since Intel regards certain Internet technology as a potential threat to its micro-processor business. Therefore, to reduce its risks Intel invested more than a half billion dollars in venture capital and took equity positions in over 50 venture businesses.

In the maturity stage of emerging technology, alliances and M&A are used to achieve scale or scope-based competitive advantage and to enhance or multiple its market position and share. To create the most effective partnerships, firms should find partners that have complementary capabilities and complementary goals in that stage. In a high-tech industry like telecommunications and wireless technology, alliances and M&A are used to achieve access to complementary technologies, to reduce the innovation period and costs, and to gain competitive position with vertical and/or horizontal integration. An example of the effective use of alliances to position and commercialize more developed technologies is the joint venture between Xerox Corporation and Fuji in Japan in 1967, which was created to produce and sell photocopying equipment in Japan. Xerox had the patents on
the photo technology, but no market knowledge and no manufacturing and distribution channel in Japan. This partnership with Fuji gave Xerox access to the resources to gain market position.

We can also see alliances and M&A in the buyer’s industry. Similar to technological based companies and industries, established buyers are likely to gain competitive position market leading position through alliances and M&A. In the 3G mobile telecommunications industry, mobile telecom operators aggressively pursued an M&A strategy. Vodafone has already acquired many companies and now operates in 32 countries. Orange has taken its global alliance strategy via license agreements to nearly 90 countries. T-Mobile bought several major operators such as VoiceStream, for which it paid $50B in 2000. NTT-DoCoMo has taken minority purchase of shares (less than 20%) to further its i-mode service business worldwide. DoCoMo has also made an alliance with the Spanish giant Telefonica group to license its i-mode know-how in 2002. The emergence of mobile telecom operators changes the rule of the game through increasing their bargaining power against network suppliers.

Global alliances and M&A affect changes of the power balance between buyers and sellers. Market dynamics always change someway. Furthermore, if the most important buyers take a global alliance strategy, their bargaining power increases significantly. First, aggressive M&A reduces the numbers of operators worldwide, which, as Porter’s Five forces model shows, increases the bargaining power. Second, global buyers take a global purchasing strategy and request buyers to supply them worldwide at a low price. Automobile makers like GM and Toyota request component suppliers like Yazaki to supply cheaper, but globally.

In the next chapter, I will explore with the emergence of Vodafone Group how global mobile operators increase buyer’s bargaining power against suppliers by changing the rule of the game.

**One more pressure from buyers; Financial Requirement**

As described previously, sociopolitical forces, disruptive technology, and alliances for

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52 See Section 3.1. Figure "Porter’s Five Forces Model"
competitive advantage in emerging markets can transform the industry. The change sometime causes new internal constraints on the buyer industry, and pressure on the competition. Vendor financing in the 3G mobile telecommunications industry is one example of the financial constraints in the buyer's market, which was resulted from the 3G licensing auctions across countries. Network vendors cannot simply ignore buyers' financial constraints, since vendors also want industrial growth and believe that supporting the buyers market ultimately yields them more profits. This idea leads to a win-win solution. However, financial constraints against buyers may increase the relative bargaining power from buyers. I will explore this idea in the next section.

3.7 Analysis of Mobile Telecom Operators' Power Increase

In the previous sections, I concluded that financial performance, especially revenue, is sometime beyond the control of a firm because most of the firms in the industry will suffer from a revenue decrease if the buyer's industry is in a downtown. The financial performance of the buyer's industry is a significant factor, which changes the power balance between the industry and buyer's industry. Therefore in this section I will analyze three external determinants that influence the whole buyer's industry and change the power relation between firms in the industry and their buyers.

Mobile telecommunications operators are increasing their relatively strong bargaining power against network and handsets suppliers. European network vendors like Ericsson, Nokia, and Siemens have reduced their bargaining power. There are several reasons that cause a significant increase of the bargaining power for mobile operators in the mobile telecom industry: the emergence of Global Mobile Telecom Operators through alliances and M&A, pressure to decrease contracts with vendors, capital constraints, vendor financing brought by licensing auctions and fierce price competition by disruptors (See Figure 15). In this section I will analyze each of those shocks: What caused the shock, how those shocks affect telecom operators, and how they increased their bargaining powers against network vendors.
1st Reason: Decreased number of Buyers through alliances and M&A

The emergence of global operators or global operators groups like Vodafone\textsuperscript{5354}, NTT DoCoMo\textsuperscript{5556}, Orange\textsuperscript{57}, and the emergence of global alliances groups among leading operators in each country have significantly increased pressure from buyers. The major players, German giant Deutsch Telecom (T-Mobile\textsuperscript{58}), Spanish and Latin American leader Telefonica\textsuperscript{59}, and Telecom Italia Mobile\textsuperscript{60} agreed to cooperate in joint mobile internet

\textsuperscript{53} Vodafone; http://www.vodafone.com

\textsuperscript{54} For further discussion for Vodafone's global strategy, See section 4.3

\textsuperscript{55} NTT DoCoMo; http://www.nttdocomo.co.jp/index.shtml

\textsuperscript{56} See further information on DoCoMo global strategy and IR reports: http://www.nttdocomo.co.jp/corporate/ir/

\textsuperscript{57} Orange; http://www.orange.co.uk/

\textsuperscript{58} T-Mobile; http://www.t-mobile.com/

\textsuperscript{59} Telefonica Mobile press release, Apr/7/2003; http://www.telefonica.com/pressoffice/home.html
services, roaming services, marketing, and customer support\textsuperscript{61}. This agreement includes the development of joint services in roaming, voice, data and mobile internet, the rollout of joint multinational marketing offers, and the development of handsets. This cooperation covers 162 million in Europe, the Americas and the Mediterranean Basin. This global alliance strategy aims to compete against Vodafone’s global strategy.

MmO2\textsuperscript{62} and KPN\textsuperscript{63} are in preliminary talks about merging their wireless businesses. The merged company would be worth around US$12 billion. KPN’s mobile division currently has about 13.7 million subscribers in the Netherlands, Belgium and Germany while mmO2 currently has some 18.5 million subscribers in the UK and Ireland plus operations in Germany and the Netherlands which could merge with KPN’s own companies.

Vodafone’s strategy of alliances and M&A has decreased the number of operators in the market. General markets dominance among a few number of buyers increases their bargaining power against their suppliers, since network suppliers decreases options to sell their products to alternatives in case. I will further analyze strategy of the Vodafone Group in the next chapter.

\textbf{2\textsuperscript{nd} Reason: Pressure to decrease the number of suppliers}

Network operators want to reduce the number of suppliers. They want to reduce their costs to build network infrastructure and to supply handsets to end users. Global contracts with a number of global suppliers enable network operators to reduce their manufacturing costs. It can also reduce costs by reducing the number of bugs in interoperability testing among network equipment. Interoperability testing is critical to maintaining six sigma level of quality in commercial services, even though all equipment and handsets comply with international standards. Vodafone established a Global R&D committee that would rule on the specifications of the Vodafone Group, targeted not only to their 32 subsidiaries worldwide, but also to the other 40 operators with whom they work. Vodafone purchased a unified system with a special level of service quality and products

\textsuperscript{60} Telecom Italia Mobile: http://www.tim.it/
\textsuperscript{61} For further information: See Section 4-3
\textsuperscript{62} mmO2: http://www.mm02.com/docs/home.html
\textsuperscript{63} KPN: http://www.eurorings.kpn.com/
from selected suppliers\textsuperscript{64}. Global operators need to supply a uniform level of services globally, build consistent roaming services without requiring a change of handsets, build global market and brand strategy, and provide a uniform level of customer support\textsuperscript{65}. Global telecom operators want supply these services global, but it is very difficult to do.

