Market Entry Strategies
Of Wireless Startups

Thesis

In Co-operation with

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Table of contents

Index of Appendices

Index of Figures

1) Introduction

The recent few years has seen a tremendous explosion in mobile phone ownership all over the world[1], resulting in a boom in the wireless industry. However, as the effects of the boom taper, the average revenue per user (ARPU) from voice traffic is projected to decrease over the next few years. As a result, increasing revenues from data traffic over mobile devices is touted as the next "holy grail"[2]. Marrying the Internet and mobility is the next natural progression since the Internet has become an indispensable tool in our lives.

Incumbents all across the industry value chain like Nokia, Palm Inc., Sonera, NTT DoCoMo and Verizon had started to make plans in this area a few years back, all hoping to have a share of the pie. There have been various steps by these incumbents to push for the acceptance of mobile Internet in the mass market, whether in R&D, strategic alliances across the value chain or setting up forums for collaboration. With intense competition and the industry still very much at its infancy, firms have yet to secure dominant positions in the data transmission market. Many startups have taken advantage of the opportunities opened up by this emerging industry. They have come up with innovative products and services to serve markets untouched or too specialized to be worthy of incumbents' attention.

This phenomenon bears an uncanny resemblance to the Internet boom of the late 90s, which saw many startups trying to cash in on the opportunities brought about by the Internet. Having witnessed the spectacular demise of many of these ventures, startups and venture capitalists (VCs) are treading with more caution. Startups without defendable business models would have difficulty in procuring funding. Good market entry strategies are hence crucial not only in securing funding, but also, in view of the current grim economic climate, the keys to success.

The aim of this thesis is to identify the market entry strategies of these startups. The areas covered are strategic issues the startups have to decide on prior to product launch, to ensure successful market entry and their ensuing survival. These include, but are not limited to,

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[1] See Appendix 1

[2] See Appendix 2 and 3

their rationale for entering that particular market segment, the modes of marketing, their competitive advantages and ways to sustain these advantages.

There is ample literature on entrepreneurship, strategic management and the wireless sector. They usually deal with two of the three topics but never all. For example, there are numerous papers on what kind of competitive strategies startups in dynamic environments should follow[3] or how some wireless incumbents are developing new strategies to face rapid changes in the markets[4]. However, there is no comprehensive study that covers all three areas. This thesis aims to fill this gap by covering both entrepreneurship and strategic management as applied to the wireless industry, giving the reader an overview of the strategies wireless startups are employing in view of the new and rapidly evolving industry.

Existing studies on entry strategies usually deal with generic strategies focusing on incumbents wanting to enter new markets or the influence of founding strategies on performance of firms in different industries[5]. In this thesis, entry strategies will be discussed in the context of wireless startups. It will be shown that while existing theories can be used to clarify why these startups adopt certain practices, strategies from these startups can also be used to critically review and refine these theories as applied to this particular industry.

This thesis is carried out in a bottom up manner to guide the reader from the basic theory of strategizing to how these concepts are applied in the wireless industry. This is contrary to previous studies on strategies, where researchers work with a pre-defined set of strategies[6]. The reason for this is to reduce the constraints set down by these preconceived sets, which will never completely fit the profile of any one firm. In reality, firms do not have to limit themselves to one type of strategy. For example, firms with niche strategies serve a specific group of buyers but are not expected to pursue cost leadership as well.

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[3] See Anderson et al. (2001); Carter et al. (2002); Forlani et al. (2000); Gruber et al. (2002); Gruber (2002); Hofer et al. (1987); Lee et al. (2001); Levesque et al. (2002); Li (2001); Lopperi (2002); McDougall et al. (1990); Shepherd et al. (2000)

[4] See Aijo (1999); Barczak (1995); Constance et al. (2001); Garrone et al. (1998); Koski (2000)

[5] See Bamford et al. (1999); Boeker (1989); Carter et al. (1992); Green et al. (1990); Green et al. (1995); McDougall et al. (1990); Sharma (1998)

[6] See Carter et al. (1994); Shepherd (2000); Sandberg (1987); Green (1990); Green (1995); Bamford (1999); McDougall (1990)

As the wireless industries in different countries differ from one another in terms of organization, trends, players and regulations, the entire study is carried out in the context of the wireless industry in the U.S.A. only. Compared to the European and Asian markets, the U.S.A. market is more fragmented and less developed, making it a more compelling case study. Startups thrive especially in such an environment, where players have yet to establish dominant positions.

In Chapter Two, an overview of the wireless industry is presented. The roles taken on by the various players will be elaborated. A review of the literature on theories about market entry strategies will follow in Chapter Three. In Chapter Four, an analysis of the wireless industry will be carried out using one of these theories, Porter's Five Forces. The methodology used to examine startups will be explained in Chapter Five. Results from the interviews with five startups will be reported in Chapter Six. Chapter Seven will then link these results closely with all the theories brought up in Chapter Three. This thesis will conclude with Chapter Eight, which will highlight the major findings, with suggestions for further research in this area.

Kommentar: Wat about RBV?

It is hoped that after reading this thesis, the reader will get a clearer picture of the current state of the wireless industry and the issues a startup entering this market has to face. Results from this study will also hopefully contribute to the general understanding of how startups, characterized by scarce resources and short track record, try to beat the odds and survive in an industry characterized by short product life cycles, lack of standards and rapidly changing structures and technologies.

2) The Wireless Industry

According to the American Standard for Telecommunications, wireless is "descriptive of a network or terminal that uses electromagnetic waves (including radio frequency, infrared, laser, visible light and acoustic energy) rather than wire conductors for telecommunications."[7] With a definition as broad as this, the wireless industry encompasses production of mobile devices like mobile phones, laptops and personal digital assistants (PDAs), as well as all the hardware, software and services that enable communication using these devices. The operation of the networks that allows communication to take place is also included.

2.1) Reasons for studying the wireless industry

To narrow the scope of this thesis, wireless companies are defined as those involved in wireless data transmission rather than voice transmission, while applying the abovementioned technologies. The reason for this focus is the increasing interests from all players in the industry value chain in the future of the mobile Internet. Mobile operators in particular are worried about tapering revenues from voice traffic and have shifted their investment strategies to promote mobile data transmission, which offers higher margins than voice traffic. The potential of this market is exemplified by the wireless and Internet penetration figures[8]. With mobile penetration outstripping Internet penetration in many countries, it is no wonder that companies want to replicate the success of the fixed line Internet on the mobile Internet. According to a study compiled by Sonera, ARPU from mobile Internet in the U.S.A. will increase from US$5 in 2000 to US$20 in 2005[9]. With the number of mobile Internet subscribers increasing, the huge potential of the market has made it very lucrative.

Kommentar: Goldman Sachs or Sonera? Something wrong with this comp. Cannot read appendix

From an entrepreneurship researcher's point of view, it is interesting to find out how these startups study the market and plan for market entry, while taking the unique characteristics of the industry into consideration. Some of these characteristics are listed below:

- There is an ongoing standards battle across the value chain. This includes operating systems (e.g. Symbian, Palm OS, Stinger), transmission standards (e.g. UMTS,

[7] http://www.atis.org/tg2k/t1g2k.html

[8] See Appendix 1

[9] See Appendix 3

GPRS, GSM, TDMA, CDMA)[10], browser protocols (e.g. HTML, C-HTML, WAP, HDML), development platforms (e.g. Java, BREW, Linux, .Net)[11] and devices (PDAs, mobile phones, smart phones).

- The upstream value chain is regulated. In the U.S.A., the Federal Communications Commission (FCC) governs infrastructure building and regulates spectrum use[12].
- Rapid technological advancement can be witnessed at every stage of the value chain. This phenomenon is exemplified by the continuous developments of innovative products, which can be verified at the Cellular Telecommunications & Internet Association (CTIA) exhibitions held annually[13]. For example, CTIA Wireless 2002 featured electronic eyewear products from MicroOptical, which incorporate electronic displays, cameras, microphones and speakers to provide a hands-free, portable and private audio and video interface to the Internet. The Nokia 3390 was also featured as the first mobile phone to include AOL instant messaging services as a built-in application[14].
- Products have short life cycles, as there is a constant need to keep up with the latest technologies and standards.
- Incumbents like Nokia, Ericsson and Motorola are vertically integrated and straddle across the value chain, making their positions and bargaining powers very strong.
- Players not traditionally associated with the wireless industry are making forays into the market. Some notable examples are Microsoft and SUN.

The above reasons contribute to a volatile environment, where entrepreneurs have to constantly keep abreast of the newest developments. Startups wanting to enter this market would have to formulate strategies to best position themselves in this dynamic environment.

2.2) Overview of the wireless industry

This section depicts how the wireless industry functions as a whole, who the players are and their relationships with one another. This is crucial in understanding what issues the startups have to grapple with.

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[10] See Glossary for explanation of terms

[11] See Merrill Lynch, *Mobile Transitions*, 6 Feb 2002, p. 34

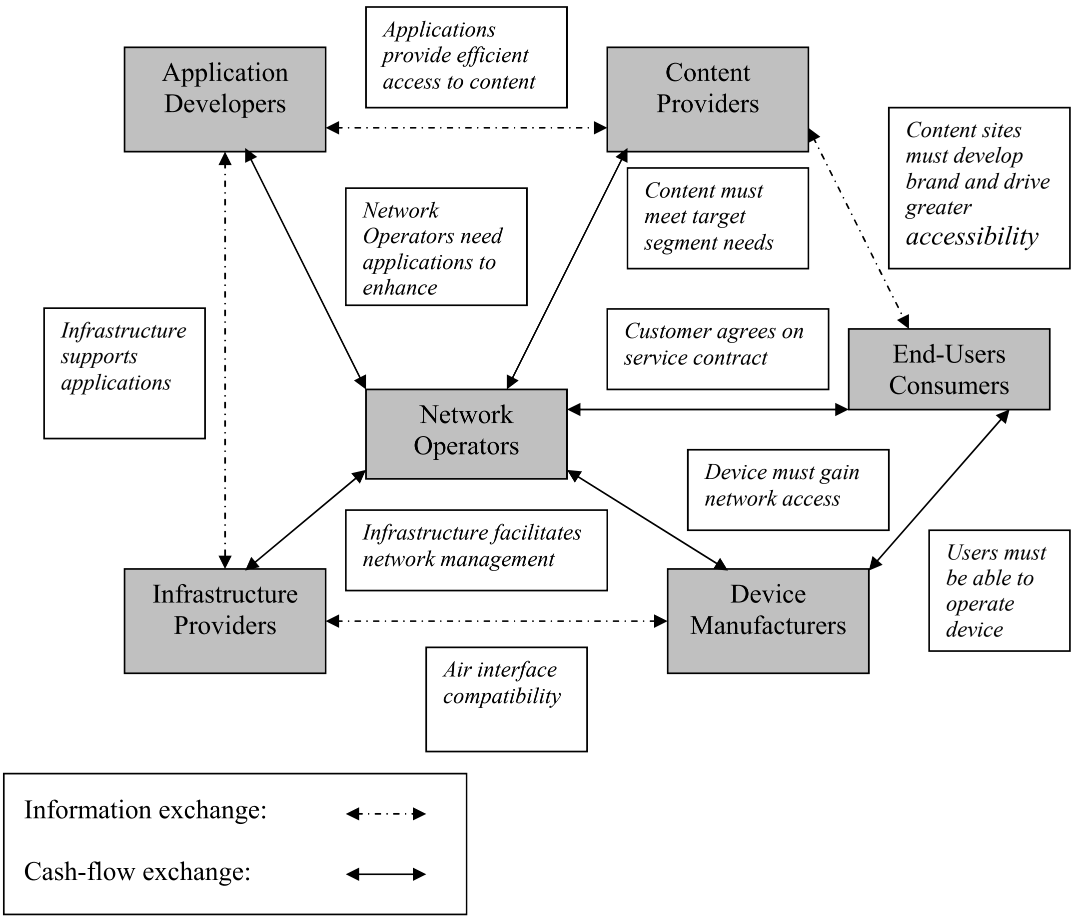
[12] http://wireless.fcc.gov/rules.html

[13] http://www.wow-com.com/

[14] http://wireless2002.ctsg.com/media/media_news.cfm

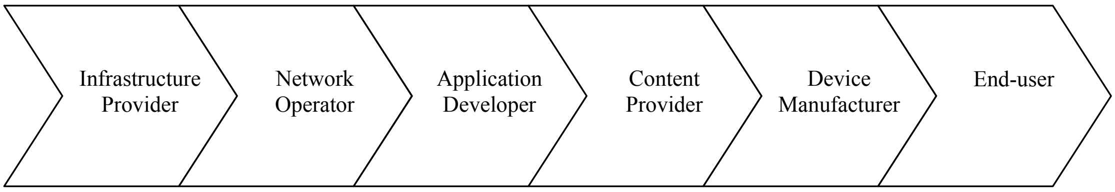
The industry, comprising a complex web of many different players, can be represented by value chain models of varying details. For the purpose of this thesis, only the main groups of players will be depicted, as finer distinctions do not serve any significant purpose. Figure 1 below illustrates the various players and their interactions with one another. It separates the cash-flow and information exchange to show the relationships between players more clearly. The white boxes provide explanations of how the players are related. This web is more comprehensive than a simple value chain, as there are different representations of the industry value chain. The orders of network operator, application developer, content provider and device manufacturer are often ambiguous, as their businesses all add value to one another, in no particular order. In order to elucidate the value creation process, value chains from two different sources are combined and modified, as shown in Figure 2.

Figure 1: Relationship between players in the wireless industry



Source: Modified from Constance, 2001

Figure 2: Value chain of the wireless industry



Source: Modified from Durlacher, *Mobile Commerce Report,* p.15 and Zobel (2001), p.122

The role each of the players has, the challenges they face with regards to the changes in the industry and typical business models are explained in the following sections.

2.2.1) Infrastructure providers

An infrastructure provider designs and manufactures the physical infrastructure needed for wireless communications to take place. In the case of mobile phone networks, the infrastructure includes radio base stations, base station controllers, receivers, mobile switching centers (MSC) and the various interfaces that enable connections between mobile phone users and the public switched telephone network (PSTN).

In order to complete a mobile phone call, signals have to be transmitted to the base station, which would relay the signal to a MSC that process these calls. If the call were directed to another mobile user, it would be routed to the base station of the target call. If it were directed to a landline, it would be connected with the PSTN[15].

The challenge of the infrastructure provider lies in replacing hardware-based switching and proprietary service platforms with open network protocols, next-generation mobile switching centers and high-capacity base stations. Their typical business models include hardware sales and leasing to network operators. Some key players are Ericsson, Motorola, Nokia and Lucent.

Other forms of wireless transmissions, like 802.11b (Wireless Fidelity or WiFi) would require additional specialized receivers and wireless access points to function[16]. Receivers are incorporated in Local Area Networks (LAN) cards installed in a desktop, a USB adapter or can be integrated in handheld devices. Access points are installed by the

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[15] See STVP, *Wireless Industry in 2002*, p. 8

[16] http://h30008.www3.hp.com/whitePapers/understandingwifi.html

wireless service providers themselves. The scale of infrastructure required is substantially smaller than mobile phone networks, since WiFi access in the public domain is usually restricted to specific locations. WiFi infrastructure providers include 3Com, Compaq, US Robotics and Intel. Startups in this area include Netgear and Ubicom.

2.2.2) Network operators

The network operator is the link between the infrastructure provider and end-user. A mobile phone network operator licenses spectrum from the government and makes use of the infrastructure to provide mobile services to the end-user. The challenge for network operators is to increase data and other value-added services as a new source of revenue, rather than rely solely on voice revenues. In Europe and Asia, this has been particularly successful with the introduction of short messaging services (SMS)[17]. In Europe, the success of SMS has led to the general market sentiment that its successor, multimedia messaging services (MMS) would be well received by end-users. The faster rate of data transmission required by MMS is promised by the next generation (2.5G) of infrastructure. In addition, 3G infrastructure is needed to achieve other types of services that require even higher bandwidth, like video streaming to the mobile terminal. This is one of the reasons why European operators spent large sums of money to bid for 3G licenses.

Typical business models are based on monthly fees, which are determined by the speed of connection and/or volume of data flowing through it. In the U.S.A., the dominant national carriers collectively known as the Big Six consists of Verizon, AT&T Wireless, Sprint PCS, Nextel, VoiceStream and Cingular.

For WiFi network operators, current access points are usually set up in public places with high human traffic and facilities to allow users to sit down to use the wireless infrastructure. These include cafes, hotels and airport terminals. Typical business models are based either on monthly fees or timed usage. Owners of the physical locations are usually compensated with revenue sharing agreements with the network operators. Examples of such WiFi network operators include Boingo and Wayport.

2.2.3) Application developers

These are companies that develop the interfaces between the device and the network hardware. They provide both open source and proprietary operating systems for devices and the network. In addition, they develop applications ranging from e-mail, browsers and games for consumers to enterprise resource planning (ERP) and sales force automation (SFA) for enterprises.

As devices span a whole range of sizes, types and specifications and networks encompass standards like 2G, 2.5G, 3G, WiFi and private radio networks, different applications have to be developed to suit devices and networks. This has led to a highly fragmented market. Developers face the challenge of continually upgrading their products and making them compatible with the newest standards and developing new applications that are compatible with as many specifications and standards as possible, to enable cost-effective deployment.

The typical business model is based on software licenses, number of transactions and subscription fees. Examples of application developers include Aether Systems, AvantGo and Symbian.

2.2.4) Content providers

Content providers provide, aggregate and package content into mobile ready formats. These are usually companies which already provide information via other channels like the Internet or television, and wish to capitalize on the mobile channel as a new channel of distribution. The challenges faced include providing content that consumers want and packaging them concisely to suit a range of devices and protocols. The typical business model is based on advertising, subscription fees and revenue sharing with network operators. Yahoo, Reuters and Infospace are some of the major players.

A specialized group of players in this segment are mobile portal companies, which develop stripped-down versions of traditional web portals. Mobile portals provide a subset of available content targeted toward the preferences of the user base. They usually include personal information management (PIM) tools, personalized content and location-specific information. The latter leverages on the primary advantage mobile portals have over web portals. For example, a subscriber can look up information on the restaurants in the proximity and the nearest petrol station with a mobile portal. Examples of mobile portal companies include Mviva, eMobiNet! and Wireless Entertainment Services (Finland).

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[17] See Appendix 4

2.2.5) Device manufacturers

Companies, which manufacture laptops, mobile phones and PDAs are included in this segment. The challenge these companies face is to continually adapt their products to meet the changing needs of consumers for size, quality, appearance, functionality and synchronicity of the devices. As the functions of mobile phones and PDAs converge, new devices have been conceived to serve both functions. These include Treo from Handspring and the Nokia 9210 Communicator.