\textbf{3\textsuperscript{rd} Reason: Capital Constraints: Vendor financing brought by Licensing Auctions}

The 3G spectrum auctions led to severe capital constraints, which in turn triggered the emergence of vendor financing solutions. Network operators requested that network vendors provide a certain amount of vendor financing in their business proposals. Network vendors had little choice but to accept these financial constraints because of fierce internal competition. Global leaders like Ericsson, Nokia, Nortel, and Siemens drove vendors to gain advantage by offering attractive vendor financing to telecom operators. And as a result of this strong competition, telecom vendors have had reduced the bargaining power and higher financial and commercial risks.

\begin{table}[h]
\centering
\caption{Vendor Financing Exposure in 3G in Europe\textsuperscript{66}}
\begin{tabular}{|l|c|c|}
\hline
\textbf{Supplier} & \textbf{Amount (\textdollar m)} & \textbf{Portion of annual mobile systems sales} \\
\hline
Ericsson & 1,000 & 5\% \\
Nokia & 3,500 & 50\% \\
Siemens/NEC & 1,200 & 15\% \\
Acalait/Fujitsu & 500 & 17\% \\
Nortel & 2,000 & 33\% \\
Lucent & 1,600 & 9\% \\
Motorola & 500 & 36\% \\
\hline
\end{tabular}
\end{table}

Table 10 shows a brief summary of vendor financing in the European 3G business. The table clearly shows that Nokia is by far the most heavily exposed to 3G vendor financing in Europe. Of all suppliers, Nokia has been by far the most aggressive in

\textsuperscript{64} NEC Internal Confidential Document

\textsuperscript{65} See Vodafone Global Strategic presentation of invest relation presentations:
http://www.vodafone.com/download_list/0,3031,CATEGORY_ID%253D40304%2526LANGUAGE_ID%253D0%2526CONTENT_ID%253D30053,00.html

\textsuperscript{66} As of 2001.
lending its balance sheet to its customers. Nokia’s total exposure currently amounts to 3.5bn Euro, which is equivalent to 50% of its current annual mobile systems sales and 40% of Group equity. Ericsson, by contrast, has been relatively conservative as reflected by corresponding ratios of just 5% and 10%, respectively. In the initial contract competition, which happened between 2000 and 2001, Nokia and Nortel gained the most market position, as measured by the numbers of contracts. The table shows clear evidence as to how Nokia and Nortel increased their market share.

Summary

Buyers’ expectations for the global 3G standard heated up 3G licensing auctions, because of the potential for the 3G to disrupt the 2G market with new packet based technology. These factors accelerated alliances and M&A activity for global mobile operators, they increased the requests for vendor financing, it reduced the number of contracted vendors, and it increased the degree of price competition among network vendors. Figure 16 shows the brief relationship among three key factors which increased the bargaining power of operators.

Figure 16 Three main factors increase Bargaining Power of Buyers

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3.8 Summary

This Chapter introduced three forces that affect the buyer's industry and shows that analyzing these forces is critical to understanding the balance of power between buyers and suppliers in the industry. I explored this framework by analyzing the current mobile telecommunications industry, and what factors actually shift power from network vendors to telecom operators in Europe. Figure 17 summarizes the characteristics of these forces.

Figure 17  Summary of three important factors that increase buyer's bargaining power and threat network vendors

Summary of three important factors

Sociopolitical Force  Disruptive Technology  Global Alliance, M&A

Buyer's Industry

Network Vendors

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4. CASE STUDY OF VODAFONE AND NOKIA

4.1 Case Study of Vodafone: How increase its bargaining power?

4.1.1 Brief History of Vodafone

Vodafone was formed in 1984 as a subsidiary of Racal Electronics Plc. In 1985 it successfully hosted the first ever mobile call in the UK. Then known as Racal Telecom Limited, approximately 20% of the Company’s capital was offered to the public in October 1988. It was fully spun off from the Company and became an independent company in 1991, at which time it changed its name to Vodafone Group Plc. In the same year, Vodafone started GSM service in the UK and succeeded the first international mobile roaming call with Finland Telecom in the following year. In middle 90s, Vodafone started various services like Fax, Short Messaging, Pre-paid, and Pre-second billing services. Mr. Chris Gent was named CEO in 1997, and soon announced a strategic direction that featured a global expansion strategy. He pressed forward with an M&A strategy for gaining global market leader position. In 1999, Vodafone AirTouch, the largest mobile communications company in the world, was created as a result of the successful merger between Vodafone Group Plc of the UK and AirTouch Communications Inc. of the US. As of the end of November 1999, the company had increased a market capitalization of approximately £90 billion. In 2000, Vodafone reached an agreement to acquire Mannesmann AG. In addition Verizon Wireless in US was launched, the combination of Vodafone AirTouch and Bell Atlantic US. In 2001, Vodafone pushed forward its global M&A strategy. Vodafone launched its first global communications campaign featuring TV, cinema, print, online and outdoor media, each version asking the question, “How are you?” In November, supported by NEC, the largest Japanese telecom network infrastructure and mobile phone supplier, Vodafone succeeded in enabling the world’s first 3G roaming call between Japan

67 http://www.vodafone.com

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and Spain.

In 2002, Vodafone signed Ericsson as a global Multimedia Messaging Supplier (MMS). MMS is an evolution of SMS, allowing customers to send and receive messages using text, pictures, audio and video. Vodafone also signed Siemens as a global location enabling server supplier. The platform allows Vodafone to create location-enabled applications. In March Vodafone launched the first commercial European GPRS roaming service. Customers are able to seamlessly access services such as corporate e-mail, intranet and personalized information on their mobile phones, laptops or PDAs over GPRS.

Following mergers and acquisitions with AirTouch, Mannesmann AG, Verizon Wireless, and recently Japan Telecom and its J-Phone Group, Vodafone Group presently operates in 28 countries worldwide. Vodafone Groups has approximately 101.1 million customers, calculated on a proportionate basis in accordance with the company's percentage interest in these ventures, and has 229.1 million registered venture customers. Vodafone is the world largest mobile telecom operator.

Table 11 shows major Vodafone group companies worldwide, and specifies Vodafone's share of their ownership. As shown in Vodafone's Annual Report 2003, the company enhances its geographical expansion by acquisition and the use of brand licensing agreements and partner network agreements.

Table 11  Vodafone Group Worldwide

<table>
<thead>
<tr>
<th>Country</th>
<th>Service name:</th>
<th>Ownership (%)</th>
<th>Proportionate customers (1000s)</th>
<th>No. of competitors:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>Vodafone D2</td>
<td>100.0</td>
<td>22,732 (31 Dec 2002)</td>
<td>3 (T-Mobile)</td>
</tr>
<tr>
<td>Greece</td>
<td>Vodafone Greece</td>
<td>62.7</td>
<td>2,019 (31 Dec 2002)</td>
<td>2</td>
</tr>
<tr>
<td>Hungary</td>
<td>Vodafone Hungary</td>
<td>68.3</td>
<td>568 (31 Dec 2002)</td>
<td>2</td>
</tr>
<tr>
<td>Ireland</td>
<td>Vodafone Ireland</td>
<td>100.0</td>
<td>1,729 (31 Dec 2002)</td>
<td>2</td>
</tr>
</tbody>
</table>


Copyright: Takashi UCHIDA, MIT Sloan School of Management
<table>
<thead>
<tr>
<th>Country</th>
<th>Operator</th>
<th>Subscribers</th>
<th>Date</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Italy</td>
<td>Vodafone Omnitel</td>
<td>76.8</td>
<td>14,592 (31 Dec 2002)</td>
<td>3 (TIM)</td>
</tr>
<tr>
<td>Malta</td>
<td>Vodafone Malta</td>
<td>80.0</td>
<td>132 (31 Dec 2002)</td>
<td>1</td>
</tr>
<tr>
<td>Netherlands</td>
<td>Vodafone Netherlands</td>
<td>77.6</td>
<td>2,290 (30 Sep 2002)</td>
<td>4 (KPN)</td>
</tr>
<tr>
<td>Portugal</td>
<td>Vodafone Portugal</td>
<td>94.4</td>
<td>1,469 (30 Jun 2002)</td>
<td>2</td>
</tr>
<tr>
<td>Spain</td>
<td>Vodafone Spain</td>
<td>100</td>
<td>8,121 (31 Dec 2002)</td>
<td>2 (Telefonica)</td>
</tr>
<tr>
<td>Sweden</td>
<td>Vodafone Sweden</td>
<td>99.1</td>
<td>948 (30 Sep 2002)</td>
<td>2</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>Vodafone UK</td>
<td>100.0</td>
<td>13,224 (31 Dec 2002)</td>
<td>4 (m2O2, Orange)</td>
</tr>
<tr>
<td>France</td>
<td>SFR</td>
<td>31.9</td>
<td>3,699 (30. Sep. 2001)</td>
<td>2 (Orange)</td>
</tr>
</tbody>
</table>

**Americas**

<table>
<thead>
<tr>
<th>Country</th>
<th>Operator</th>
<th>Subscribers</th>
<th>Date</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>Verizon Wireless</td>
<td>44.3</td>
<td>14,386 (31 Dec 2002)</td>
<td>4 (AT&amp;T)</td>
</tr>
</tbody>
</table>