The business model is based on selling the hardware to the end-users or network operators. Palm and Handspring are examples of PDA manufacturers. Mobile phone manufacturers include Nokia, Sony-Ericsson and Motorola.

3) Theoretical Framework

It is imperative that key terms used in this study are defined clearly to avoid confusion. This will be followed by an explanation of the major theories applied in this thesis. A comprehensive framework of how this thesis is structured will then be presented at the end of this chapter.

3.1) Definitions of key terms

The critical elements that make up this study are wireless, startups and market entry strategies. Since "wireless" has been dealt with in detail in the previous chapter, this section will focus on the other two elements.

3.1.1) Definition of startup

A startup here is synonymous with the term "new venture" in other entrepreneurship research. This is defined as "a new business venture which satisfies the following criteria:

- Its founders must acquire expertise in products, process, market and/or technology.
- Results are expected beyond the year in which the investment is made.
- It is considered a new market entrant by its competitors.
- It is regarded as a new source of supply by its potential customers."[18]

Last but not least, the firm should be 6 years old or younger.[19]

Due to its newness and smallness, there are several unique characteristics of startups which differentiate them from incumbents. These characteristics determine the strategies they eventually employ, due to certain inherent advantages and limitations. Startups

- Have a lack of resources, including capital.
- Have a lack of track record and reputation.
- Are threatened by retaliation from incumbents.
- Do not have the power to influence the environment.
- Are flexible due to the absence of hierarchy and bureaucracy.[20]

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[18] See Gartner (1985), p. 698

[19] See Robinson (2001), p. 661

[20] See Blomqvist (1999), p.6 and Gruber (2002), p. 7

3.1.2) Definition of market entry strategy

According to Green (1995), there is no consensus in literature about which managerial decisions constitute an entry strategy. In order to define the scope of this study, it is therefore necessary to define what market entry strategy means in the context of this thesis.

Strategy is defined as an internally consistent set of goals and policies, which aligns the firm's strengths and weaknesses with the external (industry) opportunities and threats[21]. In other words, if a firm has an effective strategy in place, internal firm-level variables will be best matched with external environmental variables to achieve superior performance[22].

A market entry strategy is therefore one which is formulated before the actual product launch, in order to guide a firm's decisions with regards to product, market and firm organization. Entry strategies are crucial to the survival of new firms as they ensure that the firms are moving on the correct track right from the start without deviating from their goals.[23] Numerous studies[24] have shown that an effective launch strategy increases the chances of firm survival and improves performance. Sandberg and Hofer (1987) also found that the interactive effects of industry structure, strategy and the entrepreneur have a far greater impact on performance than any of the variables in isolation. Even though this study attempts to take all these factors into consideration, the emphasis will be placed on strategy. The entry strategy is especially important, as the strategy chosen will restrict the number of strategic and tactical alternatives open to the firm in future[25].

Kommentar: Don't know what footnote 23 is, so u might want to check if position of footnote is still correct

Kommentar: If this is true, should you be studying entry strategies for wireless startups in isolation?

Kommentar: Strategic or tactical? Or both?

Both strategic and tactical decisions make up a firm's market entry strategy. Strategic decisions address the *what, where, when* and *why* to launch questions[26] whereas tactical decisions aim to answer the question of *how* to launch.

Tactical decisions are made relatively late in the project and can be easily modified. These include all the marketing mix decisions for the new product, like pricing, distribution,

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[21] See Porter (1991), p. 96

[22] See Robinson (2001), p. 667

[23] See Gruber (2002), p. 1

[24] See Bamford (1999); Carter (1990); Green (1990); Green (1995); Guiltinan (1999); Hultink (1998)

[25] See Carter (1992), p. 161

[26] See Hultink (1998), p. 271

promotion, branding and product assortment. These tactics are implemented after the new product has been developed.

The marketing mix decisions are dependent on what the short term goals of the firm are. These goals include profits, market share, growth and sales. Different tactical decisions yield different results. In certain literature[27], profitability, sales and market share are viewed as performance indicators rather than goals set out by the firms. It was found out that different tactical decisions are associated with different performance indicators. For example, high profits are associated with manufacturing and advertising strategies whereas high market share is associated with the time of the launch. Therefore, a firm has to make tactical decisions in consonance with its short-term goals[28].

Strategic decisions, on the other hand, are made long before the actual launch of the product into the market. They are akin to Porter's "competitive scope" and are concerned with the following six dimensions[29]:

- Degree of product newness
- Driver of new product development (technology versus market)
- Number of competitors
- Product innovativeness
- Targeting strategy (niche versus mass)
- Innovation strategy (lead versus follow)

The interplay of these decisions defines the boundaries of competition and shapes the competitive advantage of the firm.

3.2) Theories

Porter's Five Forces theory and the resource-based view (RBV) are applied as they are two of the most established theories used to analyze the external environment (characterized by industry structure) a firm faces and its internal environment (characterized by available resources and competencies) respectively. Technology also has an important role to play in strategizing in a high-tech industry like the wireless industry. Its importance will be explored as part of the RBV. An approach combining the two generic theories will then be used to explain the tactical and strategic decisions of startups.

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[27] See Benedetto (1999), p.536

[28] See Benedetto (1999), p. 541

[29] See Hultink (1998), p.271

Both Porter's Five Forces and RBV will be explained only briefly in this chapter. Porter's Five Forces will be elaborated in Chapter Four with respect to the wireless industry. The application of RBV is firm specific, and can hence only be discussed in Chapter Seven, where strategies of selected startups are explained.

3.2.1) Porter's Five Forces

Porter eloquently summed up the "essence of formulating a competitive strategy" as "relating a company to its environment."[30] When a firm wants to decide what strategies to adopt in entering a market, it has to first analyze the industry. The Five Forces framework by Porter has become an indispensable tool for such an analysis. In this framework, an industry is defined as a "group of firms producing products that are close substitutes for each other."

Kommentar: Perhaps definition of industry should have come earlier in chap 2 under overview of industry?

Porter's Five Forces are:

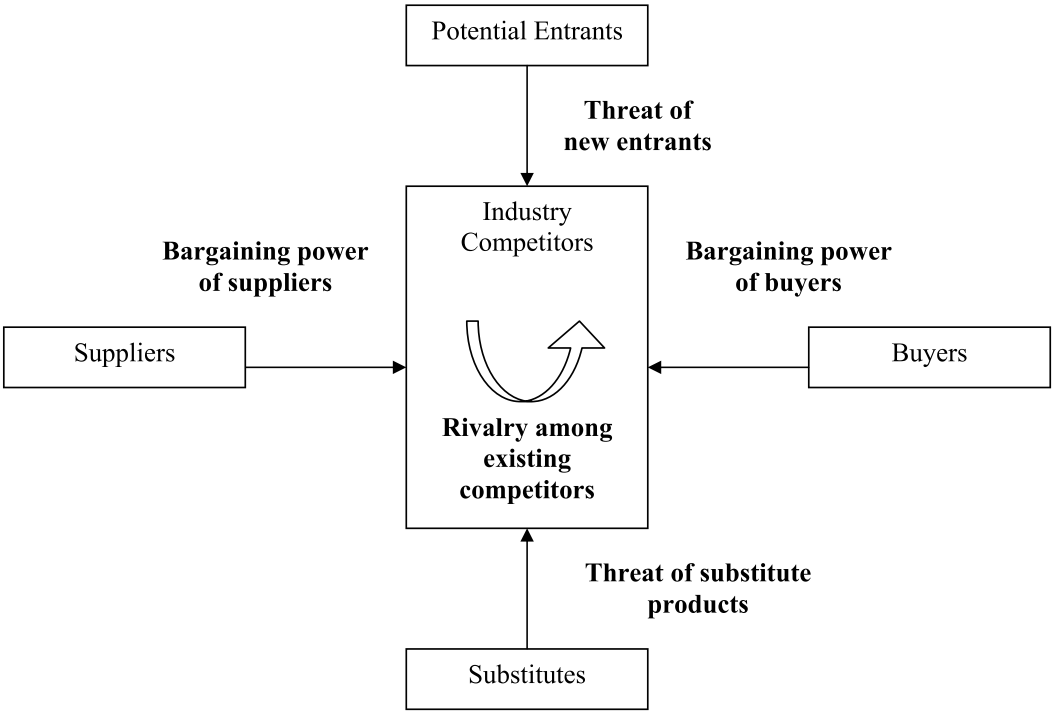
Kommentar: Standardize reference to five forces

i) Threat of new entrants
ii) Intensity of rivalry among existing competitors
iii) Threat of substitute products
iv) Bargaining power of buyers
v) Bargaining power of suppliers

Porter has identified these five forces as the determinants of ultimate profitability in a particular industry. All firms in the same industry face the same forces, but their abilities to deal with them differ. Identifying competitive strategies involves capitalizing on these abilities to best position oneself amidst these five forces.

[30] See Porter (1998), p. 3

Figure 3: Porter's Five Forces



3.2.1.1) Threat of new entrants

Kommentar: Standardize how u refer to the five forces

Entrants into the market are viewed unfavorably by firms as these new entrants could potentially gain market share at the expense of incumbent players. Therefore, there are usually barriers erected to prevent new players from entering the industry. A startup would have to consider not only how to overcome these barriers but also how to erect additional barriers to prevent more firms from entering. The following paragraphs give some examples of common barriers to entry.

Economies of scale result from shared fixed costs and effects of the experience curve. They deter entry because incumbents have cost advantages over entrants, enabling more efficient production and more room for price undercutting. Startups would not have achieved these economies of scale[31], since by definition they have not been in the business as long and production volumes are not as large.

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[31] See Carter (1994), p. 21

Intangibles like know-how and brand are often also effective barriers to entry. As the startup is new, its brand name would not have been established yet. However, if the entrepreneur has founded other firms before this one, he could capitalize on his previous success as a form of branding. In addition, if the previous business involves related technology, he can leverage on the know-how accumulated. Strategic alliances and partnerships with reputable firms and investments from well-established VCs can also enhance the branding of the new firm. Once the startup has a close or exclusive relationship with major partners, this would serve as an entry deterrent to potential entrants.

The high initial costs required to set up the business may pose a problem for startups. This includes all the fixed and sunk costs on advertising, research and development (R&D) and setting up the production facilities.

Switching costs are another barrier to entry. These refer to the one-time costs buyers would have to bear when switching from one supplier's product to another. They include employee retraining costs, costs of changing ancillary equipment and psychic costs of building up a new relationship with suppliers and customers. Startups have an especially hard time against incumbents when the latter have firm relationships with their customers and offer a range of complementary products.

Exclusive access to distribution channels may also prevent entry. Startups might have problems selling their products to end-users, if they require a distribution channel that has an exclusive relationship with incumbents to distribute their products.

Legal barriers such as patents and restrictions from government policies hinder entry as well. Telecommunications is one such regulated industry, as the bandwidth required to operate the mobile telephone networks has to be licensed from the government. These licenses are limited in number, hence erecting a barrier to entry.

3.2.1.2) Intensity of rivalry among existing competitors

This is an important force to consider when planning entry, as the intensity of rivalry directly affects profitability. Competition will potentially erode any advantage firms have over rivals as the latter can respond accordingly. Startups are in an especially bad position to face retaliation from incumbents due to the scarcity of resources. Most of its resources would be devoted to building a strong foundation for the business rather than to compete with the incumbents.

Consequently, many researchers[32] advocate the niche strategy for startups. This avoids head-on competition with incumbents and targets market segments overlooked by the latter. On the other hand, critics of the niche strategy believe that startups should pursue a broader range of strategic alternatives to match up to the broad appeal of their competitors.[33]

3.2.1.3) Threat of substitute products

The availability of substitutes will also lead to limited returns, as the customers have an alternative source to turn to. The analysis is similar to that of direct competition spelt out in 3.2.1.2, but draws the startup's attention to the importance of identifying products which can perform similar functions as its own. Startups might also want to improve the industry's overall position against substitutes by engaging in collective action with its competitors. This is a viable option in the wireless industry in view of the ongoing standards war. For example, WiFi providers are congregating to create roaming standards so that WiFi coverage and usage can attain the ubiquity of mobile networks. The Wireless Ethernet Compatibility Alliance (WECA) and Pass-One are the results of such collective actions.

3.2.1.4) Bargaining power of buyers

As buyers are the ones who directly contribute to revenues, the power they hold over sellers impacts the latter's profitability. Therefore an important entry strategy of startups entails buyer selection. They should segment the market and target buyers who have less power over them. This is a challenge for startups as very often, they are smaller than their buyer groups. These buyer groups can exercise significant control over them because their purchases are a large proportion of total sales.

3.2.1.5) Bargaining power of suppliers

The power of suppliers is a crucial force in determining profitability of the industry as they can raise prices or reduce quality of the products, thereby affecting the cost structure of the firms. Startups are usually at the mercy of suppliers as they are in a weak bargaining position.

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[32] See Carter (1992), p. 161

Porter's Five Forces interact with one another to define the industry. The aim of the entry strategy is to create a defendable position against the five competitive forces. This involves identifying the strengths and weaknesses of the startup and positioning itself where the forces are the weakest and building defenses against these forces. Another feasible strategy for startups is to actively alter the forces to their advantage. This is not as far-fetched as it sounds, as many innovative startups enter unexplored markets where the forces are just beginning to establish themselves. This is especially relevant to the wireless industry, which is still at its infancy.

A firm which subscribes to the competitive forces view, makes an entry decision as follows:

1. Pick an industry based on structural attractiveness;
2. Choose an entry strategy based on possible retaliation from competitors;
3. Acquire requisite assets to carry out the chosen strategy.

3.2.2) Resource-based view

The resource-based view (RBV) represents a vastly different paradigm from the competitive forces approach. It focuses on how firms match their strategies with scarce, firm-specific resources, rather than product-market placement. It therefore argues that the external environment has little to do with the profitability of a firm. Its internal resources and capabilities determine where the firm has a competitive advantage. Correspondingly, the decision-making process to enter the market is different from that derived from the competitive forces approach[34].

The RBV advocates the following decision-making process:

1. Identify the firm's unique resources;
2. Decide in which markets those resources can earn the highest rents;
3. Decide on the most effective way to utilize the rents. This could be:
    a. Integrating into related markets;
    b. Selling the output to related firms;
    c. Selling the assets themselves to a firm in related businesses.

This approach is especially relevant for firms considering vertical integration or diversification.

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[33] See Carter (1994), p.22

[34] See Teece et al. (1997), p. 514

The term "resources" extends beyond physical assets. It also includes intangible assets like intellectual property, human capital and brand. Strictly speaking, as long as the following conditions are fulfilled, the resource can be exploited by the firm to establish a competitive advantage[35]:

1. Resource heterogeneity – the resource must be unique to the firm.
2. Ex post limits to competition – the resource cannot be imitated or substituted, once the firm enters the chosen market.
3. Imperfect resource mobility – the resource cannot be transferred to other firms.
4. Ex ante limits to competition – there is limited competition for the resource, before the firm establishes its superior position.

3.2.2.1) Core competency

The idea of the RBV is closely associated with building up core competency in the corporation as proposed by Prahalad and Hamel (1990). Core competency is "the collective learning in the organization, especially how to coordinate diverse production skills and integrate multiple streams of technology"[36]. Prahalad and Hamel posited that a firm needs to capitalize on its core competency if it wishes to sustain its competitive advantage. It should only enter markets in which it has core competencies.

The relevance of the RBV to the entry strategies of startups may not be immediately apparent, since upon entry, the startup would not have accrued any competency yet. However, Man et al. (2002) proposed that the competencies of the entrepreneur could determine the competitive scope of the business. Among these are relationship, opportunity and commitment competencies. Relationship competency refers to the entrepreneur's interpersonal skills, especially the ability to cultivate relationships with people and companies which can lead to success for the startup. Opportunity competency refers to the ability of the entrepreneur to recognize and develop market opportunities. Commitment competency is what drives the entrepreneur to go through with the business. The authors argued that the external environment represented opportunities as subjectively perceived by the entrepreneur. In other words, the breadth of the business is dependent on the entrepreneur's ability to interpret environmental conditions. The same environment would

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[35] See Peteraf (1993), p.180

[36] See Prahalad and Hamel (1990), p.82

elicit different entry strategies from different entrepreneurs, due to their varying competencies.

3.2.2.2) Technology as a resource

Technology plays a crucial role in high-tech industries. According to Porter, "a technology is important for competition if it significantly affects a firm's competitive advantage or industry structure"[37]. This is the exact case of the wireless industry as technologies deployed in transmission or application development would shape products and services offered in the entire industry value chain. Due to this influential power of technology, a firm's technology strategy becomes an essential component in its overall competitive strategy. In fact, as an extension of the RBV, technological competence can provide a key means for differentiating a firm from its rivals[38]. Technological competence is defined as "the ability to combine knowledge about the physical world in unique ways, transforming this knowledge into designs and instructions for creating desired outcomes"[39].

Many wireless startups display such technological competencies as this is usually what sets them apart from the incumbents. In fact, the competitive advantage of these firms is often the technical background of their founders. Furthermore, the flexible and innovative cultures of these small firms are conducive for coming up with new products[40]. To illustrate the role of technological competence in market entry strategies, an entrepreneur might decide to enter the wireless market due to his wealth of knowledge in telecommunications, rather than the market potential he sees in the industry.

Porter recommended three factors to consider when deciding to bring new technology into the market. These are the sustainability of the technological lead, first mover advantages and first mover disadvantages. The interaction of these three factors determines whether the firm should become the technological pioneer in that field.

3.2.2.2.1) Sustainability of technological lead

This describes "the degree to which a firm can sustain its lead over competitors in a technology"[41]. This sustainability is important in entry strategy, as a firm would only be

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[37] See Porter (1985), p.166

[38] See Teece (1997), p.521

[39] See Fowler et al. (2000) p.361

[40] See Blomqvist (1999), p.7

[41] See Porter (1985), p.182

willing to introduce this new technology, if it does not simply represent a short temporary advantage over its competitors. Generally, the lead is more sustainable if the firm has certain cost or differentiation advantage in developing this technology. For example, incumbents have the advantage of economies of scale in R&D. With such a cost advantage, incumbents can sustain their lead by continually developing new and innovative products. Startups have to make up for this disadvantage in other ways, like partnerships or a team with superior technical knowledge.

3.2.2.2.2) First mover advantages

These are competitive advantages that persist for an early mover, even if competitors manage to catch up with the technological development. First movers get to "define the competitive rules" in many ways. Although first mover advantages apply to all industries, they are especially important in the high-tech industry. Timing is often critical in discerning the winners from the losers[42]. The most notable types of first mover advantages are briefly explained below.

A firm that first comes up with a technology establishes its reputation as a pioneer. This image could produce long-term benefits, as the startup becomes strongly identified with the technology. For example, Cambridge Position Systems has been strongly identified with the location-based technology Enhanced Observed Time Differences (E-OTD), that allows GSM operators in the U.S.A. to fulfil FCC's E911 requirement to locate emergency calls to within 100m.

A first mover has the first choice of where to position itself in the market, forcing competitors to adopt less desirable positions. The firm can segment the market to its advantage and get the first pick of customers, suppliers and distributors. It can even create a new market and define the product in a way favorable to its position. Having first access to buyers, the firm may also establish good relationships leading to customer loyalty. This reduces the potential customer pool for competitors.

Switching costs have previously been defined as a barrier of entry. They are however, also a form of first mover advantage, since early movers can lock customers in with high switching costs, to prevent defection to competitors. According to Shapiro and Varian, switching costs are ubiquitous in information systems and locking the customers in can be

[42] See Golder (1993); Green (1990); Green (1995); Levesque (2002); Shepherd (2000)

a source of substantial profits[43]. It is important to look ahead before actual market entry to make crucial strategic decisions regarding customer lock-in. The authors went on to suggest strategies to best exploit lock-ins. These include investing to build up an installed base of customers and finding ways to entrench them. Firms should also leverage on the base of customers by selling them complementary products.

A first mover can further define the standards for technology, forcing late entrants to adopt them. This can prove beneficial as the first mover will introduce the technology they are best equipped to deploy, in order to leverage their capabilities to the fullest. Once the technology is recognized as the industry-wide standard and complementary products are available, switching costs of customers will be even higher.

A first mover has a lead over its competitors by moving up the learning curve of value activities before them. It has learnt from its trials and errors, which new entrants have yet to experience. The firm would be able to maintain its cost or differentiation advantage further if its experience is kept proprietary. Securing patents for its technology further prevents imitation.

The new product can be sold at a premium due to its scarcity in the market, enabling the first mover to reap huge early profits. This could be crucial to the subsequent survival of a startup. They are unlike incumbents who have substantial reserves to buffer against any losses from failed products. Besides, profits are the yardsticks VCs measure performance against and early profits will ensure that the startup can secure further funding for development.

3.2.2.2.3) First mover disadvantages

First movers face disadvantages in the form of pioneering costs and risks that conditions may change. Pioneering costs include R&D, marketing expenses for an unknown product, development of new infrastructure and gaining regulatory approval. The risks involved in entering a new market include demand uncertainty and obsolescence of technology.

The demand of a new product cannot be conclusively predicted as there is no prior market research. Most startups cannot carry out extensive market research before developing the product due to resource constraints. Besides, it is almost impossible to predict the uptake of

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[43] See Shapiro and Varian (1990), p.103

the new technology in the market until it is launched. The startup would thus have to face adverse consequences, should actual demand fall short of projections.

The first mover also has to bear the risk of its technology being overtaken by a competitor's. The risk is higher for new technologies, as competitors are more likely to challenge technologies that have not dictated the market yet. This risk represents a hazard to the survival of startups, as they are usually single business entities. If the technology their products are based on becomes obsolete, they would have lost their competitive advantage.

On the other hand, subsequent players can "free-ride" on the early mover's investments on R&D, buyer education and infrastructure development. This results from information spillovers in R&D and learning-based productivity improvement. Early movers also incur costs in training labor, which benefits subsequent players who need workers with the same skill sets[44].

3.2.2.2.4) Network externalities

Network externalities are present when the value of a product to one user increases with the number of existing users[45]. Technologies subject to strong network effects witness an exponential growth in users after a long lead, since the first few users have less incentive to buy the new product. This results from positive feedback, which explains how the growth of an installed base of users positively influences the adoption from potential users. According to Metcalfe's Law, the value of a network goes up as the square of the number of users[46].

Network externalities play an especially important role in communications networks. For example, users of e-mails, telephones and fax machines would benefit more if there were a larger installed base of users. The wireless industry, which is another classic example of communication networks, is likely to be affected by network externalities as well. For example, the success of SMS in Europe and Asia has built a strong case for owning mobile phones, as new users would be assured of a large population of friends and relatives who could receive SMS.

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[44] See Lieberman (1988), p.47

[45] See Shapiro and Varian (1999), p. 13

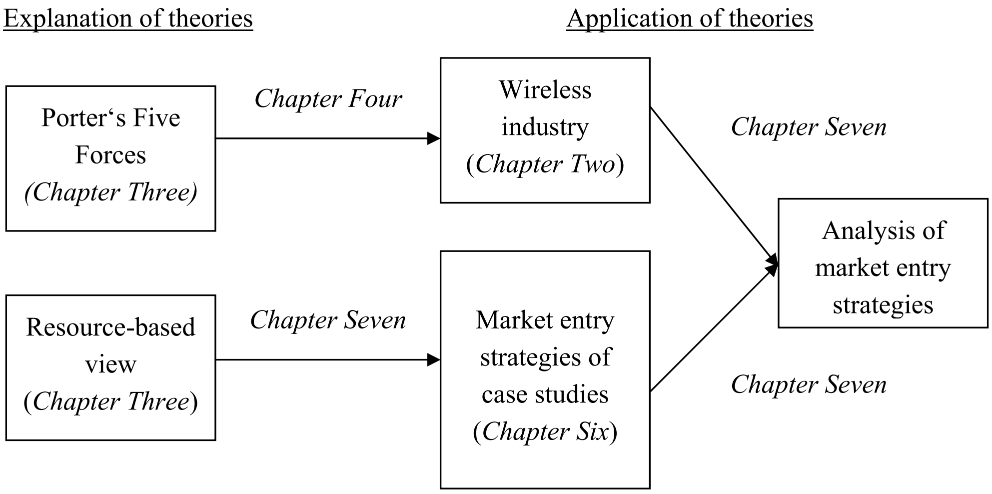
[46] See Shapiro and Varian (1999), p. 184

3.2.3) Overview of study

Apart from the theories explained above, there are other factors to be considered when entering a market. Guiltinan posited that buyers' perceptions of relative advantage and compatibility influence the eventual success of the product. These perceptions are driven by both the strategic and tactical decisions. He further proposed that the perceptions also influence the decisions. The importance of concept tests, beta tests, lead user opinions and salesforce feedback are testimonies of his proposition[47].

He went on to postulate that these tactical and strategic decisions depend on the "product-market environment, the technological environment and the firm's resource base". This is similar to the framework proposed in this thesis, which applies Porter's Five Forces theory and the RBV to analyze the industry the firm is competing in (its product-market environment) and the unique resources that enable it to gain competitive advantage (its resource base) respectively. The technology strategy of the firm is explored vis-à-vis the sustainability of the technological lead, the first mover advantages and disadvantages and the effects of network externalities (technological environment). These theories will be applied to the case studies later. The figure below gives an overview of how the entire study is conducted.

Figure 4: Overview of study



[47] See Guiltinan (1999), p.526

4) Analysis of the wireless industry using Porter's Five Forces

In this chapter, the various segments of the wireless value chain will be examined in detail using the Porter's Five Forces framework. This analysis will elucidate the external conditions under which the startups are currently competing. The understanding of this environment is essential in formulating the corresponding strategies to react to the forces.

4.1) Threat of new entrants

Infrastructure providers of mobile phone networks face very high barriers to entry. The fixed costs of setting up base stations and building up networks are extremely high. Although there are no available figures on the exact costs, a recent study by SG Cowen on the power amplifier market can shed some light on the capital outlay required[48]. Power amplifiers are one of the crucial components of a base station[49]. The biggest player of the mobile infrastructure market, Ericsson, spends an estimated US$625 million annually on power amplifiers[50] alone. Besides high costs, new entrants do not have the capital to match the range of products and services provided by these incumbents[51].

As the processes and products are extremely technology intensive, established players have a significant lead in intellectual property and technological expertise compared to new entrants. They have built up considerable reputation as a result. Due to the substantial capital investments required to build an infrastructure, the network operators prefer to obtain equipment from these established players who have proven track records.

Another barrier to entry is the high switching costs of customers, which are the network operators in this case. Due to the complexity of infrastructure building, customers would need to overhaul the entire network should they change suppliers. The combination of components from different suppliers, made possible by standardized intra-system interfaces, involve substantial costs. Besides, this combination of products may not work smoothly together to give the desired performance and increases costs of network management and training. The huge capital commitments involved usually deter customers from doing so. In addition, as most network elements are software-based, operators have to

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[48] See SG Cowen Securities, *RadioWAVES* (Jan 2002)

[49] To understand the function of power amplifiers, refer to http://www.powerwave.com

[50] See SG Cowen Securities, *RadioWAVES* (Jan 2002), p.83

[51] See http://www.ericsson.com/network_operators

regularly purchase software updates to enhance performance and correct software bugs. This represents a further lock-in, as operators develop a long-standing relationship with their suppliers[52].

Network operators also face significant barriers of entry, due to the high capital outlay required to invest in the necessary infrastructure. Investments are especially high in this period, as many operators are overhauling their networks to accommodate the high potential demand for data transmission services. In the U.S.A., existing multiple standards such as CDMA, TDMA and GSM have led to a fragmented market for the operators. The Big Six are currently in various stages of upgrading their networks to 3G networks, which promise ubiquitous coverage, faster transmission speeds and higher capacity. The migration path varies, depending on the current standard the operator employs. For operators upgrading their CDMA networks to 2.5G then to 3G nationwide, an investment of $1 billion is necessary for each step. Operators using TDMA have to first overlay their networks with GSM and subsequently upgrade to 3G. The entire process costs an estimated $13-$18 billion[53]. The massive capital expenditure required gives an indication of the financial commitment a new entrant would have to deal with.

Apart from the initial sunk costs of building up infrastructure, a new entrant has to spend money to acquire new customers. In the U.S.A., customer acquisition cost hovers between $300 to $375[54]. This is the average cost to a network operator of signing up an individual subscriber. Some of the factors included in the cost are handset subsidies, marketing, advertising, and promotions. An incumbent with an installed base of customers has to spend less on acquiring new customers than a new entrant.

New entrants have to take into account the switching costs of customers as well. Subscribers have to get used to dealing with the administrative style and billing methods of the new operator. Besides, the services of the incumbents are tried and tested, whereas a new entrant has no track record. These are hidden costs which new entrants have to overcome. In the U.S.A., switching costs of customers will be lowered with the introduction of wireless local number portability (LNP) as decreed by the FCC. Customers will then be able to retain their mobile phone numbers when they switch operators. It is

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[52] See Bekkers (2001), p.538

[53] See Bear Stearns, *Wireless Telephony* (April 2002), p.15

[54] See Bear Stearns, *Wireless Telephony* (April 2002), p.18

however uncertain how LNP would affect churn rates[55]. In the U.K, churn rates did not change substantially after the implementation of LNP whereas in Hong Kong, they did. One Hong Kong operator, SmarTone, saw its monthly churn increase from 3.5% in 1998 to 5.6% in 1999[56].

The benefits of economies of scale are significant in this segment of the value chain. General and administrative costs, such as corporate overhead and billing, decrease proportionally with scale of operations. Network costs from maintaining and building cell sites, switches and network operations centers have to be spent, regardless of how many customers are connected. Once the main network is in place, the costs of servicing each additional user represent only a fraction of total costs with the growth of the customer base[57]. Appendix 5 illustrates the potential economies of scale. A new entrant can never match up to the operating scale of an incumbent due to the long lead period the latter has.

Scarcity of bandwidth results in a limitation in the number of mobile phone network operators. In the U.S.A., operators have to license spectrum from the FCC in order to provide cellular services to their customers. This erects a legal barrier for new entrants. The FCC had also introduced a rule that companies could not own licenses to operate in more than 45MHz of spectrum to ensure that the market was competitive. This cap was subsequently raised to 55MHz, and is due to be eliminated on 1 January 2003[58]. With this move, the barrier of entry is raised for new entrants as incumbents can theoretically license as much spectrum as they wish. Entrants, like incumbents, have to compete equally for the limited spectrum.

Application developers do not face high barriers of entry like the previous two segments. Economies of scale do not play a significant role in software development. Capital requirements are also comparatively lower, as the most important resource is the technical expertise. Switching costs exist in the form of relearning how to use the new software and operating systems. This is however insignificant if the new system provides substantially more benefits than the previous one. Applications developers must also form strong

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[55] Churn is a measure of the number of subscribers who leave or switch to another operator's service.

[56] See Bear Stearns, *Wireless Telephony* (April 2002), p.96

[57] See Bear Stearns, *Wireless Telephony* (April 2002), p.16

[58] See Bear Stearns, *Wireless Telephony* (April 2002), p.10

relationships with either a device maker or operator to secure distribution channels for their products.

The barriers of entry into this segment are intentionally lowered by some platform developers as they recognize the importance of the role the application developers play in determining the mass acceptance of their platforms. Since applications are the interfaces between the end-user and the platform, the more applications the platform supports, the more popular the platform becomes. This is the classic example of the effects of network externalities. New players are encouraged to enter the market when platform developers advocate an open software architecture. Third party developers can easily gain access to the platform technology this way. In a closed architecture, only developers with access to proprietary technology are able to develop applications, thereby limiting entry of new players.

Nokia is an incumbent which is actively encouraging the formation of a development community. It offers third party developers its Software Development Kits (SDK), thereby lowering the technological barrier. Nokia has approximately 15,000 developers currently[59].

Content providers are closely affiliated to application developers, as content and applications are mutually dependent. In fact, many firms are both application developer and content provider. They develop the software architecture needed to support the provision of content in the mobile space. To increase the value of their software, they provide the content as well. Infospace is one example of an application developer which took on this strategy. It is therefore difficult to separate the analysis of content providers from application developers. For these content developers, capital outlay is similarly lower than the first two segments of the value chain. There are also few legal and economical barriers.

Pure content providers do exist, but they are typically information providers which make use of the wireless medium as an additional distribution channel. Internet portals like Yahoo, online brokerages like Consors and stock exchange information providers like Multichart started out with the Internet as their channels. These players have an advantage over new entrants as they have established brands. With numerous information providers

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[59] See Merrill Lynch, *Mobile Transitions* (6 Feb 2002), p.47

on the Internet, it is hard for entrants to come up with compelling new information which users would pay for.

There has also been an emergence of firms which provide content solely for mobile devices. These include content aggregators, mobile portals and firms specialized in location-based information. Content aggregators collect data from various sources and repackage this information for distribution to mobile devices. Mobile portals aggregate not only content but also applications like e-mail, calendar and instant messaging. One barrier of entry for these players is the need to convince network operators or handheld manufacturers to include their portals in the mobile services or devices. This can prove difficult, especially if the latter two groups of players have their own portals. Some notable examples include Zed by Sonera and Mobile Internet Exchange by Motorola.

Some firms hope to leverage on the unique property of mobile phones to provide information relevant to the location of the users. 10Best Inc. is one such example. Using its service, subscribers can locate highly recommended restaurants, hotels or places of attraction in the proximity. The technological barrier to entry for such services will be lowered with the enforcement of the E911 initiative by the FCC. Under this regulation, network operators must ensure that 100% of new handset activations can be located within 100 meters of accuracy by the end of 2002[60].

Device manufacturers encounter economies of scale just like any mass producers. Incumbents have a lower per unit cost than new entrants. Costs are lowered further now that mobile phone manufacturers outsource most of their production[61].

The mobile phone market is dominated by incumbents as illustrated by Appendix 6. They are established players which have close relationships with network operators, since the major players like Nokia, Ericsson and Motorola are also infrastructure providers. The operators serve as an effective channel for them to sell their products. New entrants have no such benefits. Besides, branding is paramount to the successful take-up of mobile phones, as they are personal items, which sometimes serve as fashion accessories[62].

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[60] See SG Cowen, RadioWAVES (Jan 2002), p.65

[61] See Merrill Lynch, *Mobile Transitions* (6 Feb 2002), p.16

[62] See Merrill Lynch, *Mobile Transitions* (6 Feb 2002), p.14

As devices become more technologically sophisticated, new entrants may lack the requisite technical expertise to ensure compatibility with the networks. This barrier has been lowered by Ericsson and Motorola which licensed out their technology platforms to attract third parties into the market.

The PDA market is very saturated, with incumbent players from the personal computer market also trying to enter the market by introducing high-end Pocket PCs. These include Hewlett Packard and NEC. There is a whole range of products with varying functions and degrees of performance for consumers to choose from. Palm is the market leader with a market share of 60%, followed by Handspring with 15%[63]. New entrants would have to compete against these established players.

The new generation of PDAs must include wireless connectivity in order for manufacturers to continue generating profits, as the basic PDA is fast becoming a commodity. Product life cycles have become much shorter, leading to higher R&D expenditure. New players must possess a high level of technical expertise to enter the market and differentiate their products. In addition, due to the potential convergence of the functions of PDAs and mobile phones, they face competition not just from the major PDA players, but mobile phone manufacturers as well. Examples include Motorola with its Accompli and V Series Personal Communicator and Nokia with its 9210 Communicator.

4.2) Intensity of rivalry

Intensity of rivalry is closely correlated with the concentration of the industry. If the market is dominated by a few powerful incumbents, the perceived leaders can impose discipline or play a coordinative role. On the other hand, a fragmented market with many players leads to intense competition for market share. Other factors like slowing growth can also lead to increased competition in highly concentrated industries. Generally, competition will increase whenever there is a change in paradigm in the industry, as firms try their best to exploit the change to gain market share and tip the old equilibrium.

The mobile infrastructure market is a highly concentrated one. In 2001, Ericsson dominated with a market share of 29%, followed by Motorola with 14% and Nokia with 13%. The other major players and their market shares can be found in Appendix 7. The pie chart illustrates the dominance of the top five players of the market, which holds a

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[63] See Dresdner Kleinwort Wasserstein, *Mobile Devices and PDAs* (3 Aug 2001), p.27

combined market share of 79%. Appendix 8 shows their dominance across the different systems.

The originally stable market has been shaken up by the advent of 3G networks, as Appendix 9 shows. Although this presents a new opportunity for growth, significant costs will have to be incurred for R&D purposes and new infrastructure components. This has led to increased competition as incumbents fight with each other to win the 3G race. However the biggest players still tend to benefit more due to reputation, synergies and economies of scale[64].

Network operators in the U.S.A. are categorized into national and regional carriers. National carriers serve subscribers all over the country, whereas regional ones limit their markets to certain regions. The former include companies like Verizon, AT&T Wireless, Sprint PCS, Cingular, Nextel and Voicestream. Their market share adds up to 84.6%[65], rendering the market highly concentrated and competition stable. Regional players include Carolina Phone Wireless and Cellular 2000 which operates in South Carolina and central Minnesota respectively.