**Asia Pacific**

<table>
<thead>
<tr>
<th>Country</th>
<th>Operator</th>
<th>Subscribers</th>
<th>Date</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>Vodafone Australia</td>
<td>100.0</td>
<td>2,454 (31 Dec 2002)</td>
<td>4</td>
</tr>
<tr>
<td>China</td>
<td>China Mobile (Hong Kong) Ltd</td>
<td>3.27</td>
<td>1,384 (30 Sep 2001)</td>
<td>2 (China Unicom)</td>
</tr>
<tr>
<td>Japan</td>
<td>J-Phone Vodafone</td>
<td>69.7</td>
<td>9,254 (31 Dec 2002)</td>
<td>3 (DoCoMo, KDDI)</td>
</tr>
<tr>
<td>New Zealand</td>
<td>Vodafone New Zealand</td>
<td>100.0</td>
<td>1,220 (31 Dec 2002)</td>
<td>1</td>
</tr>
</tbody>
</table>

### 4.1.2 Analysis of Vodafone Strategy

Table 12 gives a brief summary of Vodafone strategy and their competitive position. Their main strategic direction is to build a closer relationship with customers by taking advantage of their position as a global market leader. This strategic direction is equivalent to the idea of strategic intent as defined by Gary Hamel. He defines strategic intent as successful companies that create an obsession with winning at all levels of the organization, and then sustain that obsession over the 10-20 year quest for global leadership. As Vodafone successfully built on their strategic intent, they pressed forward with an aggressive M&A strategy, gained position as a market leader, and built close relationships.

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with customers worldwide.

<table>
<thead>
<tr>
<th>Strategic direction</th>
<th>Building a closer relationship with customers by taking advantage of their position as a global market leader</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Focus on growing market share</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997 Strategy</td>
</tr>
<tr>
<td>1. Accelerated customer growth</td>
</tr>
<tr>
<td>2. Geographical expansion</td>
</tr>
<tr>
<td>3. New service deployment</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Evolved Strategy in 2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Growing new revenues from established customer base</td>
</tr>
<tr>
<td>2. Extending operational leadership: leveraging scale and scope, and delivering synergies</td>
</tr>
<tr>
<td>3. Extending service differentiation with &quot;Vodafone Live!&quot; and 3G service</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Strategic Initiatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Improving customer proposition</td>
</tr>
<tr>
<td>Improve the way of marketing products and services to improve customer proposition by adopting a more consistent marketing approach based on global advantage</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Implementing data strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implement data strategy in a way that supports interoperability and sustainable business models</td>
</tr>
<tr>
<td><em>Three Point Data Strategy:</em></td>
</tr>
<tr>
<td>1) Deploy the right services Vodafone Live!: New text, picture, and video messaging services with camera phone.</td>
</tr>
<tr>
<td>Deliver appropriate content and services through partnership with contents creators and providers</td>
</tr>
<tr>
<td>2) Interoperate technically, differentiate commercially Offer the whole world to customers, ensuring they can communicate with anyone they wish. Then create a differentiated service and customer proposition on top of these interoperable technology platforms</td>
</tr>
</tbody>
</table>

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70 http://www.vodafone.com
3) Promoting appropriate pricing models

Vodafone's global strategy strengthens their competitive advantage. First, they can enjoy economies of scale. Second, they can differentiate from other commercial competitors by offering the same level services globally, in particular roaming and customer support. In 2001, Vodafone began its first global marketing campaign, which succeeded in establishing Vodafone's global brand. To achieve brand establishment, they also sponsored a Formula One Ferrari Team and the most famous soccer club, Manchester United team, both of which are the first and second most famous sports in Europe and Asia (See the following pictures).

In 2002, Vodafone announced that they completed the three main strategic goals that they set five years ago: accelerated customer growth, geographical expansion, and new service deployment. Furthermore they have evolved this strategy to first, grow new revenues from established customer base, second extend operational leadership, and third extend service differentiation with “Vodafone Live!” and 3G service. Vodafone introduced non-voice service like “Vodafone Live!” earlier than their competitors.

In 2002, Vodafone gained the undisputed industry leader position through lower subscriber acquisition costs and better global economies of scale than rivals. Vodafone has strong free cash flow and positive revenue, and holds strong market share. It has
gained approximately one-third share of five biggest markets, against each of the national operators, mmO2 (former BT) in the UK, T-Mobile (subsidiary of Deutsch Telecom) in Germany, Telecom Italia Mobile, Telefonica in Spain, and NTT-DoCoMo in Japan. In France, Vodafone formed SFR through a partnership with Vivendi and BT, and holds one third of the market against Orange (subsidiary of France Telecom).

Figure 18 shows a pressure map centered on Vodafone\textsuperscript{71}. The map shows how aggressively Vodafone attacks competitors' markets, and how their two main rivals, T-Mobile/TIM/Telefonica group and NTT DoCoMo, respond to Vodafone's market expansion.

The scale of each circle in the figure shows the company's market capitalization at the NYSE as of April 11, 2003, which describes stock valuation. The color of each circle shows its financial strength based on its ROE, revenue, stock price, EPS, D/E ratio, bond rating given by Standard and Poor's, and overall evaluation by analyst reports\textsuperscript{72}. Vodafone, NTT-DoCoMo, and TIM are colored in red (strong), mmO2, Orange, and Telefonica are colored in orange (moderate), and T-Mobile and KPN are colored in yellow (weak). H3G and Vivendi have light blue color (New Entrants or N/A), since compared to peers there is little information available. The arrows can be coded to show the direction and the strength of pressure, which reflect relative advantage in price, advertising, introduction of new products and services, and customer awareness through brand recognition. Brown dotted arrows, pointing to China by Vodafone and Latin America by Spain Telefonica, indicate enhancement of their market expansion to green fields, where other rivals have not yet entered. Two symbols describe i-mode, developed and provided by NTT-DoCoMo and supplied by NEC, and "Vodafone Live!," which was originally developed and provided by J-Phone and installed into Vodafone's global market. NTT DoCoMo allied with KPN, Telefonica, TIM, and AT&T Wireless (not shown in the figure) in deployment of its i-mode service\textsuperscript{73}.\textsuperscript{74}

\textsuperscript{71} To describe the pressure map, I applied Richard D'Aveni, Competitive Pressure Systems, Sloan management Review, Fall 2002
\textsuperscript{72} I reviewed several equity research reports by Bear Sterns, HSBC, Lehman Brothers, Morgan Stanley, and Schroeder Salomon Smith Barney's, and evaluated each mobile operators overall.
\textsuperscript{73} See Press Release:

"Tokyo/Madrid, July 24, 2002 ... NTT DoCoMo, Inc. and Telefonica announced an agreement
Figure 18 Pressure Map by Vodafone and Rivals Responses

This pressure map describes the balance of power in the industry and helps to explain the dynamics of how the industry is changing. The map clearly shows that most of Vodafone's rivals such as T-Mobile in Germany, TIM in Italy, Telefonica in Spain, KPN in Netherlands, and NTT DoCoMo in Japan are on the defensive and only mmO2 in the UK attacks back at Vodafone.

under which i-mode, the world's most popular mobile internet service, will be launched in Spain in the first half of 2003.”

See, “NEC to Develop the Mobile Multimedia i-mode Wireless in Spain” http://www.3g.co.uk/PR/Feb2003/4941.htm; “Telefonica Moviles Espana and NEC Corporation have entered into an agreement for the supply of a mobile multimedia platform system with a view to developing i-mode services.” 2003/Feb.
Defensive rivals have to counter back at Vodafone if they want to keep their main market, aim to be a global operator or at least be a global supplier of products and services. To achieve this, there are two solutions. The first one is to accelerate global M&A and operational alliances. The other is via licensing or loyalty agreements in services and products.

The first solution is currently being pursued. In March 2003, three major rivals, T-Mobile\textsuperscript{75}, Telefonica\textsuperscript{76}, and Telecom Italia Mobile\textsuperscript{77} announced an agreement to cooperate in joint mobile internet services, roaming services, marketing, and customer support. This agreement includes the development of joint service in roaming, voice, data and mobile internet; the rollout of joint multinational marketing offers, and the development of handsets. This cooperation covers 162 million customers in Europe, the Americas and the Mediterranean Basin. This alliance enables the partners to generate major synergies and economies of scale. The agreement also announced that the alliance is open to other operators, since they want to attract several small players and form a global operating group. This strategy is most plausible alliance, because although they should ideally merge, nationalistic regulation would make this too potentially difficult.