Compared to Europe, which has an average of three to four operators in each country, the operators in the U.S.A. face more competition with an average of 5.9 operators in the top 100 markets[66]. The competition has become extra intense as voice services become commoditised. Operators are forced to differentiate their services to customers by developing value-added services. Nextel has been very successful at differentiating itself through its Direct contact and packet data services. Cahner's In-Stat ranked Nextel first in data applications, ease of use, quality and reliability. Enterprise customers like IBM cited their differentiated services as the reason for choosing Nextel.

Due to the presence of a multitude of devices, platforms, programming environments and operating systems, the applications development market is highly fragmented. The lack of incumbents who dominate the market leads to relatively easier entry but intense competition. There are established firms like Microsoft and SUN who hope to transfer their competencies from the personal computer and network markets to the wireless market.

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[64] See Appendix 10

[65] See Appendix 11

[66] See Bear Stearns, *Wireless Telephony* (April 2002), p. 18

Microsoft has developed a smartphone operating system based on Windows CE, codenamed Stinger. Sun has also been actively promoting its Java platform for developers to easily create mobile applications. However, they are still new to the wireless industry and have yet to gain a strong foothold. On the other hand, Nokia has introduced the Club Nokia concept where applications are optimized for Nokia handsets only, with the aim of winning customer and brand loyalty.

Before interoperability and standards for platforms, operating systems and transmission technologies are established, new entrants do not have to conform to any dominant standard. As such, developers try to build their applications around an existing standard. These developer communities compete to push their platform and operating system of choice as the de facto standard.

As mentioned in section 4.1, content providers face stiff competition from various players across the value chain, as exemplified by the concept of mobile portals alone. Like application developers, the lack of standards has led to a fragmented and competitive market.

It has been widely agreed that the success of NTT DoCoMo's i-mode is can be attributed to the proliferation of content. Starting out with only 67 official sites, the company decided to open up their standards to allow anyone to create content for i-mode phones. This resulted in the existing 1,900 official and 50,000 unofficial sites. Content providers in the rest of the world would face similar competition, should the market evolve like Japan's[67].

Though the PDA and mobile phone markets have very clear market leaders, competition has intensified due to new opportunities presented by the mobile Internet. PDA makers hope to integrate wireless connectivity in their products and mobile phone makers hope to improve on their user interfaces and functionalities. With the increasing popularity of hybrid products[68], PDA and mobile phone manufacturers are facing competition from each other as well as PC manufacturers.

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[67] See Bear Stearns, *Wireless Telephony* (April 2002), p. 66

[68] See Appendix 12

4.3) Threat of substitute products

From the point of view of the network operators, there are no substitutes for the infrastructure required. There is no alternative way to transmit voice data other than via the base stations. However, the transmission of data faces competition from wireless local area networks (WLAN), which has seen increasing popularity in recent years. WiFi is one such WLAN specification developed by the Institute of Electrical and Electronics Engineers (IEEE). Users with WiFi-enabled laptops can gain access to networks via "hotspots", which are access points located in various public places like cafes, airports and hotels.

WiFi uses radio frequency (RF) transmissions rather than cabling to provide location-independent network access to fixed and mobile computing devices. It resembles a small, localized cellular network with both systems using a grid of transmitters and receivers to enable communication. As WiFi uses the Ethernet standard, it can perform all the traditional functions of a wired LAN, like e-mail, file transfers and web surfing. With a speed of 11Mbps[69], WiFi operates at a much faster compared to a 2G cellular network at 9,600 bps[70] or 2Mbps for a 3G network.

WiFi is deemed a potential threat to the upcoming 3G networks by some. This has however been refuted by others as the former is limited by its range and would require an unattainable density of access points to achieve national coverage. In reality, WLAN is seen as a complementary technology to 3G, where certain areas with higher bandwidth requirement would be outfitted with such WLAN hotspots. Thus operators in Europe such as Sonera, Telia, Telenor and Telefonica are willing to roll out WiFi services in parallel to 3G. In the U.S.A., Voicestream has integrated WiFi systems into their mobile networks.

From the viewpoint of an infrastructure provider, the increasing proliferation of WLAN does not pose a threat to its position. Every WLAN access point must be connected to a wired network, which in turn, requires the same infrastructure they provide.

However, independent WLAN providers could pose a threat to network operators. Companies like Boingo offer subscribers access to their networks for a monthly fee of $25 to $75 per month. This could reduce the demand for data transmission via mobile phones or PDAs and thus lowering potential revenues from 3G networks.

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[69] http://80211-planet.webopedia.com/TERM/8/802_11.html

Application developers, content providers and device manufacturers can be analyzed together with respect to substitutes. Viewed at the segment level, application developers, content providers and device manufacturers do not face threats from substitutes. No products can replace applications, content or mobile devices in the mobile world. At the segment level, device manufacturers include PDA, mobile phones and laptops makers. The three types of devices could be substitutes for one another, but have instead been grouped together and viewed as a segment. As explained above, finer distinctions between groups are not made in this thesis, in order to retain a bird's eye view of the industry.

4.4) Bargaining powers of buyers and suppliers

The bargaining powers of buyers and suppliers will be discussed simultaneously here, as suppliers of one segment are the buyers of another segment. Some of these segments also have the same buyers.

Network operators buy from infrastructure providers. Their bargaining powers are usually undermined by the virtual monopoly of the infrastructure providers. The lack of substitutes for the products and high switching costs are responsible for this lack of power. The importance of reliable infrastructure to the service they provide further reduces their demand elasticity, which consequently weakens their bargaining power.

The bargaining powers of suppliers of infrastructure providers are also weak with respect to the strong positions of their customers. Most of the suppliers will lose huge proportions of their revenues if they terminate contracts with these infrastructure providers. Besides, the threat of backward integration is very real. Using power amplifiers as an illustration, a majority of the big players (Motorola, Lucent, Nokia) has historically developed them internally[71].

Appendix 13 tabulates the suppliers of various components of base stations. The highlighted area shows the dependence of each supplier on base station sales. For example, Powerwave derives 100% of its revenues from sales of power amplifiers for use in base stations construction while Signal Technology depends on these infrastructure

[70] See Raymond, James & Associates, Wireless Local Area Networks (Dec 24 2001), p.8

[71] See SG Cowen Securities, *RadioWAVES* (Jan 2002), p.83

manufacturers for only 8% of its revenues. The suppliers are clearly highly dependent on the infrastructure providers for revenues. This weakens their bargaining power further.

The buyers of network operators are the end-users, who face low switching costs. The availability of a plethora of operators allows users to assert their preferences and show their disapproval by switching services. Low switching costs translate into strong bargaining powers. Switching costs will be further lowered by mandatory number portability. However, network operators can lock their customers in by contractual agreements, under which the latter cannot terminate the former's services within a stated period of time. The introduction of pre-paid cards has nevertheless undermined the potential of such a lock-in tactic.

Application developers sell to either device manufacturers or network operators. As the latter two groups have many developers to choose from, bargaining powers of the former are relatively weak. Since there is no inclination towards certain standards in the industry, developers are in a weak position to push for their products. As mentioned in section 4.1, certain device manufacturers like Nokia actively encourage the growth of its developer community by providing incentives. These developers are therefore dependent on Nokia, since their products can only be used in Nokia devices.

Content providers sell to application developers and end-users, with network operators and device manufacturers as distribution channels. End-users are the ones who will ultimately make use of the content. As a group, they have the power to determine the success of the content, by choosing to use it or not. Application developers also have stronger bargaining powers relative to content providers, as they can provide their own content, on top of writing the applications. However, traditional web portals like Yahoo and information sources like Reuters which are in high demand have more power due to their reputations.

Device manufacturers sell to end-users, who face switching costs when they change devices. They would have to get used to a new user interface. However consumers also have a wide range of devices and brands to choose from, which reduces their lock-in. Individual end-users have little bargaining power, but as a group, they dictate the market via their preferences.

Suppliers of device manufacturers depend heavily on their customers. Flextronics is a firm some major device manufacturers outsource production to. From Appendix 14, one can conclude that revenues from device manufacturers make up the majority of Flextronics's earnings. Although only one type of supplier is identified to illustrate the situation, it is deemed relatively representative, as Flextronics supplies products pivotal to the device manufacturers' businesses.

4.5) Overall attractiveness of industry for startups

The diagram below summarizes the five forces on each of the segments.

Figure 5: Five forces on wireless industry

	Threat of entry	Intensity of rivalry	Pressure from substitutes	Bargaining power of buyers	Bargaining power of suppliers
Infrastructure Providers	Low	High	Low	Low	Low
Network Operators	Low	High	Moderate	Moderate	High
Application Developers	High	Very high	Low	High	Low
Content Providers	High	Very high	Low	High	Low
Device Manufacturers	Low	High	Low	High	Low

An evaluation of the infrastructure provision market shows its attractiveness for existing players. However, a startup wanting to enter this market has massive barriers to overcome and may incite retaliation from incumbents, who would have ample resources to do so.

Startup activities have nevertheless sprung up in this area, mostly due to the opportunities opened up by network upgrading by network operators. As the capacity of the 2G networks is insufficient to meet the burgeoning needs of the end users in terms of transmission volume and speed, network operators all over the world have begun massive upgrading of their networks. Most of the network operators in the U.S.A. are in various testing phases of 2.5G technology, which boasts packet-based data access, improving data transfer rates. Many operators are also investing heavily to enable their networks to support 3G technology. Consequently, startups are seizing this rare opportunity to enter the market with superior technology. In this way, they can leapfrog the incumbents.

Most of these startups usually focus on a particular component of the network and aim to improve its efficiency, effectiveness or security. This is to avoid direct competition with the incumbents. In other words, there is an overwhelming adoption of the niche strategy in this market.

Startups also usually choose not to challenge the traditional businesses of network operators. They have no competitive advantage in providing mobile phone services against such established players. However, many startups have started to enter the WiFi market described above. They charge users for connecting their laptops to hotspots around the region. WiFi is popular with startups due to its low technological and financial barriers to entry, since it operates in an unlicensed part of the spectrum and there is no need to build extensive infrastructure. On the other hand, a sustainable business model has yet to be found.

The application development and content providing markets have seen a surge of startup activity primarily due to the low barriers to entry and highly fragmented market. The existence of multiple development protocols, platforms, operating systems and handheld devices has led to the need for various application developers and content providers to suit the wide array of needs.

The success of enterprise-oriented firms like Aether Systems is noteworthy. These firms focus on developing wireless applications for enterprises and are therefore less affected by the volatility of the consumer market. Some of these startups market themselves as application service providers (ASPs), who manage the entire wireless networks of clients, instead of simply selling software solutions to them. This allows their clients to concentrate on their core competencies.

Startups would find it unfavorable to enter the device manufacturing market due to intense competition from so many different players. They would choose to focus on specific components of the devices, whose performance can be enhanced by their technology. These new entrants have also taken advantage of the need to improve present devices for data transmissions. Airify Communications is producing a chipset that could work with different protocols, instead of the typical protocol-specific chipsets. Digit Wireless introduced the Fastap™ keypads, which enable users to input text into phones faster.

The Open Software Architecture (OSA) is an initiative announced in November 2001 at Comdex in the U.S.A.[72]. Industry players across the value chain realized that they have to work together to encourage mass acceptance of mobile multimedia services. They set up this initiative to develop an open mobile architecture platform which allows different types

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[72] See Merrill Lynch, *Mobile Transitions*, 6 Feb 2002, p.35

of handsets to operate across different mobile service technologies. Should the OSA prove to be a success, startups can look forward to a less fragmented market and a lower risk of technological obsolescence.

There is an increasing inclination for players to straddle their businesses across the value chain. Nokia has been pursuing a software, services and content “triple play”. A lot of startups cannot be categorized into any one segment of the chain, as they try to use the technology developed to offer a range of products and services which customers might demand. This is one way to attract and lock customers in. Some other startups try to fill gaps between segments by acting as a middleman.

5) Methodology

This chapter deals with the research methods used in this thesis and the rationale for those methods. Section 5.2 will explain how the startups were selected.

5.1) Research approach

Research can be carried out quantitatively or qualitatively. Quantitative research deals with numbers and attempts to use statistical methods to prove hypotheses or analyze particular phenomenon. Qualitative research is descriptive and inferential[73]. Qualitative studies are defined as those that "use words to describe situations or circumstances surrounding a phenomenon, while quantitative studies use numbers usually in the form of counts or measurements to attempt to give precision to a set of observations"[74]. This thesis is *qualitative* in nature. This method is deemed more appropriate as the thesis aims to investigate the subject matter in depth, from the perspectives of those involved[75].

This study is a *cross-sectional* research, as it provides "a snapshot of a situation in time"[76], as opposed to a longitudinal study, which is carried out over a period of time. Longitudinal studies usually aim to identify trends, while cross-sectional studies examine how something is done at the time of research.

Qualitative studies usually focus on exploration of a new area or formulation of theories on particular phenomena. However, they can also be devised to test or confirm an existing theory. The last application is employed in this study, as results from the empirical study are used to confirm or refute the applicability of the theories explained in Chapter Three. This study hopes to go a step further and examine how relevant these theories are to the wireless industry. Researchers have affirmed the value of single industry studies[77], as they recognize the futility in generalizing theories across disparate industries.

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[73] See Gillham (2000), p.10

[74] See Remenyi et al. (1998), p.121

[75] See Gillham (2000), p.10

[76] See Remenyi et al. (1998), p.47

[77] See Barczak (1995), p.225

A qualitative study consists of four steps, namely data collection, data reduction, data display and verification[78]. After the data collection phase, there is often a large amount of information, some of which might not prove useful in drawing conclusions. The data reduction phase aims to sieve out the important information, in order to construct a "higher order narrative", which captures the essence of the collected data. The eventual theoretical conjecture, based on this higher order narrative, will then be presented. Conclusions and revelations from the study will follow.

There are numerous methods to carry out qualitative research. Some notable approaches include experiments, case studies, surveys, discussions and simulation[79]. This thesis proposes the use of *case studies* to "provide a multidimensional picture of the situation". This is the most appropriate method for the purpose of this study as it enables one to "identify detailed interactive processes which may be crucial, but which are transparent to large-scale survey"[80]. In other words, the case study method allows more than a superficial evaluation of a point of view by eliciting opinions, and not just facts. It aims to be a holistic approach.

Case study research can be further split into three categories: exploratory, descriptive and explanatory. This thesis is an *exploratory* study, which is defined as "a pilot study that can be used as a basis for formulating more precise questions or testable hypotheses"[81].

The sources of evidence used in case studies can be further classified into documents, interviews, direct observations, participant-observation situation, physical artifacts and archival records[82]. This study relied heavily on the websites and press releases of the five startups chosen, as these are the most direct and richest sources of information about these small companies. Interviews were also conducted to supplement these documentation, since strategies and opinions of founders about the industry are seldom present in publicly available information. Unfortunately, interviews were not done with more startups due to time and budgetary constraints and the unwillingness of some of them to share strategic information. The startups that had kindly consented to interviews are not named to protect

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[78] See Loperri (2002), p.22

[79] See Remenyi et al. (1998), p. 48

[80] See Remenyi et al. (1998), p. 49

[81] See Remenyi et al. (1998), p. 75

[82] See Remenyi et al. (1998), p. 175

their confidentiality. The people interviewed are founders or co-founders, to ensure that they were directly involved in the formulation of the market entry strategies.

5.2) Choice of startups

In order to ensure the quality of research, the importance of validity and reliability in the research design have been repeatedly emphasized[83]. Validity refers to establishing correct operational measures for the concepts being studied. This entails choosing startups deemed suitable for the topic of the thesis. Reliability refers to the consistency of the measures used and how applicable the results are to other cases. The choice of using multiple over single cases in this study serves to boost the reliability of results obtained.

The first prerequisite the companies have to fulfill is their age. To remain consistent with the definition highlighted earlier, startups have to be less than six years old. As the goal of this study is to provide the reader with a broad overview of the entire wireless industry, startups across the value chain are chosen to be subjects of the case studies. There is no deliberate focus on any specific segment of the value chain, as this would defeat the purpose of the holistic approach advocated here. The research process entails breaking down the wireless industry into different segments of the value chain, examining each segment in detail using appropriate case studies and finally synthesizing the information collected to present a complete and accurate picture of the entire industry from the viewpoint of startups. The segmentation of the industry into the various players in Chapter Two will serve as the basis for the types of startups chosen.

In order to isolate the effects of geographical bias, all the startups chosen are headquartered in the Silicon Valley area. This area is selected as it is well-known for its high concentration of entrepreneurial activities. Most of the startups involved focus on the local market as an entry point and may face unique problems or advantages peculiar to the U.S.A. However, one of the companies interviewed has a business model based on the world market. As the location of the headquarters is not a strategic consideration for this company, its inclusion will not adversely affect the validity of results.

The startups chosen must also have distinguished themselves by having secured venture capital funding[84] or having substantial positive press coverage[85]. This criterion is necessary

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[83] See Remenyi et al. (1998), p. 179 and Gummesson (1991), p. 13

[84] Recent funding activities in the Silicon Valley can be found on http://www.siliconvalley.com

to ensure that the startups quoted in this thesis have a fair chance of survival beyond the founding years. Although this does not prove the soundness of their entry strategies conclusively, it can at least serve as a crude yardstick to sieve out the failed strategies.

Firm A was picked as it is a typical startup in the infrastructure provision segment. In order to include WiFi startups in the study, Firms B and C were selected. There was a need to pick two WiFi firms, as it was interesting to examine how different business models of WiFi service providers can be. Firm D was chosen as it is an application developer to PDAs rather than mobile phones. This would further broaden the scope of the case studies. The business concept of Firm E as a middleman between content providers and network operators was unique and represented an innovative business model, that came about because of the development of the industry.

[85] The Economist, Red Herring and analyst reports are major sources.

6) Case studies of wireless startups in the U.S.A.

After analyzing the opportunities open to startups in the entire industry, it would now be appropriate to describe how startups actually react to the forces. In this section, distinctive strategies of the five startups interviewed will be presented. The analysis of these strategies with respect to the theories introduced in Chapter Three will follow in the next chapter.

6.1) Firm A – Infrastructure provider

Firm A, founded in January 2001, addresses the needs of network operators to control data services, content and applications in their networks by providing them with infrastructure solutions. With the new data networking infrastructure product, operators would be able to simultaneously provide hundreds of thousands of subscribers with a wide range of personalized data services and bill them accordingly by the traffic generated.

Firm A realizes that mobile operators often expect turnkey solutions from incumbent vendors and are locked in once they form partnerships with the latter. The only way for it to enter the market is to convince vendors to integrate its products into their solutions. The choice of partners is especially important, since alliances with closely competing vendors will not be possible due to existing rivalry. Since 20% of its customers contribute to 80% of its revenues according to the Pareto's Principle, Firm A must pick partners which would give it ample coverage of network operators. In fact, the CEO believed that "getting the right partners" is one of the most important strategic decisions.

At the onset, Firm A has sought to be a global firm and targets its products at top global network operators. It recognizes that operators all over the world are facing the same problems with data transmissions and need similar solutions. By starting off with a global perspective, the startup would tap the full market potential right from the beginning.

As business models of operators are region-specific and the pace at which they upgrade their networks varies, Firm A segments its markets geographically. Another reason for this segmentation is the difference in transmissions technologies, rendering different products necessary. CDMA is predominant in the U.S.A., Korea and Japan, whereas European and other Asian markets follow the GSM standard. It chose to target markets with the greatest potential for short-term returns, to keep in line with their foremost goal of achieving positive cash flow as soon as possible. VCs are especially concerned about cash flow in the face of the gloomy economic situation and difficult fundraising environment. The extra costs needed to establish high market share is deemed an unnecessary trade-off by the startup.

The main mode of marketing was to "build education around the product" and convince customers how it can fulfill their needs. The CEO also talks frequently to financial and industrial analysts to keep them abreast of the firm's situation. Broader forms of marketing like participation in trade-shows are not undertaken, as the firm is more concerned about channeling efforts to their specific target groups.

The infrastructure market has very long sales cycles. The startup tries to accommodate the "spikiness of sales" by applying the subscription model. Sales under this revenue recognition model cover a longer period of time and are paid on a periodic basis rather than upfront[86]. This helps to smooth revenue streams, which would appeal more to the financial community. The pricing model is based on feature sets and the number of subscribers.

The founders decided to enter the market as they saw a perfect match between their core competencies and the market opportunity. They had previously founded a company with analogous products for the broadband market. With this technical expertise, they found a niche in the mobile infrastructure market narrow enough for them to penetrate. It took 18 to 24 months between setting up the company and rolling out the products.

The ideal market entry timing is the result of a combination of strategy and luck. Rolling out the products either too early or too late will be detrimental to the market uptake. Firm A benefited from the economic slump because it helped push back the rollout of infrastructure. Without the slump, the launch of its products would not have been on time for the infrastructure rollout. The CEO believed that choosing the right time to build alliances was more important than the right time to launch the product. Infrastructure takes years to be built, hence there is no correct point in time to deliver components. On the other hand, alliances have to be formed before partners are committed to other ventures, or when they can see economic and technical sense in integrating the new products.

Mobile operators have very high expectations, especially with regards to reliability. The products offered will have to be "clearly far beyond the abilities of incumbents before the operators will look at you." In order to fulfill these expectations, Firm A is more concerned about getting the product right from the beginning rather than getting it onto the market as soon as possible.

Although the product is aimed at the wireless infrastructure now, the technology applied can be extended to the wireline business in the future. Flexibility was taken into account during product development, so that there will be growth opportunities in other areas. During the R&D phase, Firm A worked very closely with lead users to come up with the final product. There was also extensive information sharing with partners.

The reason for such a niche focus is to avoid retaliation by incumbents. The startup does not want to be viewed as a threat to them. It intends to build brand equity of the team and company for this niche and to be "perceived as the people to beat in this industry". The CEO reiterated that their competitive advantage was the competencies of the team. He also believed that as opportunities change in the market, strategies would have to be changed accordingly. This is contrary to big companies which usually have fixed strategies.

6.2) Firm B – Network operator

Firm B is a WiFi service provider and owns a network of WiFi hotspots around the Bay Area. These access points are located in cafés, restaurants and lounges. Subscribers can check e-mails, surf the web or chat online in any of these locations by paying less than US$20 a month or US$6 to $8 per venue for a 24-hour session. The startup recently introduced a "hotzone", which spans over six city blocks. Users can connect to the Internet anywhere within this zone.

The reason founders decided to enter this market was their belief that wireless technology will be the next boom. Founded in early 2001, Firm B targets "road warriors"[87], as that was deemed the most profitable segment. One of the co-founders believed that their competitive advantage lies in their first mover advantage within this niche. Compared to other WiFi providers, their cost structures are also lower. Value-added services like increased security are also offered, since security has always been a major concern to WiFi users.

Kommentar: Definition of road warriors?

[86] http://www.eetimes.com/story/OEG20010727S0079

[87] Road warriors are working people who are on the move most of the time.

The main goal of the startup is to increase its physical presence by building more hotspots, since this would help to increase market share. Growth is currently deemed more important than profits, unlike Firm A.

The co-founder interviewed said the decision when exactly to enter was the result of a combination of "market observation and gut feel". It took 34 days between setting up the company and rolling out the service. It was more important to get the service onto the market as soon as possible and subsequently adapting to necessary changes, than to get it right from the start. He further added that he did not know what the right product was. It was better to act on feedback from customers. A free trial period was therefore set up to encourage the first customers to sign up.

This market has low barriers of entry, as the spectrum belonged to an unlicensed range and the technology was already present. The investment into WiFi infrastructure was also relatively low. Consequently, many startups have sprung up in this space. Firm B views startups like Boingo and Wayport as competitors. The smaller scale of deployment compared to these startups is deemed an advantage, as it will not "be taken seriously by competitors".

The co-founder reiterated the importance of quick implementation due to the small window of opportunity and uncertainty of how the industry will evolve. He believed that due to the infancy of the industry, the best execution method is to "build rules as you go".

6.3) Firm C – Network operator/Application developer

Firm C takes the WiFi concept a step further by introducing a free software platform that allows anyone who has a WiFi enabled computer and broadband access to act as a WiFi access point. In other words, they will share bandwidth with others. These micro wireless service providers (micro-WISPs) are known as affiliates. Affiliates can connect to all access points for free and subscribers can do so for a limited period. Pricing plans for affiliates are underway. There is also an enterprise version of the software which focuses on security and network management issues.

Gaining market share is clearly the most important issue for Firm C. This explains why they are offering their affiliate software for free and choosing to earn their revenues from the enterprise version instead. This encourages more people to sign up as affiliates, which increases the ubiquity of the startup's gateways. This in turn gives a higher incentive for others to sign up as new affiliates, since they can gain access to a wider network of gateways. Firm C is exploiting the network externalities of their product. With the proliferation of gateways, it hopes to become the de facto channel for WiFi access.

Another interesting strategy undertaken is its open source software. The reason was to breed a development community capable of extending the platform in areas like virtual private networking applications, voice-over-IP and mesh routing. The CTO cited one reason for the success of Microsoft as their ability to “nurture an ecosystem around them”. This is what the startup is trying to emulate.

There was no marketing in the form of public relations or advertising. The firm is more concerned with delivering to customers what they need. Acting on customers’ responses is therefore one way to improve their products. The eventual range of products offered was also a consequence of this iterative process.

The startup segmented its enterprise market into logistics/transportation firms, IT organizations and WISP. These companies are the most likely ones who are willing to pay for Firm C’s products due to their need for remote manageability. The firewall protection also offers much-needed security. The pricing for the products is based on the number of users.

The firm conceived the product in May 2001 and its first release was in February 2002. The product development stage was undertaken fully by the founding team and no information was shared with third parties or lead users. The team was in stealth mode for quite some time as they did not want to hype up the product. They wanted to lower risks by going through a longer period of product development. Nevertheless, the team believed that once the basic functionality of the product is guaranteed, it should be launched as soon as possible. Other features can be added later on.

Bluesocket and ReefEdge are examples of Firm C’s competitors. However, contrary to most of its competitors, the startup provides an application platform rather point solutions. It believes that the intellectual property within the firm, its positioning and branding are effective strategies to defend its market.

As the barriers to entry of this market are low, the CTO believed that the window of opportunity is closing quickly. The startup has a 9-month lead over new entrants with its protected intellectual property. The way the company deals with the rapidly evolving nature of this industry is to "release early, release often". The key is to keep an eye on the market and focus on solving customers' problems.

6.4) Firm D – Application developer

Firm D has developed the first two-way infrared wireless communication platform. With a PalmOS device, users can beam information from access points as well as upload information, as long as the access points are connected to a server. The platform, access points and servers make up the firm's product package. This package is especially useful for interactive advertising where potential customers can download information on the product advertised. It can also be used in tradeshows and universities, where participants and students can acquire information they need wherever there are access points.

This wireless company is different from the other three mentioned so far as it would rather focus on technology users are already familiar with. The devices exchange information via infrared, which has been in use for several years now. This "latch onto a standard" is a protection against the changes threatening the industry.

The most important mode of marketing was building the essential distribution channel. In this case, a partnership with market leader Palm is invaluable. This co-operation boosted the reputation of Firm D and allowed it to benefit from Palm's marketing efforts. Stanford University was also successfully recruited as a development partner, which could showcase the startup's products. The CEO decided to focus efforts on educational institutions rather than corporations, as the latter would not be as willing to acquire extra wireless infrastructure due to the present economic climate. As it is harder to extract revenues from educational institutes, the firm chose to sell the software at a low price. In return it could market applications to students. Students who were interested could then pay US$25 per annum to make use of these applications.

It took the startup two years to roll out the products after setting up the company. These two years were spent in R&D and building up customer relationships. The CEO believed in getting the product right from the beginning, rather than getting it out onto the market as soon as possible. He had witnessed the demise of competing startups adhering to the latter belief.

The vision of the product remained the same from the beginning. However, opinions of customers were integrated during the beta-testing phase to enhance the user experience. There was also a conscious effort to keep the products flexible. It recently introduced Bluetooth-enabled access points.

Incumbents have not retaliated so far as it is "not worth the effort". Some competitors cited were AdAlive, Streetbeam and WideRay. The CEO felt that the team's technical expertise and the firm's strategic relationships with big players gave them an edge over competitors. Besides, competitors are focusing on the consumer market.

6.5) Firm E – Content provider

Firm E provides end-users with access to content via SMS, by acting as the middleman between network operators and content providers. This service functions over the startup's data network, and enables messages to get to the intended users, regardless of geography, protocol, device or network operator. The startup also enables mobile commerce across countries by developing payment systems and dealing with the discrepancies that may exist between different tariffs, currencies and billing policies. Payment is carried out by applying bi-directional SMS.

The CEO believed that their short term goals should be profits, growth and market share, in that order. The reason is pressure from the VCs to make profits. He believed that once the company is profitable, it will not need further funding. It can then gain more autonomy.

The startup built its service on established technology, lowering the risks of technological obsolescence. Another reason for the sustainability of the business is the necessity of such a service. Operators and content providers do not work well together. They even compete in some instances, when both players strive to establish their own portals. This impedes the flow of content to end-users, depriving both players of additional revenues. The CEO claimed to have reaped substantial first mover advantage by forming partnerships with major content providers like Yahoo and Lycos, as well as with 88 of the world's leading mobile operators, ensuring access to more than 90% of the world's mobile users. Later entrants would face barriers in finding partners to co-operate with.

As the evolutionary path of mobile messaging technologies has already been established, the startup can work confidently on future plans. Currently, most messages are still transmitted via SMS and to some extent, Enhanced Messaging Service (EMS). The upcoming Multimedia Messaging Service (MMS) will be a new addition. To keep itself updated on the latest standards and technology, Firm E became a member of industrial organizations like the European Telecommunications Standards Institute (ETSI), SMS Forum, the GSM Association and the Mobile Payment Forum.

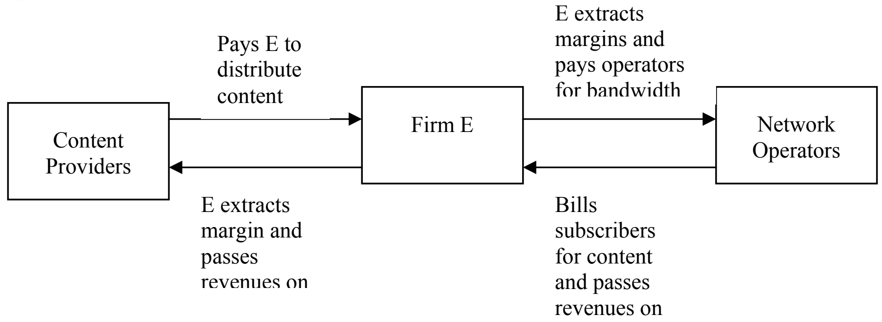
The startup has three groups of customers from the value chain, namely content providers, mobile operators and device manufacturers. Content providers needed a channel to distribute their products, but found it difficult to negotiate agreements with the many existing operators, to ensure that as many subscribers as possible received their contents. On the other hand, mobile operators wanted to offer a range of content and mobile commerce possibilities to their subscribers in order to differentiate their services from competitors. The needs of multiple content providers and mobile operators converge at Firm E, making it necessary for them to negotiate with only the startup. The last group of customers is the device manufacturers, which wanted to provide unique services to subscribers using their handsets. This was only possible with the co-operation of all the mobile operators, whose subscribers used their respective handsets. Interestingly, the device manufacturers came to Firm E on their own accord due to its connections with operators all over the world.

The founders decided to target the global market right from the start because the international reach of the firm was to be its competitive advantage. This was picked as a strategy as they had competencies in dealing with people all over the world due to their international backgrounds. It was important for the firm to employ local people as “it was difficult to deal with mobile operators from a distance”. Their business is very country-centric.

The firm carries out direct marketing and direct sales to customers. It does not rely on distributors, although in Asia, it depends on resellers to form alliances with the smaller content providers. This strategy enables the firm to channel its effort into the big players. Due to Pareto’s Principle of “20% of the customers representing 80% of the business”, this focus is deemed necessary. The CEO does not see the need to advertise as the service is “invisible” to the end-users. However, the startup attends major telecommunications shows like the 3GSM Congress and the Cellular Telecommunications & Internet Association (CTIA) exhibitions. It tries to take part in at least one such show per continent, to make its presence known to major players in the region. Apart from this, the CEO talks to industry analysts.

There are revenue sharing agreements with operators and content providers. The figure below summarizes how this works.

Figure 6: Revenue model of Firm E



Market entry timing was not planned strategically, but was a consequence of recognizing the opportunity and acting on it immediately. The CEO believed that it was crucial to get the service out onto the market as quickly as possible, in order to reap first mover advantages in establishing important partnerships. Lead users like Yahoo and Lycos were consulted during product development.

There has not been retaliation by incumbents so far, although content providers and network operators do deal with each other directly sometimes. The CEO felt that this did not pose a threat as it was not scalable. Competitors exist in various geographic regions, but none of them are as international as Firm E. It is also difficult for these startups to expand internationally later on once they have established a niche in a region as their services would be tailored for a specific region and might not scale internationally.

Future plans of Firm E include developing its own applications. Application development is currently undertaken by partners. The CEO also believed that in the long run, it is "important to be on the same side of the table as Microsoft".

7) Analysis of strategies in the case studies

In this chapter, results from the interviews will be analyzed in detail. Characteristics of the wireless industry and the theories introduced provide insight into the rationale behind these strategies. Common strategies among these five startups will be presented and analyzed.

7.1) Form partnerships with incumbents

Firms A, D and E deem partnerships with incumbents a crucial strategy in the success of their businesses. For Firm A, market entry would not have been possible without alliances with incumbent vendors, since they own the customers. As explained above, the infrastructure market is dominated by powerful incumbents, who straddle across the value chain. The high switching costs of network operators discourage them from purchasing infrastructure from a new vendor. Firm D also cited its relationship with market leader, Palm as the most important form of marketing. It believed that Palm was an essential distribution channel to reach customers. The highly fragmented applications market poses a challenge for customer acquisition, because end-users are overwhelmed by the barrage of applications in the market. With Palm's co-operation, Firm D has direct access to its customers.

While incumbents are partners with Firms A and D, the former are the customers of Firm E. Instead of avoiding incumbents, the startup built a business to serve them. It foresaw the complex relationships incumbents would have with the advent of the mobile Internet and solved the problem by acting as a middleman. The opportunities arising from this new market have led incumbents to vertically integrate, in order to capture more potential revenues. Network operators who want to offer value-added services developed their own portals, leading to conflicts with content providers. Firm E acts as a gateway between these two groups of players, so that it can be the single point of contact for a content provider to distribute content to various operators around the world and for operators to acquire content from many different content providers.

Another reason for such partnerships is the need for startups to boost their credibility and image. With no track records to prove themselves, these startups have difficulty in convincing customers to accept their products and services. In a rapidly evolving industry like the wireless industry, expectations management and buyers' perceptions become especially important in the entry strategy. It is vital for customers to know that these products will not become obsolete in the near future. The willingness of a reputable firm to endorse these products could assure customers of their quality. Besides, the startups can "free-ride" on the marketing efforts of the incumbents without having to incur exorbitant marketing expenditure. This is an important consideration for startups since they suffer from a dearth of finances.

The CEOs of these startups also believed that strategic alliances with these incumbents are important first mover advantages. Having established exclusive relationships with these partners, the startups effectively reduces the number of potential partners new entrants can choose from. This could be a crucial barrier to entry if the distribution channel were pivotal to the success of a business.

7.2) Time product launch

The strategy of launching a product as soon as possible is popular in a fast-moving industry such as the wireless. Startups recognize that their products and technology could be overtaken by newer and superior products anytime. This fear is especially relevant in the wireless industry due to the ongoing standards battle, which results in short product life cycles. Therefore, firms want to launch the products fast, before the window of opportunity closes. Firms B, C and E subscribe to this belief. They felt that getting their products out onto the market as soon as possible and subsequently adapting them to necessary changes was more important than getting them all right from the beginning. In fact, Firm C adheres to the motto of "release early, release often" to keep up with the pace of development in the industry.

Launching early also enables these companies to reap first mover advantages. WiFi providers like Firms B and C can attract potential customers who have not subscribed to any other WiFi services yet. This benefit can be substantial as the WiFi market has very low technical and financial barriers to entry.

It is also interesting to note that while the startups agree that launching early was beneficial, the exact market entry timing was not a strategic decision. This applies to all the startups interviewed. Firm E even cited luck as a reason for entering the market at that particular time. The startups entered the markets when they felt the demand for their products existed. Firm B claimed that "gut feel" played a role too. The exact time for product launch was more the consequence of the time it took to develop the product, than a strategic decision. This is contrary to the popular belief that market entry timing is an important consideration for entrepreneurs. Despite the studies[88] that have highlighted the importance of entry timing, the startups made it dependent on product development period rather than the other way round.