The second solution is primary being taken by NTT DoCoMo with its i-mode service. In the beginning, NTT DoCoMo tried to deploy i-mode service by owning shares as of KPN, H3G, and AT&T Wireless. However they lost 95% of their investment due to plummeting stock prices. Therefore, the company changed its strategy from ownerships to loyalty agreement with peers. This trend began with the launch of i-mode services from E-Plus of Germany in March 2002, and was followed by the launch of services from KPN Mobile in the Netherlands and Bouygues Telecom in France in the same year. Telefonica Moviels in Spain is also planning to launch i-mode in the first half of 2003. NTT DoCoMo

The pressure map can clearly forecast the next most probable movement. First NTT DoCoMo will negotiate with T-Mobile to reach a licensing agreement to deploy its i-mode systems. After that, NTT DoCoMo will join the three party alliances among with T-Mobile/TIM/Telefonica. The other probable strategy for NTT DoCoMo is that it should focus on Asian market instead of European and North American market, where there are

\footnotesize{\textsuperscript{75} T-Mobile: \url{http://www.t-mobile.com/} \\
\textsuperscript{76} Telefonica Mobile press release, Apr/7/2003: \url{http://www.telefonica.com/pressoffice/home.html} \\
\textsuperscript{77} Telecom Italia Mobile: \url{http://www.tim.it/}}
numbers of big rivals operating there.

Vodafone is taking an aggressive market strategy to enrich its close relationship with customers by their global expansion. To expand their market share and push a global unified network and services, Vodafone attacks not only competitors, but also network vendors. To counter, its rivals attack back by forming alliances and license agreement. In the next section, I will introduce how Vodafone uses pressure on network vendors to increase its bargaining power against vendors, and the role of exogenous factors in this increased pressure from Vodafone.

4.1.3 Pressure by Vodafone to Network Vendors

Vodafone’s globalization increases its bargaining power against network suppliers. In this section, I will summarize how the 3G standards and the licensing auctions have driven mobile telecom operators’ global strategy, I will describe latest Vodafone strategy against vendors, and I will show you how these strategies affect the power balance between Vodafone and its vendors.

Vodafone and its rivals made huge investments in 3G licenses. For example Vodafone paid 9.4BUSS$ for a UK license, 7.6BUSS$ for a German license and 2.1BUSS$ for an Italian license. Vodafone and its rivals believed that they had no choice but to bid. Spectrum rights are especially vital for them, since if they fail to obtain the rights or even participate in the license auctions, the financial markets would regard the operators as giving up on telecom service. Furthermore, the 3G is the global standard that aims to set a unified global service with the same handsets, thus pushing mobile operators to obtain spectrum rights in not only their local country, but also in other major markets. If they don’t, they cannot commercialize their global service, and they will lose their competitive advantage against rivals. Vodafone aggressively bid in the 3G license auctions in Europe and acquired several mobile operators such as Japan Telecom in other areas. These huge investments constrained operators’ financial leverage. To escape this, Vodafone and its rivals requested vendor financing from network vendors. As I analyzed in Chapter 3, buyers’ market growth is essential for network vendors to get return of investment.

78 For detail information, See Chapter 2 “Vendor Financing”
79 For further discussion, See Chapter 3, “Understanding Buyers Power”

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Industry competition also becomes fiercer in the 3G market, because the global 3G standard enables network vendors to provide their products and services globally, which is different from the regional 2G market. The 3G standard and the 3G licensing auctions changes the power balance between network vendors and mobile operators. As a result, the major players have the following vendor financing exposure: Nokia 3.5B, Nortel 2B, Siemens/NEC 1.2B and Ericsson 1B Euro\textsuperscript{80}.

In a fiercely competitive market, only those vendors that have the financial leverage to afford vendor financing and which possess technological competitive advantage in 3G deployment will survive. In the 2G infra-network system that consists of a core network and a radio access network, Vodafone group’s 28 operators have 10 different network vendors\textsuperscript{81}. However, in 3G contracts only the big four vendors, Ericsson, Nokia, NEC/Siemens, and Nortel, have succeed in keeping Vodafone’s business and have gained 80% market share in Europe and Japan. These leaders have gained the principle suppliers’ positions in each Vodafone’s big five market. Ericsson was selected as the principle supplier in the UK, Siemens in Germany, Nortel in Spain, Nokia in Italy, and NEC in Japan\textsuperscript{82}.

Currently four partners group supply Vodafone group’s 3G infrastructure system. Vodafone’s rivals have chosen only one or two vendors as their primary partner. For example, T-Mobile chose NEC/Siemens as its principle partner, Telecom Italia Mobile chose Nokia and NEC/Siemens, NTT DoCoMo chose NEC, and mmO2 chose Ericsson. H3G chose NEC as its principle partner after Nokia could not meet its deadline to deliver its products, and thus lost the first partnering position. As you see in Figure 18, “Pressure map by Vodafone\textsuperscript{83},” Vodafone attacks its rivals using its competitive advantage of economies of scale, global deployment of services and products, and established brand. However, having four vendor partners may be a disadvantage for Vodafone to provide the same level of services to any geographical customers at the same time. In deploying the network, the most difficult technological factor is interoperability testing between network nodes. Building a fault-free network among four partners is quite difficult to achieve. J-Phone has suffered from this problem. The company used three vendors to build its 3G

\textsuperscript{80} Amounts include all contracts.
\textsuperscript{81} NEC Confidential Internal Document
\textsuperscript{82} http://www.cellular-news.com/infrastructureContracts/
\textsuperscript{83} For details, see Section 4.1.2
network; NEC (50% in subscriber base), Ericsson (30%), and Nokia (20%). However, many technological errors occurred, especially with Nokia and Ericsson products, and J-Phone had to delay its service launch three times and finally deciding that NEC should replace the Nokia network.

Therefore, the simple solution for Vodafone would have been to reduce the number of partner vendors, to build closer relationships with selected vendors, and to cooperate with them to deliver more unified network and services to Vodafone group. This solution would bring several competitive advantages. First, Vodafone would enjoy economies of scale. Second, they could bring to market their network and services more quickly, thereby reducing the risk of service delay caused by problems in a partner's products. Third, they could reduce costs for interoperability testing and maintenance costs.

Furthermore, Vodafone's strategy causes a change of the power balance between network vendors and Vodafone. Vodafone is likely to significantly increase its bargaining power against telecom vendors. By threatening to reduce the number of suppliers, Vodafone can try to press network vendors for better pricing. This strategy also will give Vodafone the principle mobile operator position for vendors. Four big vendors group have many customers. They will have agreements with Vodafone's rivals to supply the 3G network by some deadline. For strategic, technical, or political reasons, some vendors will regard Vodafone's rivals as more important customers, and try to deliver their 3G products firstly to them. For example, Nokia has a close relationship with Telefonica, Nortel with mmO2, Siemens with T-Mobile, Ericsson with TIM, and NEC with NTT DoCoMo. Vodafone should gain the main customer position for network vendors by its bargaining pressure, and launch its global service first. This move is necessary for Vodafone to gain competitive advantage and meet its global strategy.

### 4.1.4 Summary

Vodafone's case shows clearly that the results of the changing balance of power between network vendors and global mobile operators. The global mobile telecom standard, the 3G, enables mobile carriers to operate globally, thus accelerating global M&A and alliances. The emergence of global mobile operators and the financial constraints caused by the 3G license auctions significantly increased their bargaining powers against network vendors. Further global competition among telecom operators will let Vodafone
increase pressure on network vendors.

4.2 Case Study of Nokia: How Network Vendors Should Respond to Operators Power Increase?

A market dynamics approach can inform us to possible counter-responses from network vendors. In this section, I will advance discussion of responses with an analysis of Nokia.

4.2.1 Nokia’s Brief History

"As the market moves further into a new phase of advanced features and services, we see Nokia at the forefront in terms of brand, product offering and operational excellence.”

Jorma Ollila, Chairman and CEO

The roots of Nokia go back to the year 1865 with the establishment of a forest industry enterprise in South-Western Finland by mining engineer Fredrik Idestam. In 140 years, Nokia evolved from a papermaking company to a conglomerate manufacturing items such as rubber boots, consumer electronics and cable machinery, before becoming the world’s leading mobile communications company.

At the beginning of the 1980s, Nokia strengthened its position in the telecommunications and consumer electronics markets through its acquisitions. In the late 1980s, Nokia became the largest Scandinavian information technology company through the acquisition of Ericsson's data systems division. In 1989, Nokia conducted a significant expansion of its cable industry into Continental Europe by acquiring the Dutch cable company NKF. Since the beginning of the 1990’s, Nokia has concentrated on its core business, telecommunications, by divesting its information technology and basic industry operations. In 1992, Jorma Ollila became CEO of the Nokia Group, and soon decided to concentrate on the mobile phone and infrastructure business along with

84 http://www.nokia.com
85 Nokia Annual Report, 2001
accelerated global strategy. Nokia now comprises two business groups: Nokia Mobile Phones and Nokia Networks. In addition the company includes a separate Nokia Ventures Organization and the corporate research unit, Nokia Research Center. Currently Nokia has 35% market share of mobile phones and is the second largest mobile infrastructure vendor after Ericsson and just ahead of NEC/Siemens.

4.2.2 Nokia’s Strength and Strategy

Nokia’s overall business objective is described as strengthening its global leading position, especially in the mobile handset business. To achieve this, Nokia focused on building strong brand, expanding market share, and delivering products and services with new features and functionality. In the mobile handset business, Nokia attacks its rivals by its strong brand strategy and strong product and service portfolio. In the mobile network business, Nokia attacks its rivals mainly by price competition and new products that offer disruptive features based on IP-based switching technology.

Table 13 is a brief summary about how Nokia captures its value. Nokia’s main strength is its strong brand. Readers Digest has studied brand preference across product categories in Europe and only one brand, Nokia, won outright across all 18 countries surveyed. Nokia has a strong product portfolio in the handset business; Nokia’s variety covers most customer preferences such as fashion, premium, and basic.

Nokia’s strength also comes from its worldwide economies of scale, low labor costs and low distribution costs through local production. Also there are strong positive feedback loops for high investment on R&D. Nokia’s stock is currently traded on the New York Stock Exchange thus attracting foreign investors. Then Nokia can reduce the financial risk by being sheltered from their domestic economy and stock market. Their financial leverage brings further cash flows which they can then invest in R&D and local plants. This results in a more attractive mobile phone service worldwide, which increases sales and revenue, which then results in a stock price increase. Finally, they can then go back to the financial markets to attract more investors favorable terms to Nokia. Nokia also has very strong management with great leadership from Chairman and CEO Jorma Ollila. He dramatically changed Nokia’s corporate culture and strategic intent by focusing on the global

86 http://www.nokia.com
87 Analysis by NEC Planning Divisions, Internal Confidential Documents
88 Nokia, the Inside Story, Martti Ha‘ikio’, Prentice Hall, 2002
mobile phone business. His success precisely differentiates Nokia from other companies, and Nokia has successfully captured its value.

Table 13: 3 Factors for Nokia to Capture Value

<table>
<thead>
<tr>
<th>Three Strategic Factors to Capture Value</th>
<th>Nokia</th>
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<tr>
<td>Uniqueness</td>
<td>- Economies of scale (dominant position in market share)</td>
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<td></td>
<td>- Patents</td>
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<td>Complementary Assets</td>
<td>- Low Price</td>
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<td>- Worldwide Distribution Channel</td>
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<td></td>
<td>- Brand (handsets)</td>
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<td></td>
<td>- Chose English as Nokia’s corporate language</td>
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<td></td>
<td>- Worldwide local manufacturing plants</td>
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<td></td>
<td>- Excellent Management including CEO Jorma Ollila</td>
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<td></td>
<td>- Positive Feedback Loop:</td>
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<td>US Investor → Leverage (reduce risk) → Cash Flow → R&amp;D Investment → Mobile phone development → Sales</td>
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<tr>
<td>Structure of Value Chain</td>
<td>- Worldwide Distribution Channel</td>
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<td></td>
<td>- Bargaining power against suppliers</td>
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<td></td>
<td>- Bargaining power against buyers like telecom operator</td>
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Nokia’s great success since late 90s derives from its right strategic direction in the mobile phone business, and its use of its competitive advantages such as strong brand, economies of scale, manufacturing, low price offers, customer relationship management, supply chain management, and advanced products and services with new features and functionality. However, aggressive competitors like Samsung will not only imitate Nokia’s attractive positions but also will more importantly seek to take advantage of new strategic positions that are emerging continually. Furthermore an increase of the bargaining power from mobile operators will be a serious threat for Nokia. For further growth, Nokia faces the need to reshape its global strategy.

In the next section, I will summarize the situation Nokia face, and then I will explore
how Nokia responds to increase of the bargaining power of buyers.

4.2.3 Analysis of pressure from operators

Vodafone’s case in Section 4.1 clearly shows how operators increase their bargaining power. The global mobile telecom standard, the 3G, enables mobile carriers to operate globally, thus accelerating global M&A and alliances. The emergence of global mobile operators and the financial constraints caused by the 3G license auctions significantly increased their bargaining powers against network vendors. Further global competition among telecom operators will let Vodafone increase pressure on network vendors.

To regain the bargaining power, network vendors should take possible counter-responses. Nokia should find new revenue stream because mobile operators squeeze Nokia’s network infrastructure business. Figure 19 shows that network infrastructure business is pressured by operators, but in handset business, Nokia’s core business, the bargaining power from operators are less important because handset suppliers directly sell their handsets to end users.

Figure 19 Pressure from Buyers
Handset business has potential for further revenue stream. Future mobile internet services will be provided by mobile handsets and application service servers, which are called "Mobile Multimedia system" in 3GPP. This concept will be realized in the All IP core network (Figure 20). Legacy circuit switching systems will be replaced by evolved GPRS and 3G packet switching systems or IP routers that consist of a backbone network surrounded by mainly intelligent servers. In the All IP network it is not necessary for operators to provide all of the services through their network. Service providers that have not own their network can supply their services by renting operators networks, which happens in the fixed Internet services. Operators may supply their backbone-like "pipe" that only carries traffic routing calls and packets from point A to point B. This gives them no "ownership" of the customer or the content. The higher layer, consisting of the application services layer, would be supported by application service servers and its management servers.

Figure 20  Nokia's All IP Vision

In this next section, I will describe Nokia's next strategy how Nokia should counterattack increase of bargaining power of buyers.

http://www.nokia.com
4.2.4 Analysis of Nokia’s Next Strategy to Regain the Power

To attain further dominance in the ALL IP era, and to counterattack mobile operators business where their bargaining power is less important, Nokia’s strategic direction should focus more on its handset business and its complementary application service customized for Nokia handsets. “Club Nokia” is the solution. Club Nokia is an internet site that enables Nokia handsets users to personalize their phone to their own individual style, to get their personalize information, to download Ring Tones and Picture Messages, and to download games and some other JAVA scripts.

Nokia should first focus on keeping the handsets business strong and enhance the application and contents server business in 2.5G and 3G. Second, they connect both businesses through Club Nokia, the Nokia specified service which only Nokia users can access Club Nokia which is an internet site for registered Nokia handset owners from which ring-tones, pictures, graphics, games and cartoons can be purchased. Finally, they lock in their customers not only from industrial rivals like Samsung, NEC, and Motorola, but also from telecom operators that have a significant increase in bargaining powers. I define this strategy as a “Connecting Strategy,” which satisfies Nokia slogan, “Connecting People.”

Figure 21 shows how Nokia attacks mobile operators that have increased their bargaining power, and changes the rule of the game in the industry. Instead of protecting network infrastructure business that is threatened by mobile operators, Nokia set Club Nokia to attack operator’s contents and service provider business, by using its competitive handset business.

Club Nokia strategy also enables Nokia to differentiate from their industry rivals in handset and network infrastructure businesses. Ericsson outsourced the handset business through an alliance with Sony, and thus they cannot control their handset business and cannot pursue synergy with their infrastructure and mobile multimedia business. Samsung, which is Nokia’s main rival in handset business, doesn’t have infrastructure nor applications service systems, thus Samsung will not able to obtain the same competitive advantage as Nokia.

To accelerate mobile business focus more on handset and service from infrastructure,
Nokia also set "Openness strategy" through forming the Open Mobile Alliance\textsuperscript{91} and the Open Base Station Architecture Initiatives\textsuperscript{92} successfully complements their Club Nokia strategy. The openness strategy will accelerate the hollowing out of the transportation network that operators provide and promote service implementation in handsets and applications servers, which are provided by Club Nokia.

**Figure 21** Club Nokia enables Nokia to attack operators and also differentiate from handsets' and network infrastructure rivals

Currently there are a few successful mobile internet content providers. A key for successful content providers is to have a strong brand behind them and Nokia is one of the top 10 brands in the world. Nokia's strong brand is a complementary asset towards the success of Club Nokia and towards achieving their "Connecting Strategy." Club Nokia is currently one of the few successful content providers, with 5 million users worldwide.