Only Firms A and D feel that getting the product right from the start is more important than launching it as soon as possible. Due to the long period it takes to build infrastructure, the stance of Firm A is reasonable. Besides, operators doing a major upgrade of their networks would rate the reliability of the infrastructure upgrade a more important factor than the speed of the upgrade. Firm D is taking an unusually cautious approach compared to other application developers.

7.3) Undertake direct marketing

All the startups do not carry out extensive marketing activities like advertising due to budgetary constraints. Firms A, C, D and E market their products directly to their customers. Such focused marketing is common for high-tech startups as the uptake of the new and innovative products is dependent on how much the target group understands their uses and benefits. Therefore the startups feel that building good relationships with their customers and educating them on the products are crucial. This type of marketing appeals to the customers as well, because they are told directly how their businesses can benefit from the new products. Building good relationships with customers will further the trust they have in the small startups. This personal approach works well with customers who are early adopters, which is usually the case, since the startups are introducing new technologies. Switching costs of customers would also be raised as a result of the increased psychic costs of changing suppliers, with whom they have a good relationship with.

The other advantage of this method is the possibility of obtaining feedback directly from customers on what they want. This gives the startups an idea of how to structure their product range to cater to customer needs. Firms B, C and D based their decisions of the final breadth and depth of the product mix on what their customers wanted. This illustrates the bargaining powers of customers vis-à-vis these startups and how the latter deal with it.

Firm B was the only startup not to have undertaken direct marketing, as its customers are end-users, which are too scattered to market directly to. It employs guerilla and viral marketing instead, which can reach out to a wider group of audience at a lower cost. Viral

[88] See Lévesque et al. (2002), Covin et al. (1999)

marketing entails propagating information via the Internet, rendering it especially suitable for this target group, who most probably spends a lot of time on the Internet.

7.4) Maintain good public relations

Apart from directly marketing their products to customers, firms pay considerable attention to public relations. Firms A and E both talk frequently to financial and industrial analysts to update them on the ongoings of the firms. The favourable opinions of these experienced third parties serve to boost the confidence of investors and customers. Coverage by analysts is useful publicity for these two firms, as their customers are incumbents who would be very concerned about the financial status and ensuing survival of the firms. Large corporations usually have specific protocols to abide by when deciding on suppliers, whereas end-users tend to be less concerned about future strategies of the firms. Besides, analysts report details about the new products which the mass media typically neglects, like technical details, grounded opinions about the team and facts about the industry itself.

In addition, Firm E is a member of several industrial organisations like ETSI, the SMS Forum, the GSM Association and the Mobile Payment Forum and attends trade shows in all the continents its services are offered. A membership with these organisations allows the startup to keep up with the latest developments in the industry and to contribute its opinions on matters of concern. This is especially important in an industry with no standards and uncertain future developments. Being at the forefront of the information source means first-hand knowledge, which is crucial in a time-critical market like the wireless industry. The organisations will also integrate members‘ opinions on important issues, from which Firm E can benefit by introducing ideas to its advantage. Attending trade shows is also a form of marketing to a targeted group of audience. The startup can make its presence known to the industry players in this way. However, Firm A refrains from such large scale marketing as it deems such activities unnecessary and less effective than going straight to the customers.

Firm C took on a different approach from startups which pursue publicity. It chose not to inflate the expectations of potential customers by working under stealth mode before the products were launched. It believed that too much media hype would lead to unrealistic expectations from the end-users. After the launch, the startup received substantial publicity from the media.

7.5) Build business around proven or versatile technology

Due to the uncertainty surrounding the development of standards, Firms D and E built their business models around technology familiar to customers. Firm D‘s products are based on infrared technology which has been in use in PDAs for some time and Firm E‘s services are centered around SMS, which has enjoyed undisputed success in Europe and Asia. By “latching onto a standard“, the firms hope to immunize themselves from the effects of the standards battle. As Firm E mentioned, the developmental path of messaging services has already been well established, thereby reducing the technological uncertainties the business will face. Besides, the risk of technological obsolescence is lower if the technology employed is enjoying widespread use.

For similar reasons, startups like Firms A and C developed technology which is versatile enough to serve other markets. They can then minimize losses if the technology becomes outdated in the current target market. Firm A‘s products can be applied to the wireline business while Firm C‘s technology can be applied in other products.

7.6) Exploit ongoing standards battle

Due to the existence of multiple standards, no dominant player could control the value chain downstream of network operators. This became the perfect breeding ground for different startups to build their products around standards they believed will prevail. Firms B and C based their products on WiFi whereas Firm D based its product on infrared. Firm A is building infrastructure to suit various possible future standards, so that it will not depend on the dominance of any particular standard. Instead of viewing the lack of standards as a hindrance to a critical mass of subscribers, Firm E took advantage of it to build its business model. Its global network enables SMS to be sent to mobile subscribers regardless of transmission standards, handset models and network operators. As a single interface to establish contact to mobile subscribers, both enterprises and content providers find Firm E’s services useful.

Some startups chose to view the standards battle as an opportunity while others view it as a disequilibrium, which would tip one way in the future. The first group chose to encompass all standards in its products and services while the latter group based its business models on the standard it believes will prevail.

Kommentar: So what does the first group do?

7.7) Adopt niche strategy

One way to avoid retaliation from powerful incumbents is to enter a niche market. Wireless startups try not to serve the same markets as these incumbents by simply differentiating their products or undercutting their prices. This is not feasible for them as the retaliation from these powerful players would have serious repercussions on their businesses. As the CEO of Firm A put it, “they can kill us if they want to”. Therefore, the firm focused on a particular part of the infrastructure that could be improved with its technology. Firm D chose to concentrate on the education and trade show markets, in order to serve the particular needs of these customers neglected by bigger players. Similarly, Firm B targets “road warriors”.

7.8) Build brand equity of team

The competence of the team could be more important than the products in ensuring the success of a startup. A startup often only has the expertise and reputation of the team as the firm’s unique resource according to the RBV, in gaining competitive advantage. Firms A and D felt that the technical competence of their teams gave them the edge over competitors. Firm E believed that the international background of the team was the reason the startup has clinched contracts with so many important global players.

Therefore, Firm A firmly believed that building the brand equity of the team is an important entry strategy. Once the reputation of the team has been established, the credibility of the firm and its products will be enhanced. This is a necessary strategy as startups do not have track records to prove themselves. However, track records of the entrepreneurs themselves can serve the same purpose. Founders of Firms A, C, D and E previously founded other startups before the current ones. The successes of their previous firms are made known to customers and investors, as proof of their competence.

7.9) Focus on profit making as short term goal

As explained in Chapter Three, the short term goals of startups determine the course of action they take prior to product launch. Firms D and E cited profits as their foremost goals, while Firm A felt that cash flow was the most important. The reason is increasing pressure from VCs to generate profits fast, due to their experience from the dotcom crash. This restricts strategic choices the startups can make. For example, they have to minimize expenditure on market share acquisition and marketing.

7.10) Integrate lead users opinions

The strong bargaining powers of customers have been established in Chapter Four. It is therefore important to cater to what they want. Firms A, B, D and E all integrate the opinions of lead users before coming up with the final products. This is especially important in businesses which closely follow the Pareto’s Principle. Firms A and E both claimed that 80% of their revenues are attributed to 20% of their customers. Major customers are hence decisive in the success of their businesses, making their preferences vital considerations.

7.11) Choose market entry point

Market opportunities and competencies both play equally important parts in the decision to enter particular markets. When asked the reason why they chose to enter those particular markets, all the startups professed that they saw potential markets for their business ideas. Another important reason was the competencies they possessed to successfully execute the ideas. The team of Firm A had previously founded a firm which produced an analogous product for a different market. Firms C and D also formed a team with the necessary technical expertise before deciding to enter the markets. Firm E had a group of founders with international background. This diversity led to the eventual construction of a global network. The CEO claimed that it was precisely the international outlook of the team, that made them decide to serve the global market rather than concentrate on certain regions, which was what most of their competitors did.

7.12) Exploit network externalities

A communications industry like the wireless industry enjoys substantial network externalities, which can be exploited to generate exponential growth. This strategy is especially suitable in an emerging industry, where standards have not yet been set. Companies fighting for their technology to be the industry standard have a high chance of success if they made the best use of the existing network externalities.

Firm C is a startup that hopes to be the de facto platform for WiFi users. The two-pronged strategy of introducing an open-source software and allowing its software to be downloaded for free is intended to generate positive feedback and huge network externalities. The open source software will allow third party developers to develop applications for Firm C's platform. The variety of applications available will entice potential users into adopting this platform. The free download encourages new users to sign up and lowers the switching costs of users from competing WiFi service providers. With a large installed base of users, more developers would be interested in writing applications due to increased marketability. The availability of more applications would in turn attract more new users. This virtuous cycle would ensure that Firm C reaps huge benefits from the network externalities.

The other reason for introducing gratis software is to build up its networks. Every terminal with the downloaded software acts as an access point for other users, who can share bandwidth. With more access points, the ubiquity of its networks will be enhanced. More users will be attracted by the service, since they can get WiFi access in more areas.

This strategy is unsuitable for Firms A, D and E since their products are targeted at specific groups of customers and did not require widespread uptake to ensure success.

7.13) Tap global market

Firms A and E did not want to restrict themselves to the U.S.A. market right from the beginning. They acknowledged that the wireless market is a global one, even if different countries are in different stages of development. Many of their customers are multinational companies, which renders it necessary for their businesses to have a global outlook. Besides, increasing number of end-users are making international calls and sending SMS across geographical boundaries.

Firm A recognized that network operators all over the world were upgrading their infrastructure and would find the need for their products. It made sure that its products were compatible with the different transmission standards in the different countries.

The international reach of Firm E became its value proposition. Content providers find it inefficient to distribute content to network operators all over the world, as this requires negotiation with the individual operators, which can prove tedious and costly. With Firm E as their middleman, they have immediate access to 88 operators in the world.

8) Conclusions

This chapter will highlight and summarize the major findings of the thesis and attempt to project the future of the wireless industry. This will be followed by a section on the shortcomings of the study and how it can be improved. Last but not least, suggestions for further research will be presented.

8.1) Major findings

The reasons for certain market entry strategies of wireless startups can be attributed to unique characteristics of the industry. These new companies employ certain strategies to best position themselves in the industry. Even though the startups operate in different segments of the value chain, there are characteristics common to the entire industry that affect them and influence their strategies.

The strategies of the startups cannot be solely explained by any single theory proposed. They are the consequence of the industry structure (Porter's Five Forces), their own resources (RBV) and the technology the products depend on (first mover advantages and disadvantages and network externalities). Even if the entrepreneurs did not explicitly use the proposed framework to develop strategies, they do make use of some aspects of these theories to aid in their decision-making.

However, not all their strategies can be accounted for by the theories proposed. It was interesting how the entrepreneurs used "luck", "chance" and "gut feel" to explain how they came about setting up their businesses and why the business models evolved the way they did. Some decisions (like timing of product launch) did not have a strategic basis and were relatively ad-hoc. This reflects the way startups function as opposed to multinational companies, which usually have certain protocols to follow before carrying out any plans.

The aim of the following sections is to draw conclusions about strategies of these startups with respect to the theories proposed.

8.1.1) Porter's Five Forces

The startups are successful at overcoming barriers of entry in their respective markets. Despite the high financial barrier into the infrastructure provision market, Firm A managed to raise $50 million in their first round of funding from reputable venture capital firms to solve this problem. It also overcame the dominance of incumbents by partnering them.

Firms B and C entered markets with few barriers to entry. Firm E needed contacts with country-centric network operators and this was facilitated by hiring locals. In addition, these startups erected additional barriers to prevent entry of potential players. A few of them cited their first mover advantages as barriers to further entry. Exclusive contracts with customers and distributors and patents of their technologies also deter entrants.

One aspect that seemed to be missing in some of the startups' strategies was to increase customers' switching costs. The lock-in effects are inherently present in products like infrastructure. Customers will always need Firm A's services, as long as they have its products integrated into their infrastructure network and are using its products. Servicing and maintenance can only be done by the startup, as they are the owners of that technology. Firm D's customers would have to change equipment and Firm E's customers would have to negotiate new contracts, should they defect.

For WiFi service providers like Firms B and C, the switching costs customers face are exceedingly low. WiFi users can easily switch providers, without incurring high costs. This typically entails downloading software from another provider and connecting to its hotspots instead. To lock customers into their networks, the firms could perhaps introduce a discount scheme. Under this scheme, the longer the customer has been a subscriber, the more benefits he reaps. For example, a user who has been a subscriber for 6 months can enjoy a 5% discount for the seventh month of subscription. Another way to increase switching costs is to instill brand loyalty. Value-added services and hotspots at locations customers frequent would increase loyalty and switching costs. The psychic costs of changing providers can be increased with personalized services and preferred billing methods.

The startups did not actively undertake any action to overcome the intensity of rivalry. Their entry strategies are more defensive than offensive. They seek to protect their markets, rather than attack their competitors through means like price wars. The intense rivalry in the application development and content providing market cannot be subdued by individual startups as they are too small and lack the requisite means. However, the niche strategies adopted by the startups ensured that they had as few direct competitors as possible.

According to Porter, an industry with less pressure from substitutes would be more profitable. By having very distinct value propositions, Firms A, D and E tried to differentiate their products and services from possible substitutes. Hardware-based infrastructure platforms could be potential substitutes for the software-based platforms of Firm A. However, hardware solutions cannot be upgraded as easily. The products of Firm D could be replaced by SMS and MMS based services, but would not be as easy for trade show hosts and universities to centrally manage data. Customers of Firm E could directly negotiate with one another, but this would be inefficient. However, customers of the WiFi startups can easily switch to using mobile phone networks to perform similar operations. Firm C would have to worry less, since it derives its revenues from the enterprise version of its product.

Kommentar: Need to give some thot to re-writing this para. Not too sure that Firm A has no substitutes, since still not too sure what problem its pdt is supposed to solve. Perhaps a hardware solution could be a substitute.?
For Firm B and C, need to identify what other type of svce provider could replace them, ie. 3G networks.
Actually think that Firm D could perhaps be replaced by SMS/MMS based type of service
Would agree that Firm E would have no close substitutes other than operators and content providers going direct

The bargaining powers of customers and suppliers were not manipulated to the startups' advantages. All the startups sold to customers with higher bargaining powers than they did. Even though this is undesirable, it is inevitable as startups would attempt to target customers who can afford to pay for their products. Since the products are new and customers are usually early adopters, only a small group of customers are able to afford and will be willing to pay. These customers with purchasing powers are usually the ones with bargaining powers. Besides, the newness of these firms means that customer acquisition has to start from scratch, leading to the high dependence on few customers. Buyer selection as a strategy was therefore difficult to pursue. Similarly, the startups did not adopt any strategies to improve their positions against their suppliers, which would prove difficult due to their small volume of purchases.

8.1.2) RBV

In the case of wireless startups, the most important unique firm resource is typically the human capital. This includes the technical expertise and relationships the founders built with partners, investors and customers. The startups recognize this fact and have capitalized on their resources fully by centering their business ideas on their competencies.

Most of them reaped first mover advantages from their technological and relationship competencies. Startups like Firms D and E avoided first mover disadvantages by working on proven technology. Apart from Firm A and E, the startups tend not to consider the sustainability of their technological lead. Their desire to launch the product before the window of opportunity closes implies a short-term stance.

Surprisingly, the concept of network externalities is not applicable to most of the startups involved, since they have a focused group of customers. However the startups could have

Kommentar: Doesn't this negate all you have said in chap 7 about firm C?

pushed for the prevalence of their technologies by working as a group with other firms, whose products are based on the same technologies. For example, the WiFi providers could have pushed for the acceptance of WiFi by co-operating with one another to generate positive feedback. The same goes for infrared transmissions. Only Firm E took part in such a collective action by joining the GSM Association and SMS Forum.

8.2) Future of the wireless industry

The market entry strategies employed by each startup are a reflection of what the entrepreneurs predict the future of the industry is going to be like. They enter the market with projections of which technology will survive, whether customers will be willing to purchase their products, if competitors will attack their businesses, in view of the many changes taking place in the industry. Their entry strategies reflect how they can best protect their businesses against the effects of these changes. However, they might not have considered the newest developments in the industry, when they first drew up their strategies. These include the current slump in the telecommunications industry, possible consolidations and bankruptcies of network operators and the Open Software Architecture Initiative. External developments like these will influence the ensuing survival of these startups, regardless of how successful their original market entry strategies would have been. Hence, the startups must be flexible enough to modify their market entry strategies according to a changing external environment.

The depth of the global slump in the industry is a result of the overspending in building out infrastructure from the late 90s. Telecom incumbents were caught up in the Internet boom and laid extensive fibre optic cable networks, leading to overcapacity. Thereafter, they spent billions to acquire 3G licenses and ran up massive debts[89]. In the U.S.A., there is general consensus that national network operators will consolidate due to economies of scale, decreased operating expenditure and bankruptcies of certain network operators. The market is also becoming too saturated for so many players[90].

The problems of these major players in the wireless industry will trickle down to the startups. The startups interviewed all cited the opportunities presented by the boom of the industry as reasons to enter the market. However, with the depth of the current slump, they might not achieve as much success as they had predicted. The huge debts would prevent

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[89] See The Economist, *The telecoms crisis*, 20 July 2002, p.57

[90] See Bear Stearns, *Wireless Telephony*, April 2002, p.13

incumbents from investing in "superfluous" technology. The startups might have been too optimistic in their assessment of the industry.

The implications of the Open Software Architecture Initiative headed by Nokia could also affect these startups. Although startups can look forward to a less fragmented market, the dominance of this open standard could put the survival of some of these startups at risk. As all the participants in the initiative are major industry players[91], they are collectively driving the market in their favor.

For example, a startup like Firm E would not be adding as much value to its customers. Its basic business model of a distribution channel between operators and content providers would still persist, but the two groups are in better positions to negotiate directly with each other once a common standard has been established. Besides, the initiative aims to standardize mobile payment methods. This might prove to be a formidable competitor to the startup's partnership with Visa. The WiFi providers and PDA players would also be threatened by an industry wide initiative by the mobile phone players to consolidate the market. Even though the entire market for the individual content providers and application developers would be enlarged due to the open standards, competition would also be stiffer with the increased attractiveness of the market and lower technological barriers. Differentiation of products would prove even more difficult.

Market entry strategies might best position the startup in the industry at the point of entry, but unpredictable industrial developments could potentially negate the intended effects of these strategies.