Nokia's strong brand also helps Nokia attracts content and software developers to join the Club to sell their services.

Club Nokia brings a competitive advantage to Nokia in both the handsets markets and the mobile multimedia market, with the latter market estimated to be 5B Euro per year in Europe. The concept of Club Nokia is similar to the "i-mode" service or the "Vodafone Live!" service, but those services are provided by mobile operators such as NTT DoCoMo and Vodafone. Club Nokia allows handsets makers to provide the same services to end users. Club Nokia is precisely the strong business model to bring new revenue stream into Nokia, grabbing revenue from operators.

However, Nokia should carefully execute its Club Nokia strategy. Club Nokia enables Nokia to be operator's direct competitor in content and service provider business. Operators are incensed by Nokia's "double dipping" with the customer - taking the handset revenue and then some services revenue on top of that - often linked into the somewhat proprietary "Nokia handset only" features. Operators strongly fear that Nokia will eventually produce handsets that give direct online access to Nokia's portal site. But in fact, Nokia's recent presentations for operators state that operators should develop killer-application services for end users and that Nokia is just the network vendor to supply network equipment and handsets. Nokia is likely to keep a distance from operators to encourage them to provide mobile application services.

Club Nokia may clash with operators, since they regard it as their direct competitor. For example, Nokia insisted on allowing Club Nokia to be marketed directly to Orange customers, but Orange, owned by France Telecom, refused and Club Nokia information is no longer supplied alongside Orange-branded Nokia handsets. Therefore, Nokia should carefully execute its strategic direction with Club Nokia. Club Nokia's strategy is a double edged sword for Nokia. They can gain significant revenue from their application services business, but it threatens their handsets business.

4.2.5 Summary
Nokia has successful strategy over through their handset business and "Connecting and Openness Strategy." Club Nokia is a direct response to regain power by grabbing revenue from content and services, which mobile operators also target and their bargaining power against suppliers is less important. Club Nokia is also a significant way for Nokia
to successfully lock in its end users. Once they buy Nokia mobile phones and become Club Nokia members, huge switching costs prevent end users from changing their handsets to other manufacturers. Club Nokia also enables Nokia to differentiate from their industry rivals.

Steinbock states93, "Nokia’s new product development such as stylish handsets has been considered both innovative and revolutionary. The company was faster and more flexible than its rivals, and Nokia was also learning how to use the WWW as an instrument of customer commitment (Club Nokia). Nokia was also rapidly expanding its regionally focused manufacturing, just as it needed more new suppliers to build capabilities in the mobile internet. In its business segments, the composition of revenues has shifted drastically. By 2000, the emphasis was clearly on handsets (67%), even if telecommunications networks still had an important role to play (29%). The emergence of communications products (5%) precipitated the mobile internet and entirely new products. This segment is expected to continue to do so for a few years to come.

Through strategic partnerships, Nokia quickly co-opted potential rivals, such as Palm and Microsoft. Stressing open standards, it is actively not just cellular or the mobile Internet, but computing systems as well. In the long term, Nokia now sees itself primarily as a software company rather than a cellular supplier. As Nokia established its venture organization and venture fund, it made no secret of this determination to build new capabilities in a new environment for a new kind of industry. Still, absence of significant Internet properties triggered speculation over Nokia’s real strengths in the new economy.”

Case study of Nokia shows that Nokia maximizes their competitive advantage and clearly sees the future mobile business. To counterattack the increase of bargaining power from operators, Nokia focus more on its handset business where bargaining power from operators is less important, and its complementary application service which mobile operators also target.

5. CONCLUSION

The quest of this thesis was to analyze the buyer’s industry by introducing three more exogenous determinants that increase the bargaining power of buyers. This analysis uncovers the strategic implications in the changing balance of power between suppliers and buyers. By showing several examples of various industries, I concluded that the further downstream you play in the value chain, the stronger your bargaining power is, and thus the more opportunity for gain. Therefore it is essential for suppliers to analyze the dynamic change of the buyer’s industry. I explored three determinants, sociopolitical forces, disruptive technology, and alliances and M&A that play the main role in increasing the bargaining power of buyers, and thus change the rules of the game.

The sociopolitical forces set by the government and international institutions set policies which can influence industry competition and inter-industry competition in the value chain. The government roles are more determined by political factors than by purely economic ones. The government also sets regulations which limit the behavior of firms, changes the competitive environment, and sometimes takes away their competitive edges.

In the mobile telecommunications industry, the emergence of global telecom operators is regulated to the extent that local government allow foreign companies to merge with or acquire local telecom operators. Technological standards are also regulated by international organizations such as the ITU, whose implications are led by telecom operators and telecom vendors. The 3G license allocation is also regulated by the government. Since the 3G spectrum rights are especially vital for mobile telecom operators, they had no choice but to bid in the auctions to obtain the spectrum rights allocated by the government. The 3rd generation license auctions in Europe created great financial strain for telecommunications operators, thus making vendor financing a crucial determinant for network vendors to win contracts.

Disruptive technology can change the rules of the game. Disruptive technology demands that players conform to different rules of the game. It has destroyed whole
industries, such as the mainframe industry and the disk drive industry\textsuperscript{94}. Especially in technology-based industries, disruptive technology and innovation can not only change internal competition and power relations in the value chain but it can also obliterate the industry itself. IP technology is disrupting the mobile infrastructure industry, increasing price competition and enabling new entrants such as Cisco to enter the telecommunications market.

Alliances and M&A are exogenous shocks that can change the rules of the game in the industry. There are three stages in the technological development and market penetration of new technology: ferment, take-off, and maturity. And alliances and M&A play important roles in each stage. Alliances and M&A strategy are used as a window on emerging technology to monitor new developments and acquire knowledge. Furthermore they are used to explore an option and gain the opportunity to access a future winning technology. And finally alliances and M&A are used to enhance the competitive position of the firm and its alliances partners. A company can gain competitive advantage through alliances and M&A.

I conclude that a company has to evaluate the effect of alliances and M&A on the buyer's industry. Alliances and M&A in the buyer's industry can change the balance of power between buyers and sellers, and the company can lose its bargaining power against buyers.

I conclude that the three factors of sociopolitical forces, disruptive technology, and alliances and M&A can increase the bargaining power of buyers, and critically change the power balance for the suppliers. If these three factors happen same time, the changes in the industry's power balance are huge. This phenomenon has happened in the 3G mobile telecommunications industry. These three determinants have wholly changed the way of competition and increased the bargaining power of network operators. Thus network vendors need to build new competitive advantages to regain their bargaining power against operators.

The case study of Vodafone showed the following insights: First, the global 3G standard has accelerated the move by telecom operators to enter international markets by

\textsuperscript{94} For details, See "The Innovator's Dilemma" by Clay Christensen: Harvard Business School Press, 1997

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acquiring local operators. Second, telecom operators, especially Vodafone, attacked other giant mobile operators, and then they attacked back, which further drove M&A activity, hastening the emergence of global operators. Third, the emergence of global telecom operators has increased their bargaining power against network vendors. Fourth, the move to globalization by operators has driven network vendors to supply companies like Vodafone with unified global services and network systems. Fifth, Vodafone wanted a closer relationship with few suppliers in order to get their early support and be the first mover to deploy global services and products. This move to concentrate more business with fewer suppliers has made network vendors scared of losing their entire business, and thus has decreased their bargaining power against mobile operators. Sixth, huge investments in the 3G licenses have constrained operators’ financial leverage. To escape this, Vodafone and its rivals have request vendor financing from network vendors. Strong competition among network vendors has accelerated vendor financing, which has further decreased their bargaining power.

Vodafone’s case shows clearly the result of a change of the power balance between network vendors and global mobile operators. The disruptive change of the global mobile telecom standard, the sociopolitical factors of the 3G license auctions, and global M&A and alliances has accelerated the emergence of global mobile telecom operators such as Vodafone Group, and has increased their bargaining power against network vendors.

The case study of Nokia showed how they tried to change the industry: by focusing on building a revenue model from mobile applications services. To achieve this goal, Nokia is concentrating on the handsets business and application services business, and is trying to decrease the importance of the infrastructure that network operators supply. Club Nokia will enable Nokia to further enter the mobile service systems that initially installed to Nokia’s handsets. Nokia has tried to open network systems, except server systems, to help them attack the position of mobile operators’ services. Nokia has been trying to increase their power against Vodafone by attacking the mobile operator’s business. This strategy also enables Nokia to differentiate from their industrial rivals. Ericsson outsourced the handset business through an alliance with Sony, and thus they cannot control their handset business and cannot pursue synergy with their infrastructure business. Samsung doesn’t have infrastructure nor applications service systems, thus Samsung will not able to obtain the same competitive advantage as Nokia.

The only company that can compete with Nokia on such a strategy is NEC. NEC
has the top position in the handset business in Japan. NEC is the world leader in WCDMA and the i-mode handset business, and has successfully entered the European, Asian, and Pan-Pacific WCDMA markets. Their alliance with Siemens in the 3G infrastructure business has enabled NEC to enter the European 3G market, even though Lucent and Motorola failed to enter and Alcatel was kicked out. NEC has more than 500 million subscribers in their ISP business in Japan. NEC has created many applications services for handsets and wire-line. NEC has the newest PDAs and tablet PCs, and dominates the PC business in Japan.

My conclusion for NEC's competitive strategy is that NEC should focus on a "Connecting Strategy" as Nokia has, but pursue the synergy in their competitive advantage as the only company that owns handsets, infrastructure, applications services, ISP, PDAs, and PCs. Details of this conclusion will be further developed in future papers.

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APPENDIX: GLOSSARY

1G: The first generation of wireless networks based on analog frequency division multiple access technologies. Many of these systems were individually tailored, country-specific solutions, including technologies such as advanced mobile phone service (AMPS) and total access communications system (TACS).

2G: The second generation of wireless networks. These were more standards driven technologies, designed to improve upon 1G analog with digital circuit-switched solutions. There are three main 2G technology standards: Global System for Mobile Communications (GSM), which is based upon European Telecommunications Standards Institute (ETSI) standards; time division multiple access (TDMA) IS-136; and code division multiple access (CDMA), which was developed by Qualcomm. GSM and IS-136 are TDMA technologies.

2.5G: Enhancements to provide packet data capabilities over 2G networks. 2.5G improves the available data rates supported by the air interface, thereby permitting the introduction of new data-oriented services and applications. The increased data rates rise to a theoretical maximum of 384 Kbps. Examples of 2.5G technologies are general packet radio service (GPRS) and cdma2000 1X.

3G: The third generation of wireless networks. These networks must be able to transmit wireless data at 144 Kbps at mobile user speeds, 384 Kbps at pedestrian user speeds and 2 Mbps in fixed locations (peak speeds). The International Telecommunication Union (ITU) seeks to coordinate 3G standards through its International Mobile Telecommunications-2000 (IMT-2000) project, enhancing international roaming.

Advanced mobile phone service (AMPS): A U.S.-originated analog cellular standard with widespread implementation around the world. AMPS terminals and networks can receive and transmit analog wave signals.

Analog: An electronic transmission accomplished by adding signals of varying frequency or amplitude to carrier waves of a given frequency of alternating electromagnetic current.

Antenna: The element from which a radio transmission is radiated, and through which transmissions are received.

95 Excerpt from Gartner Report: Mobile Communications Worldwide: Methodology and Definition 2002.
**Bandwidth:** The width of a communications channel or relative range of frequencies that can carry a signal without distortion on a transmission medium. It is measured in hertz in analog transmissions and in bits per second (bps) in digital transmissions.

**Base station controller (BSC):** A piece of equipment that controls and monitors a number of base stations.

**Base station subsystem (BSS):** The base transceiver station (BTS) and base station controller (BSC) parts of the radio access elements of a mobile network.

**Base transceiver station (BTS):** A fixed radio transceiver in any mobile network.

**Bluetooth:** A wireless networking technology with a range of about 10 meters and a raw data transmission rate of 1 Mbps. Bluetooth supports ad hoc networking of up to 8 devices within a 10-meter radius (supporting voice and data). The Bluetooth Consortium was founded in 1998 by IBM, Intel, Ericsson, Nokia and Toshiba, and is supported by about 700 organizations in the Bluetooth Special Interest Group. The Bluetooth v.1.0 specification was ratified and published in 1999.

**Cell:** The area covered by a single fixed transceiver in a cellular radio network. It may vary in size from a 0.5-km radius to a 50-km radius depending on the technology, capacity and power.

**Code division multiple access (CDMA):** A spread-spectrum technology standard that assigns a pseudo-noise (PN) code to all speech and data bits, sends a scrambled transmission of the encoded speech over the air, and reassembles the speech in its original format. By assigning a unique correlating code to each transmitter, several simultaneous conversations can share the same frequency allocation.

**cdmaOne:** IS-95A/B standard offering increased voice capacity over analog systems and data speeds of between 14.4 Kbps and 64 Kbps. It was developed by Qualcomm.

**cdma2000:** A set of standards (1xRTT, 1xEV, 1xDV and 3X) offering enhanced voice capacity (over IS-95A/B) and increased data speed (up to 2 Mbps, peak). It was also developed by Qualcomm.

**Wideband CDMA (W-CDMA):** A Universal Mobile Telecommunications System (UMTS) standard for third-generation (3G) digital mobile networks, utilizing code division multiple access (CDMA) technology. It offers increased voice capacity and data speed of up to 2 Mbps.

**Digitak:** A signal transmission in which information is conveyed through a series of coded pulses representing "1"s and "0"s (binary code).

**Dual-band network:** A cellular radio system that operates in two different frequency bands whose network elements conform to an identical network architecture and radio interface.

**Dual mode:** Describes a mobile device that functions on two different technologies.

**Duplex channel:** A two-way radio communication channel.
Enhanced Data Rates for Global Evolution (EDGE): Based on Global System for Mobile Communications (GSM) and shared media packet data, EDGE uses a different and more efficient modulation scheme: the eight-phase shift key (PSK) rather than the Gaussian Minimum Shift Keying (GMSK) modulation scheme used over the radio interface by GSM and general packet radio service (GPRS). This enhanced modulation technique opens up more bandwidth per radio carrier or cell. EDGE claims to provide data rates of up to 384 Kbps per cell, although this assumes that all eight radio channels (time slots) are used and that one of the time slots is not reserved for signaling. As with GPRS, the 384-Kbps bandwidth is shared by all concurrent users operating within the same cell. EDGE requires higher radio signal quality than that found in an average GSM network before higher data throughput speeds can be reached.


Frequency band: A range of frequencies defined and dedicated to a particular type of service or radio technology. A frequency band is usually divided into a number of channels.

General packet radio service (GPRS): A European Telecommunications Standards Institute (ETSI) GSM phase 2+ specification for data-over-packet radio access. The radio interface supports shared-media packet access as opposed to Global System for Mobile Communication's (GSM's) dedicated-channel dial access. GPRS is built on top of existing GSM network infrastructure and requires new network elements at the mobile switching center (MSC) and base station controller (BSC).

Gateway GPRS support node (GGSN): Provides a gateway between the general packet radio service (GPRS) mobile network and packet-based public data networks such as the Internet. It also screens and maps addresses while supporting a number of serving GPRS support nodes (SGSNs).

Global Positioning System (GPS): A technology for assessing the precise location of any compatible receiver unit, using satellites to provide 24-hour positioning information regardless of the weather. GPS works on the principle of triangulation—by knowing its distance from three or more satellites, the receiver can calculate its position by solving a set of equations. Although the technology is most commonly known as Global Positioning System, the satellite constellation used by the U.S. government (and most commercial GPS equipment) is known as Global Positioning Satellite System.

Global System for Mobile Communications (GSM): A digital cellular phone system standard that originated in Europe. It is deployed in more than 170 countries worldwide, and uses a time division multiple access (TDMA) architecture.

GSM900: A digital communications system operating at 900MHz. It is a specification for digital cellular radio systems conforming with the GSM network architecture and radio interface, with a
lower maximum limit on fixed- and mobile-transmitter power output.

**GSM1800:** A digital communications system operating at 1800MHz. It is a specification for digital cellular radio systems conforming with the GSM network architecture and radio interface, but operated at the higher frequency of 1800MHz and with a lower maximum limit on fixed-and mobile-transmitter power output. The standard is also known as DCS-1800.

**GSM1900:** A digital communications system operating at 1900MHz. It is a specification for digital cellular radio systems conforming with GSM network architecture and radio interface, but operated at the higher frequency of 1900MHz and with a lower maximum limit on fixed and mobile transmitter power output. This variant of GSM technology is widely deployed in North America.

**Handoff:** The process of passing a mobile telephone call from one cell to another as the user of a mobile terminal device traverses several cells during a conversation.