8.3) Constraints of study and suggestions for improvements

Due to time and budgetary constraints, only five case studies have been included in this thesis. Although this may not be a statistically significant sample population, it is sufficient for an exploratory study of this nature to determine market entry strategies of startups in this industry. The aim of this study was to explore these strategies in detail. As such, the aim of this investigation to describe and explain market entry strategies of startups in the wireless industry has been fulfilled.

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[91] Current OSA participants are AT&T Wireless, Cingular Wireless, MMO2, NTT DoCoMo, Mitsubishi, Motorola, Toshiba, Siemens, Samsung, Telefonica Moviles, Vodafone, Fujitsu, Matsushita, NEC, Symbian, Sony Ericsson, Sharp, Nokia

Diversity of the startups is important in this study, to give a broad overview of all the segments in the industry. This aim was fulfilled with the selected case studies of startups, which ranged from WiFi service providers to PDA application developers to mobile phone infrastructure providers and content providers. Unfortunately, due to time considerations, no suitable case study of a startup in the device manufacturer segment of the value chain could be conducted. This would have been a desirable addition to the panel interviewed to reflect unique problems faced by device manufacturers, and would make this study more complete. Nevertheless, this was not of utmost importance in the context of this study as there are relatively few startups in this segment. This might be partly due to the more difficult problems faced by device manufacturers compared to startups in the other segments. The main aim of this study is to illustrate the strategies and problems faced by wireless startups in the industry as a whole. Consequently, the case studies presented here were chosen as they were deemed representative of the industry.

Startups are typically reluctant to discuss their strategies with external parties. Searching for startups willing to be interviewed also proved to be a difficult task. This further shrank the pool of potential interviewees. During some of the interviews, the startups also refrained from answering certain questions that they deemed too confidential. Although the data collected was satisfactory and fulfilled the aims of this study, it would have been more complete without these constraints.

The original aim of this study to investigate the entire wireless industry has proven to be overly ambitious, as the industry is very big and includes many players. Consequently, the results can only provide superficial information on various players. It is hoped that this thesis allows the reader to gain a useful overview of the industry as a whole.

8.4) Suggestions for future research

This thesis has laid the groundwork for the understanding of the dynamics of the wireless industry and the market entry strategies of startups involved. Numerous interesting research could be conducted as an extension to this study.

Separate studies could be conducted on the mobile networks and WiFi industries to find out the unique problems of each industry and their interaction with one another, as the two markets appeal to different target groups. Besides, the former is a regulated industry whereas the latter is not. With a more detailed analysis of each of these industries, the problems and corresponding entry strategies of startups can also be dealt with in more depth. The possibility of the industries substituting or complementing each other in the future can also be examined

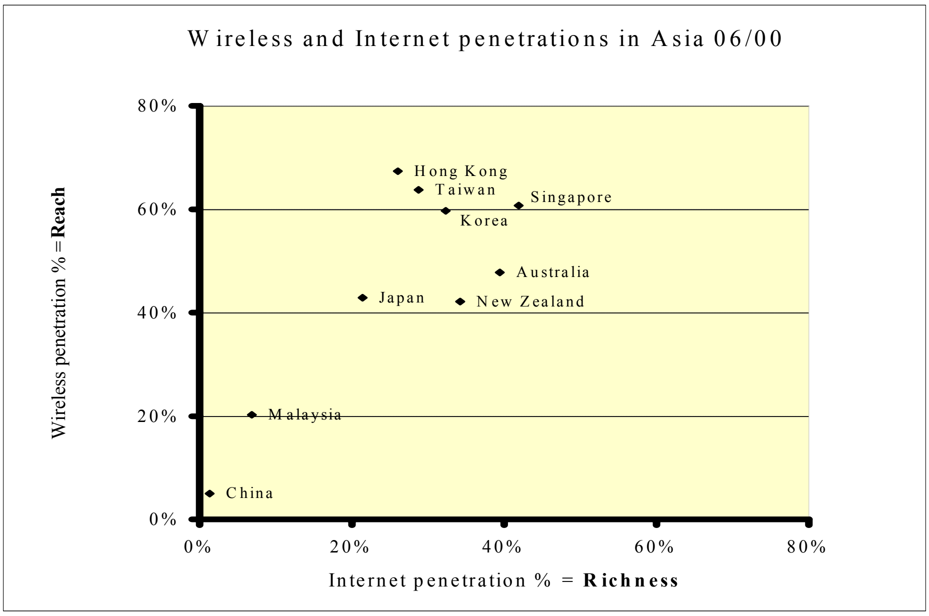
A detailed study on one particular segment of the value chain could also yield interesting results. Such a study would allow a comparison between the entry strategies of the startups in the same segment. This is of interest as entrepreneurs react to the exact same external environment differently, due partly to their different resources, backgrounds, personalities and competencies. The same set of factors is perceived differently by different entrepreneurs, thus directly affecting the market strategies of their startups. This is especially evident in the wireless industry as the uncertainties surrounding its future demand that entrepreneurs make many assumptions.

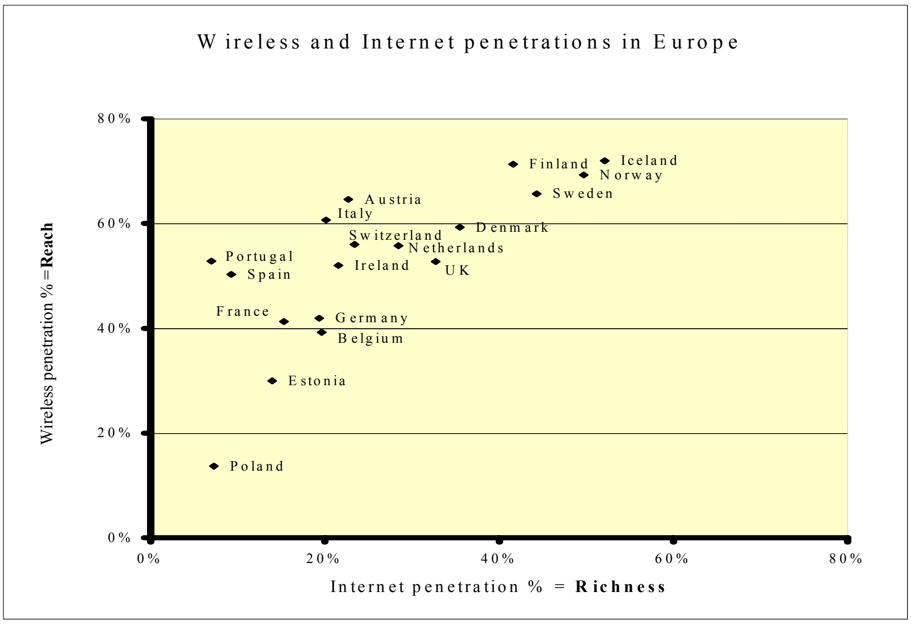
Since the study is only conducted on the wireless industry in the U.S.A., similar studies can be done in other countries. The startups may face different problems and therefore adopt different strategies from their American counterparts. Comparisons across countries could be useful for startups wanting to enter a foreign market.

Last but not least, a longitudinal study can be carried out. A few startups could be selected as case studies. Their rationale for particular entry strategies would then be documented and their success tracked over time. The impact of entry strategies on future success can then be determined.

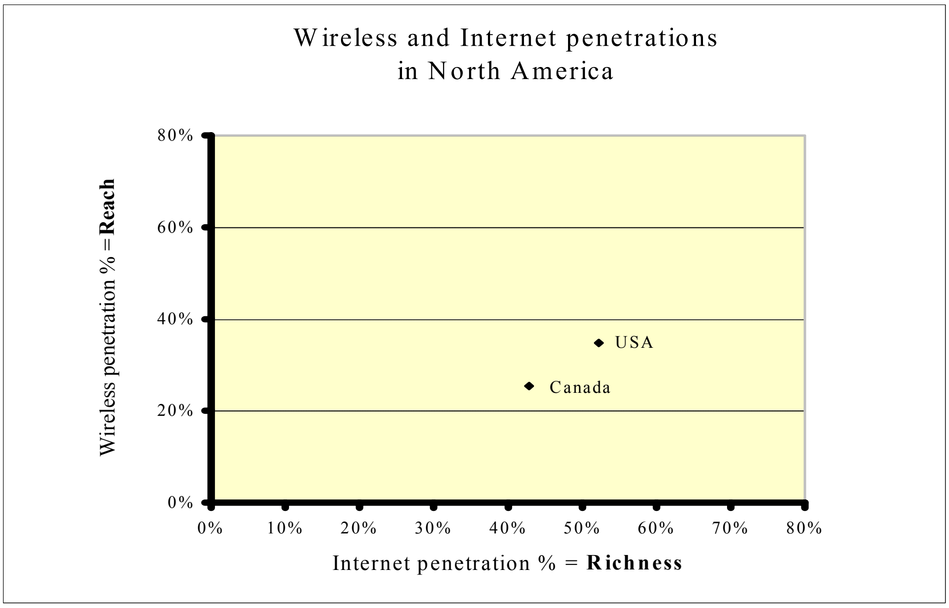
Appendices

Appendix 1: Global wireless and Internet penetrations in Asia, Europe and U.S.A.



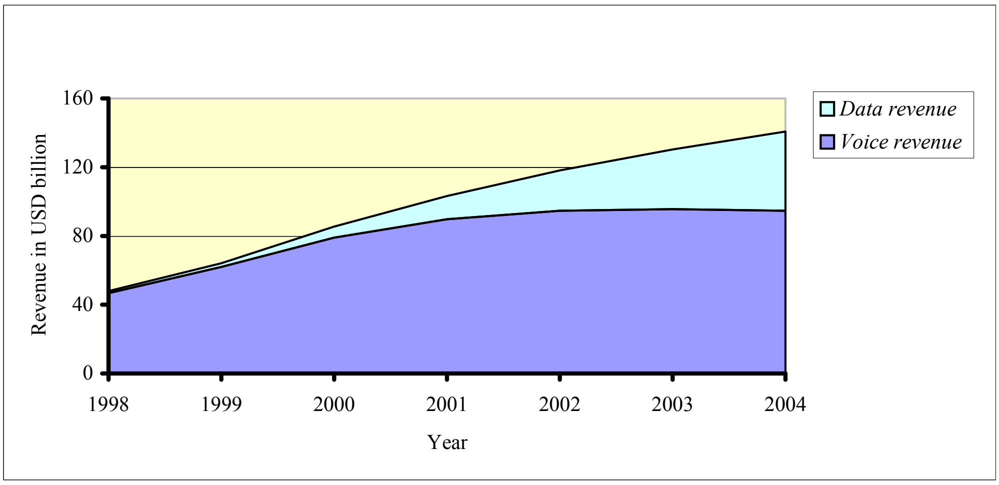


VI



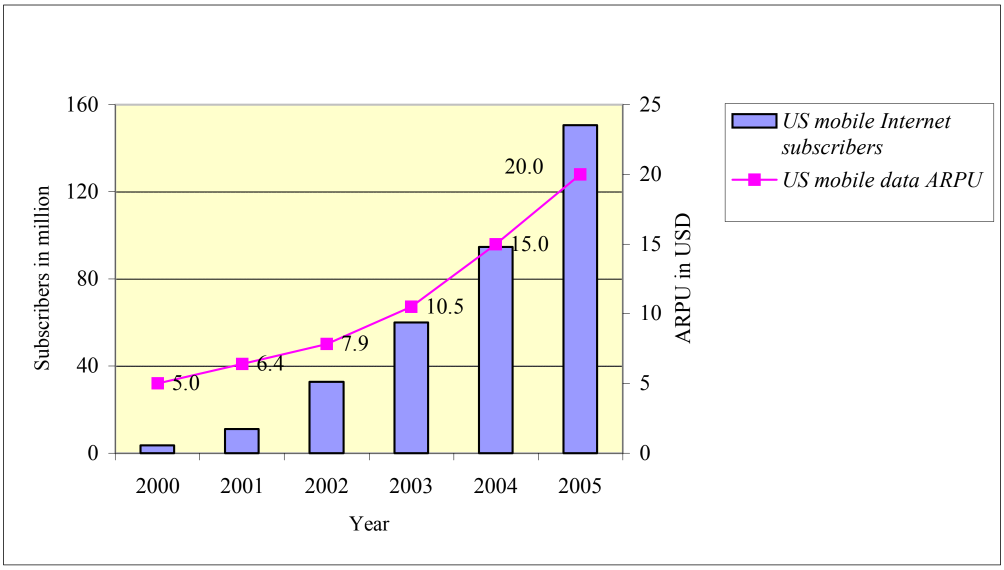
Source: Sonera Corporation, 2001

Appendix 2: Data and voice revenue projections in Western Europe



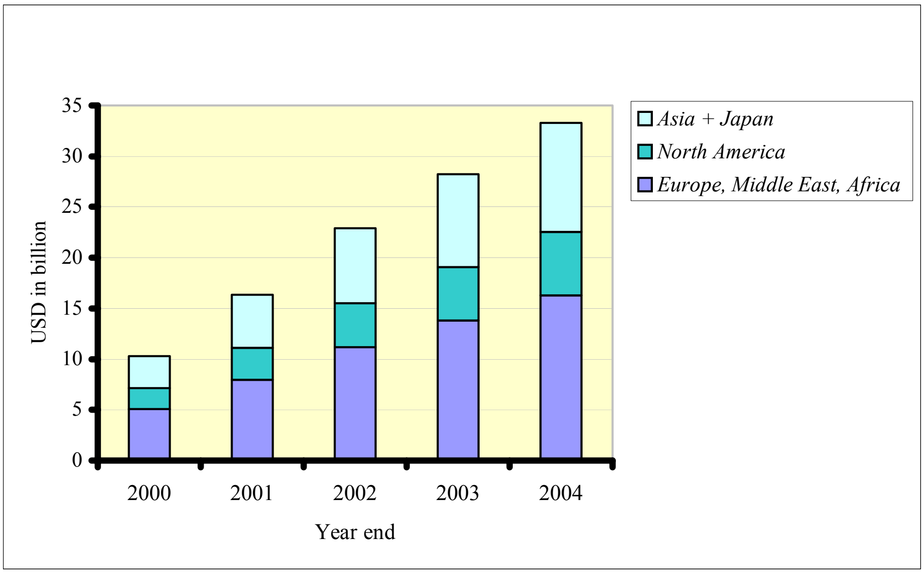
Source: Sonera Corporation, 2001

Appendix 3: U.S.A. mobile Internet subscribers and data ARPU



Source: Sonera Corporation, 2001

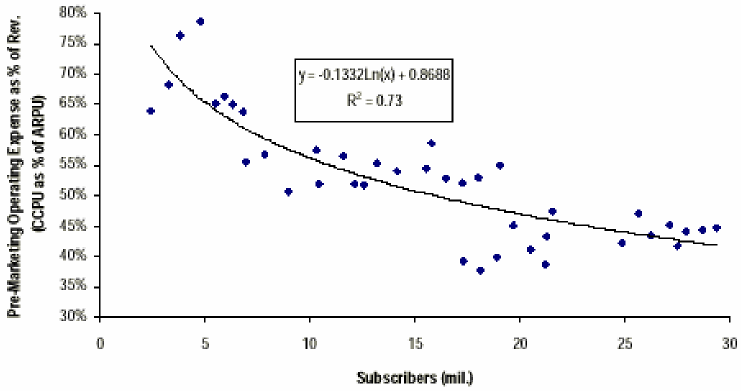
Appendix 4: SMS revenues by geography



Source: Sonera Corporation, 2001[92]

[92] Appendix 1, 2, 3 and 4 are from various studies compiled by Sonera Corporation.

Appendix 5: Economies of scale in the U.S.A. wireless industry



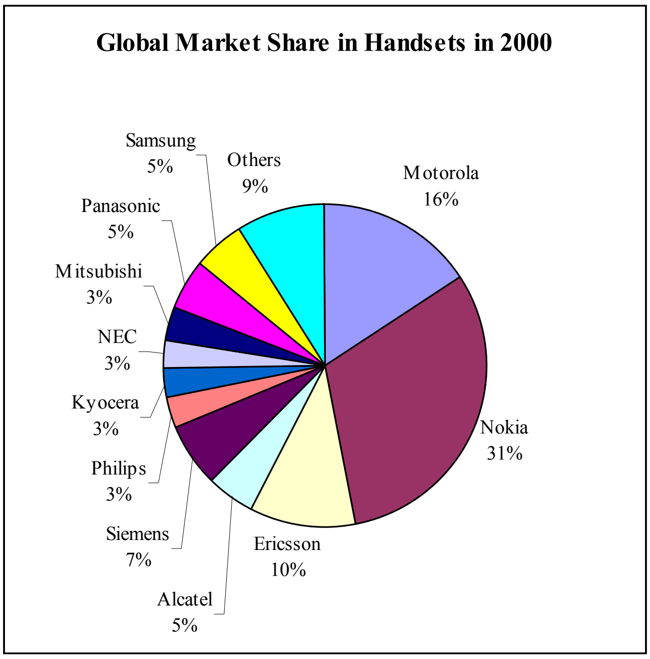
Notes: 1. Data represent the past eight quarters for the five national cellular and PCS operators.

2. We exclude Nextel from this analysis because we believe that its business model makes it an outlier — its CCPU as a percentage of ARPU is much lower than the others, but this is somewhat offset by its higher sales and marketing costs.

3. For Sprint PCS, we included its affiliate customers in the subscriber count, as Sprint does much of the back-office work, which contributes to its economies of scale.

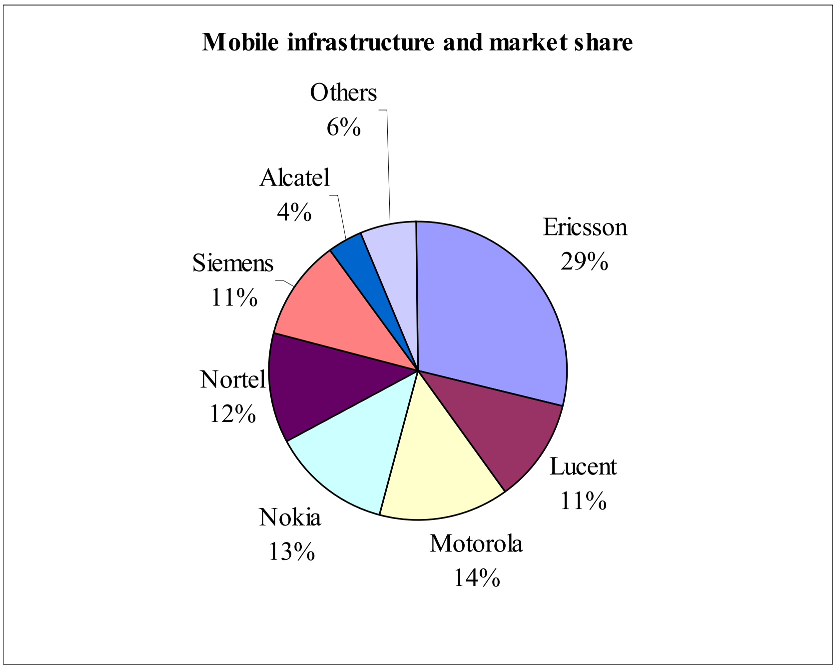
Source: Bear Stearns, *Wireless Telephony* (April 2002), p. 16

Appendix 6: Global market share of handset manufacturers in 2000



Source: Salomon Smith Barney, *Global Wireless Equipment Investor*, 7 June 2001, p. 81

Appendix 7: Mobile infrastructure and market share



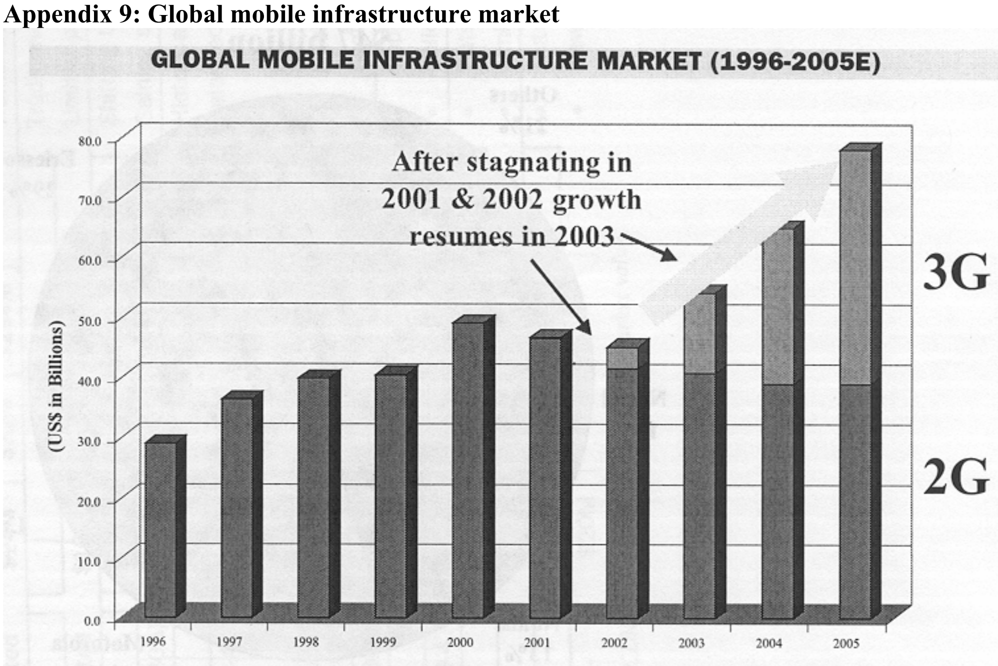
Source: SG Cowen Securities, *RadioWAVES* (Jan 2002), p.84

Appendix 8: Mobile systems revenue

	Mobile systems revenues (US$) in 2001			
	GSM	TDMA	CDMA	WCDMA (3G)
Ericsson	**$13.8b**			
	$10.8b	$2b	$828m	#1 (38%)
Lucent	**$5.3b**			
	$700m	$300m	$4.3b	Limited
Motorola	**$6.5b**			
	$2.0b	-	$2.9b	Limited
Nokia	**$5.9b**			
	$5.9b			#2 (30%)
Nortel	**$5.6b**			
	$1.7b	$1.0b	$2.8b	#3-4

Source: SG Cowen Securities, *RadioWAVES* (Jan 2002), p.85

Appendix 9: Global mobile infrastructure market



Source: SG Cowen Securities, *RadioWAVES* (Jan 2002), p.83

Appendix 10: 3G Revenue Recognition by Vendor (US$bn)

Vendor	3-5 Yr Total	Dec-01E	Dec-02E	Dec-03E	Dec-04E
Alcatel	2.17	0.08	0.43	0.62	0.57
Ericsson	16.74	0.79	3.37	4.74	4.31
Lucent	1.90	0.03	0.18	0.26	0.29
Motorola	1.82	0.28	0.50	0.50	0.36
NEC	1.91	0.31	0.51	0.52	0.38
Nokia	14.14	0.58	2.68	3.93	3.69
Nortel	4.32	0.13	0.75	1.21	1.16
Siemens	3.08	0.12	0.61	0.88	0.81
Total Revenue (shipped)	46.07	2.32	9.04	12.66	11.55
Revenue Recognition (6-9 months lag)	-	-	6.84	10.85	12.11

Source: SG Cowen Securities, *RadioWAVES* (Jan 2002), p.37

Appendix 11: Market share of publicly listed network operators in the U.S.A.

Company	Data as of	No. of Subscribers	% of Subscribers
Verizon	30-Sep-01	28,682,000	24.5%
Cingular	31-Dec-01	21,600,000	18.4%
AT&T Wireless	30-Sep-01	19,700,000	16.8%
Sprint PCS	30-Sep-01	14,384,000	12.3%
Nextel	30-Sep-01	8,303,900	7.1%
ALLTEL	30-Sep-01	6,587,922	5.6%
Voicestream	30-Sep-01	6,325,000	5.4%
U.S.A. Cellular	30-Sep-01	3,379,000	2.9%
Western Wireless	30-Sep-01	1,702,100	1.5%
Qwest Communications	30-Sep-01	1,071,000	0.9%
Dobson Comm.	30-Sep-01	1,051,400	0.9%
Century Tel	30-Sep-01	794,600	0.7%
Leap Wireless	30-Sep-01	724,458	0.6%
Triton PCS	30-Sep-01	617,804	0.5%
Rural Cellular	30-Sep-01	647,573	0.6%
Nextel Partners	30-Sep-01	434,200	0.4%
Alamosa Holdings	30-Sep-01	404,000	0.3%
U.S.A. Unwired	30-Sep-01	273,044	0.2%
Airgate	30-Nov-01	269,952	0.2%
Ubiquitel PCS	30-Sep-01	132,000	0.1%

Source: Friedman, Billings, Ramsey & Co., *Going Wireless*, Jan 2002, p.8

Appendix 12: Worldwide smart handheld forecast

	2000	2001E	2002E	2003E	2004E	2005E	CAGR
Worldwide Units Shipped ('000s)	13,519	19,537	29,521	41,066	54,164	67,894	38.1%
% growth	81.4%	44.5%	51.1%	39.1%	31.9%	25.3%	
Value of Shipments (US$mill)	6,177	7,607	9,796	12,267	15,125	18,195	24.1%
% growth	5.4%	23.2%	28.8%	25.2%	23.3%	20.3%	
Average Selling Price ($US)	457	389	332	299	279	268	-10.1%
% growth	-41.9%	-14.9%	-14.7%	-9.9%	-6.7%	-3.9%	

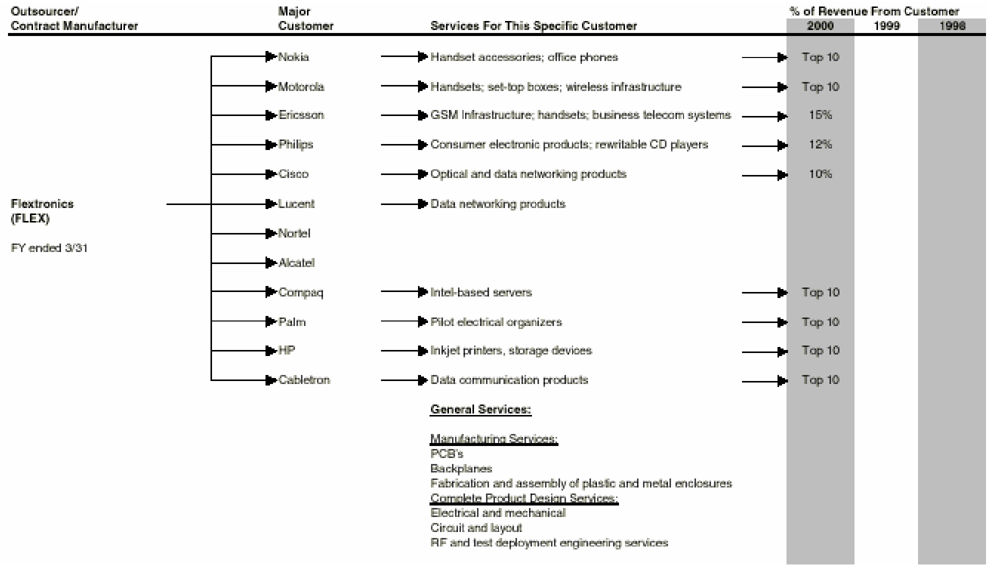
Source: Dresdner Kleinwort Wasserstein, *Mobile Devices and PDAs*, 3 Aug 01, p.13

Appendix 13: Infrastructure subsystem and component food chain

	Ericsson	Lucent	Motorola	Nokia	Nortel	Siemens	Alcatel	Other	% from base station	Products
Allen Telecom		x	x	x	>10%	X	x		~50%	Filters & combiners
Allgon	x								NA	Antennas, combiners, repeaters, filters
Alpha Industries	x	x	x	x	x	X			34%	Vector modulator, switches, filters, PA
Anaren	>10%	>10%	37%	x	x			PWAV	57%	Subsystems, passive components
Andrew	x	x					x		40%	Antennas, transmitters, PA's
Com Dev			x	x	~30%		x		53%	Subsystems
Filtronic PLC	x	x	x	x	x				59%	Tranceiver modules
MCE Companies	x	x	x						60%	Subsystems, components
Mitec	x	x		x	x				~53%	Subsystems, filters
Powerwave	x	x	x	<10%	50%				100%	Power amplifiers
Remec		x	~12%	x	x		x		35%	Mast head amplifiers
Signal Technology	x	x	x	x		X			8%	Combiners
Spectrian					50%			15% Samsung	100%	Power amplifiers
Sirenza Microdevices	x		<10%	x					<70%	LNA, driver, switch
Vari-L	x	x	20%	14%		X			75%	Oscillators, mixers, switches, combiners
CTS Corp			~21%						55%	Oscillators

Source: SG Cowen Securities, *RadioWAVES* (Jan 2002), p.48

Appendix 14: Revenue sources of Flextronics



Source: Salomon Smith Barney, *Global Wireless Equipment Investor*, 7 June 01, p. 65

Appendix 15: Questionnaire presented to startups

Vision:

1. What is your first and foremost goal? Profit, growth or market share?

2. Do you see your product as the future industry standard? Why do you think your product will be successfully adopted, leading eventually to diffusion? (i.e. Your main value proposition that will appeal to mainstream customers)

3. In view of the rapid pace of development in the industry, what other windows of opportunities do you see in future? How does this tie in with the market entry strategies that have been employed?

Marketing Mix:

4. What was the most important mode of marketing? Is there a reason for this?

5. What were the main objectives for each element of the marketing mix (price, product, place, promotion)?

6. How did you decide on the breadth or width of the products offered?

7. How did you segment your market (geographical, value chain?) and eventually decide on the target market?

8. What do the pricing and revenue models look like? What were the issues you had to face to come up with the models?

Market Entry Strategy:

9. Why did you decide to enter this market? What were the considerations and thought processes along the way?

10. How did you decide when to enter the market and when to launch the product? How long did it take between setting up the company and rolling out the product?

11. Were there any cost or revenue sharing possibilities with your partners?

12. How did you estimate demand and growth of the market?

13. Were you more concerned with getting the product out onto the market as soon as possible and subsequently adapt the product to necessary changes or getting it all right from the beginning? Why?

14. Did you work closely with lead users to come up with the end product?

15. Was there information sharing during the R&D phase?

Competition

16. Has there been retaliation by incumbents so far? If yes, how do you protect yourself from such retaliation? If not, why do you think the incumbents have not reacted?

17. Who are your major competitors?

18. What were the strategies planned to defend your market or attack should new competitors enter?

19. What competitive advantage do you have vis-a-vis your competitors (cost, differentiation, processes)? What provisions did you make prior to the launch, to sustain this advantage? How do you plan to sustain this advantage in future?

Smallness and newness

20. What were the advantages and disadvantages associated with the newness and smallness of your company, in entering the market, especially in view of the characteristics of the wireless industry?

21. How did you best leverage the resources you had? Can you give any specific examples?

22. Did you found other companies before this one? What were the competencies you gained that helped in founding this one? Can you give specific examples?

Problems

23. What were the barriers in entering the market? How did you overcome them?

24. What problems with regulations did you have?

25. How did the rapidly evolving nature of the industry affect your market entry strategies?

26. How do you try to remain flexible in view of the volatile environment?

Glossary of Abbreviations[93]:

2G: The digital air interfaces that came into commercial use in the mid-1990s, including CDMA, GSM, iDEN, and TDMA.

2.5G: This evolutionary step is the second generation, circuit-switched networks with the added capability of packet data services. 2.5G networks still use the same transmitters and receivers as a 2G network but have some incremental software on the switch and in the base stations, as well as a gateway to allow for interfacing with the Internet.

3G: The next generation of wireless technology beyond personal communications services. The World Administrative Radio Conference assigned 230 megahertz of spectrum at 2 GHz for multimedia 3G 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. 3G will work over wireless air interfaces such as W-CDMA and CDMA2000[94].

ASP: Application service provider
ASPs are third-party entities that manage and distribute software-based services and solutions to customers across a wide area network from a central data center. In essence, ASPs are a way for companies to outsource some or almost all aspects of their information technology needs.

CDMA: Code-Division Multiple Access
CDMA is a digital cellular technology that uses spread-spectrum techniques. Unlike competing systems, such as GSM, that use TDMA, CDMA does not assign a specific frequency to each user. Instead, every channel uses the full available spectrum. Individual conversations are encoded with a pseudo-random digital sequence.

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[93] Only technical terms are defined. Unless otherwise stated, the source of definitions is http://www.webopedia.com.

C-HTML: Compact HyperText Markup Language
C-HTML is a subset of HTML for small information devices, such as smart phones and PDAs. C-HTML is essentially a pared down version of regular HTML over the Internet. Because small devices such as cellular phones have hardware restrictions such as small memory, low power central processing units, limited or no storage capabilities, small mono-color display screens, single-character font and restricted input methods (the absence of a keyboard or a mouse), there is a need for a simpler form of HTML.

CTIA: Cellular Telecommunications & Internet Association

ERP: Enterprise resource planning
ERP is a business management system that integrates all facets of the business, including planning, manufacturing, sales, and marketing. As the ERP methodology has become more popular, software applications have emerged to help business managers implement ERP.

FCC: Federal Communications Commission

GPRS: General Packet Radio Service
GPRS is a standard for wireless communications which runs at speeds up to 115 kilobits per second, compared with current GSM systems' 9.6 kilobits.

GPRS, which supports a wide range of bandwidths, is an efficient use of limited bandwidth and is particularly suited for sending and receiving small bursts of data, such as e-mail and Web browsing, as well as large volumes of data.

GSM: Global System for Mobile Communications
GSM is one of the leading digital cellular systems. GSM uses narrowband TDMA, which allows eight simultaneous calls on the same radio frequency.

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[94] For definitions of 2G, 2.5G and 3G, see Bear Stearns, *Wireless Telephony* (April 2002), p. 451

HDML: Handheld Device Markup Language

HDML is used to format content for Web-enabled mobile phones. HDML is Openwave's (formerly known as phone.com) proprietary language, which can only be viewed on mobile phones that use Openwave browsers. HDML came before the WAP standard was created. It uses Openwave's Handheld Device Transport Protocol (HDTP), instead of WAP.

HTML: HyperText Markup Language

HTML is the authoring language used to create documents on the World Wide Web.

IEEE: Institute of Electrical and Electronics Engineer

LNP: Local Number Portability

MMS[95]: Multimedia Messaging Service

MMS is a messaging service for the mobile environment very similar to SMS. It provides automatic, immediate delivery of personal multimedia messages from phone to phone or from phone to e-mail. In addition to the familiar text content of text messages, multimedia messages can contain images, graphics, voice, and audio clips.

MSC: Mobile switching center

OS: Operating system

The most important program that runs on a computer. Every general-purpose computer must have an operating system to run other programs. Operating systems perform basic tasks, such as recognizing input from the keyboard, sending output to the display screen, keeping track of files and directories on the disk, and controlling peripheral devices such as disk drives and printers.

PDA: Personal digital assistant

PIM: Personal information management

PIM is a type of software application designed to help users organize random bits of information. Although the category is ambiguous, most PIMs enable one to enter various kinds of textual notes -- reminders, lists, dates -- and to link these bits of information together in useful ways. Many PIMs also include calendar, scheduling, and calculator programs.

PSTN: Public switched telephone network

PSTN refers to the international telephone system based on copper wires carrying analog voice data. This is in contrast to newer telephone networks base on digital technologies, such as ISDN and FDDI.

R&D: Research and development

RF: Radio frequency

RF is any frequency within the electromagnetic spectrum associated with radio wave propagation. When an RF current is supplied to an antenna, an electromagnetic field is created that then is able to propagate through space. Many wireless technologies are based on RF field propagation.

SFA: Sales force automation

SFA is an application service provider that focuses on providing and hosting applications related exclusively to business functions.

SMS: Short message service

Similar to paging, SMS is a service for sending short text messages to mobile phones.

TDMA: Time Division Multiple Access

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[95] See http://www.nokia.com/mms/what_is_mms.html

TDMA is a technology for delivering digital wireless service using time division multiplexing. TDMA works by dividing a radio frequency into time slots and then allocating slots to multiple calls. In this way, a single frequency can support multiple, simultaneous data channels. TDMA is used by the GSM digital cellular system.

UMTS: Universal Mobile Telecommunications System

UMTS is a 3G mobile technology that will deliver broadband information at speeds up to 2Mbits /sec. Besides voice and data, UMTS will deliver audio and video to wireless devices anywhere in the world through fixed, wireless and satellite systems.

WAP: Wireless Application Protocol

WAP is a secure specification that allows users to access information instantly via handheld wireless devices such as mobile phones, pagers, two-way radios, smartphones and communicators.

WiFi: Wireless fidelity

WiFi is another name for IEEE 802.11b. It is a trade term promulgated by the Wireless Ethernet Compatibility Alliance (WECA). Products certified as WiFi by WECA are interoperable with each other even if they are from different manufacturers. A user with a WiFi product can use any brand of access point with any other brand of client hardware that is built to the WiFi standard

WISP: Wireless internet service provider

WLAN: Wireless local area networks

WLAN is a type of local area network that uses high-frequency radio waves rather than wires to communicate between nodes.

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