**i-mode:** The brand name of NTT DoCoMo's flagship mobile Internet product. It was launched in February 1999, using a packet overlay network on the personal digital cellular (PDC) infrastructure and a compact Hypertext Markup Language (HTML) micro browser in the terminals.

**IS-41:** The network standard that allows all switches to exchange information about subscribers in the United States.

**IS-95:** The U.S. standard for code division multiple access (CDMA).

**IS-136:** The latest generation of the digital time division multiple access (TDMA) technology standard in the United States.

**Java 2 Micro Edition (J2ME):** A cut-down version of Java defined by Sun Microsystems for use in devices such as mobile phones. J2ME is part of a set of related Java technologies that include definitions of profiles and configurations.

**Location-based services (LBS):** Services based on the ability to determine the location of a mobile user using network- or terminal-based technology or a combination of the two. Technologies supporting this include cell of origin (COO), time of arrival (TOA), enhanced observed time difference (E-OTD) and Global Positioning System (GPS)/assisted GPS (A-GPS).

**Mobile network:** A cellular system comprising mobile switching centers (MSCs), antenna cell sites and radio base stations.

**Mobile network operator:** A company that owns and operates one or more mobile networks.

**Mobile portal:** A mobile Internet site that provides mobile services and content to end users who access them using mobile devices via dedicated mobile channels such as Short Message Service (SMS), Wireless Application Protocol (WAP), i-mode and voice. Mobile portals aggregate content from many sources and offer personalized services and content to mobile users—for example, unified messaging, news, search facilities, directories and m-commerce transactions.

**Mobile switching center (MSC):** A stand-alone switch with lines and trunks supporting wireless
telephony services. It covers core switching functionalities and does not include off-switch subscriber information platforms such as home location registers (HLRs) and visitor location registers (VLRs).

**Mobile virtual network operator (MVNO):** A company that does not own a mobile spectrum license, but that sells mobile services under its own brand name using the network of a licensed mobile operator. The term is applied to a variety of arrangements with a mobile network operator. At the lower end are companies offering mobile telephony services, but controlling only the branding, marketing and tariff structure of their customer offerings. At the higher end are companies with their own network code, issuing their own Subscriber Identity Module (SIM) cards and controlling elements of network infrastructure such as the home location register (HLR) and mobile switching center (MSC), in addition to controlling their customer offerings.

**Multimode terminal:** A mobile device that functions on different digital or analog cellular radio systems.

**Multimedia Messaging Service (MMS):** A new mobile messaging standard that, unlike Enhanced Messaging Service (EMS), does not draw on existing messaging technology (such as Short Message Service [SMS]). Instead it requires network operators to deploy new infrastructure. It uses a wireless data bearer to deliver messages and requires new functionality in mobile terminals. The MMS standard is defined jointly by the 3GPP (TS 23.140) and the Wireless Application Protocol Forum. It will provide many new features that cannot be delivered using existing mobile messaging standards.

**Node B:** The wideband code division multiple access/Universal Mobile Telecommunications System (W-CDMA/UMTS) term for a radio base station receiver, as defined by the 3GPP. It provides radio coverage and converts data between the radio network and the radio network controllers (RNCs).

**Original equipment manufacturer (OEM):** The manufacturer of a device that another vendor resells as part of a system through an OEM agreement. Once sold, the product is usually modified slightly and then resold directly to end users or to another segment of the distribution channel.

**Over the air (OTA):** The ability to download applications and services over a mobile or cellular network.

**Packet-switched network:** A data communications network in which data is divided into small segments known as packets. They are divided in such a way that each packet forming part of a complete message can be routed through a network of switches to its destination independently of all the other packets forming the same message.

**Personal digital assistant (PDA):** A handheld wireless device that serves as an organizer, electronic book or note-taker. It typically uses a stylus or pen-shaped device for data entry and
navigation. Types of PDA are as follows: Clamshell: A computer system that weighs about 0.45 kg and opens lengthways to expose a keyboard and screen. PDA computer: A handheld data-centric device designed for high portability. They generally run non-Windows operating systems that provide "instant on" capability. Tablet: A computer system that weighs about 0.2 kg and that is operated by direct screen contact via a pen or touch interface.

**Personal digital cellular (PDC):** A Japanese second-generation (2G) digital cellular standard operating in the 800MHz and 1500MHz frequency bands.

**Personal Handy Phone System (PHS):** A Japanese standard for digital cellular service. It provides low mobility or fixed wireless access to users operating in the 1900MHz band.

**Picocell:** Short-range cell typically used to boost in-building cellular coverage or for high-traffic locations.

**Radio network controller (RNC):** An integral part of a third-generation (3G) Universal Mobile Telecommunications System (UMTS) network. The RNC plays a similar role to the base station controller (BSC) in Global System for Mobile Communications (GSM), but supports 3G base stations (node B).

**Removable user identity module (R-UIM):** Introduced by the CDMA Development Group and the 3GPP2, an R-UIM card is a smart card for use with code division multiple access (CDMA)-based mobile phones. It allows roaming across CDMA and Global System for Mobile Communications (GSM) networks.

**Serving GPRS support node (SGSN):** Part of the general packet radio service (GPRS) infrastructure, the SGSN provides switching functionality, security and authentication via the home location register (HLR) for GPRS users. The SGSN's primary interfaces are with the HLR, gateway GPRS support node (GGSN) and packet control unit (PCU).

**Short Message Service (SMS):** A facility that allows a subscriber's mobile terminal to send or receive messages of up to 160 characters. Messages received are stored if the subscriber's terminal is inactive and relayed when it next becomes active.

**Smart phone:** A mobile terminal capable of voice and data calls. Although it is primarily voice-centric, it can run data applications while a connection to the network is absent. It has the following physical characteristics: A display that can show graphical information.

An operating system (OS) that includes application software or that supports the operation of other application software. A central processing unit (CPU) used to manipulate information from stored software or from user input. A combination of memory devices for the resident OS, any additional application software and data input by the user.

**Spread spectrum:** A radio technology that allows a number of radio communications links to use the same band of frequencies simultaneously without mutual interference.
Subscriber Identity Module (SIM) card: A programmable smart card in a mobile terminal device that gives access to a network. It contains codes to identify a subscriber to a digital mobile service and the details of the special services the subscriber has elected to use. A SIM card may be a removable plastic card with embedded memory and a processor chip or fixed within the phone.

Time division multiple access (TDMA): A digital modulation technology standard that allocates a discrete amount of frequency bandwidth to each user to permit many simultaneous conversations. Each caller is assigned a specific time slot for transmission. TDMA claims to provide three times the call capacity of current analog technology. A derivative of this standard used in North America is called NA-TDMA. Global System for Mobile Communications (GSM), digital-advanced mobile phone service (D-AMPS), personal digital cellular (PDC) and Digital Enhanced Cordless Telecommunications (DECT) are all based on TDMA.

Unified messaging (UM): A messaging system that enables subscribers to collect their e-mail, fax and voice mail messages from a single message box by using fixed or mobile devices.

Universal Mobile Telecommunications System (UMTS): Part of the International Telecommunications Union's (ITU's) IMT-2000 vision of a global family of third-generation (3G) mobile communications systems. UMTS will play a key role in creating a mass market for high-quality wireless multimedia communications. It comprises two separate standards: wideband code division multiple access (W-CDMA) for the paired frequency bands using frequency division duplex (FDD); and time division CDMA (TD-CDMA), which is used in the unpaired time division duplex (TDD) bands.

Universal Subscriber Identity Module (USIM) card: An enhancement of the SIM card used on Global System for Mobile Communications (GSM) networks. It is the smart card used in third-generation (3G) networks.

Voice mail: A network system that allows unanswered phone calls to be diverted to a personal answering service. Revenue may be generated by making a connection charge to the service, a subscription charge for the service or by charging the subscriber for messages deposited or retrieved.

Wireless Application Protocol (WAP): An open, global specification that enables users of wireless devices to access and interact with information and services easily and instantly. WAP specifications are based on Internet standards, with extensions to reflect the wireless device environment. Specifications in the WAP architecture are arranged in a protocol stack consisting of application, session, transaction, security and transport layers. The application layer includes Wireless Markup Language (WML) and WMLScript for content, and Wireless Telephony Application Interface (WTAPI) for telephony service capabilities.

Wireless LAN (WLAN): A LAN communication technology in which radio, microwave or
infrared links take the place of physical cables. The IEEE 802.11 standard specifies the technologies for WLANs.
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