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# Services on the Mobile Internet

## Service-Driven Technology Development

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## **Preface**

### **Acknowledgment**

First of all I would like to extend my gratitude to my two supervisors Professor Bob Cole at the Haas School of Business University of California Berkeley and Professor Per Magnus Andersson at the Lund School of Economics and Management who have supported me during my work.

I would also like to show my gratefulness towards the Marcus Wallenberg foundation and my employer L.M. Ericsson AB who through a generous scholarship supported my studies at Haas Business School enabling me to devote time to this interesting field of study.

Finally the thesis would not have been possible without the help and support from all interviewees.

Lund, January 20, 2003

Jonas Andersson

## Summary

Title: Services on the Mobile Internet

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Purpose: The purpose of this thesis is to describe and analyze the services on the mobile Internet and to identify when, where, and how these service offerings can be profitable.

Method: The thesis is a qualitative study based on in-depth interviews with key stakeholders in the service value chain and with relevant experts.

Case methodology have been used to gather and structure the empirical material from three cases, i-mode in Japan, SMS in Europe, and BlackBerry in the USA to be able to generate new theory as well as expand on existing theory.

Analysis: The analysis, based on the three cases, generates and validates a model for successful service strategy on the mobile Internet. The service strategy is called *service-driven technology development*.

Conclusion: Service-driven technology development explains the success of the three cases and provides a framework to successfully develop, implement, and maintain profitable services on the mobile Internet.

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# 1. Introduction

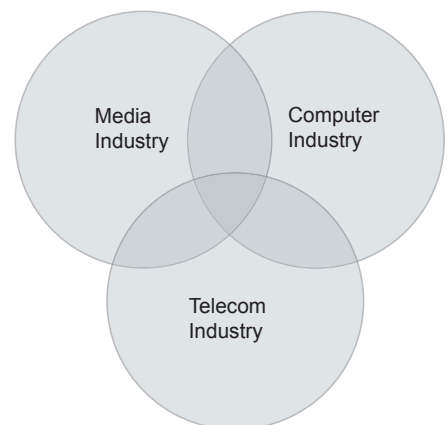
*This chapter describes the thesis and introduces the reader to the subject of services on the mobile Internet. First there is a definition of the problem followed by a statement of the thesis objective. Finally the synopsis explains how the chapters are constructed and related to each other.*

## 1.1 Background

### Three different industries coming together

The telecommunications industry is merging with the media industry and the computer industry; the result of their interaction is sometimes referred to as the infocom industry. The three industries are coming together for several reasons, but most of us would simply argue that the development of technology has made it possible. The telecommunications industry is moving from mobile voice communication to mobile data communication, which is commonly referred to as the third generation network (3G). The computer industry is moving from desktops and laptops to palmtops, and the sale of wireless computer equipment is now an established and expanding market and an integral part of the software (SW) world. The media industry is looking for new ways to distribute and promote its content, and the Internet as well as the mobile Internet are viewed as the distribution channels. The difference between the Internet and the mobile Internet is that all data communication on the mobile Internet is done wirelessly.

Figure 1: Convergence of industries to form infocom



## High expectations

These three industries are today in different stages of maturity, but all of them expect to profit from the new products and services of the mobile Internet. All involved parties have made heavy investments, some more than others. One that has captured a lot of attention was the auction of spectrum licenses; network operators spent around \$200 billion worldwide to snap up 3G licenses in recent years, running up enormous debts in the process.<sup>1</sup>

<sup>1</sup> <http://www.ovum.com>

## How to generate revenue

The question that is asked over and over again is how the industry will recoup these investments. Factors such as the over-hyped introduction of WAP (wireless application protocol), the recent global economic downturn, and the avoidance of the telecom industry by the venture capital community (at least for the moment) have added to the growing concern about how the industry is going to recoup its investments. Jakob Nielsen, a usability expert, said to InternetNews about WAP: “Its usability did not meet expectations, but even worse, WAP was generally communicated to the public as the first step to the mobile Internet.”<sup>2</sup> Therefore, its “failure” potentially will damage the reception of future offerings.

<sup>2</sup> Jakob Nielsen, InternetNews, March 2, 2002.

## The key to success: services

There are, however, success stories, such as SMS in Europe, i-mode in Japan, and BlackBerry in the United States. These companies’ successes show that there is great revenue potential in offering services on the mobile Internet. The functional business models and vast amount of services that exist on the Internet today are valuable sources of information about how services on the mobile Internet can be implemented and executed.

## 1.2 Problem area

The problem addressed by this thesis is the lack of effective and profitable service strategies on the mobile Internet. In this immature market there are not yet any proven strategies or even best practices. Still there are some cases that when analyzed provide valuable information about key success factors for service strategies.

What becomes clear after discussion with stakeholders is that there is an institutional memory within each of the three different industries. They all have very different approaches to infocom, which reflect their respective histories and give rise to conflicting interests. However, they all have a common interest in finding business opportunities on the mobile Internet. Three questions were repeatedly brought up in the interviews by the interviewee:

- What successful business models exist, and why are they working?
- Where is the potential revenue and how do companies generate it?
- What constitutes a successful service strategy?

## 1.3 Purpose

The purpose of this thesis is to describe and analyze services on the mobile Internet and attempt to determine success factors for service strategies.

## 1.4 Target audience

The target audience for this thesis is professionals who are working with or are planning to work with service strategies for the mobile Internet. Some level of understanding of the Internet and the mobile Internet is expected from the reader, but the thesis should be digestible without in-depth industry or technical knowledge.

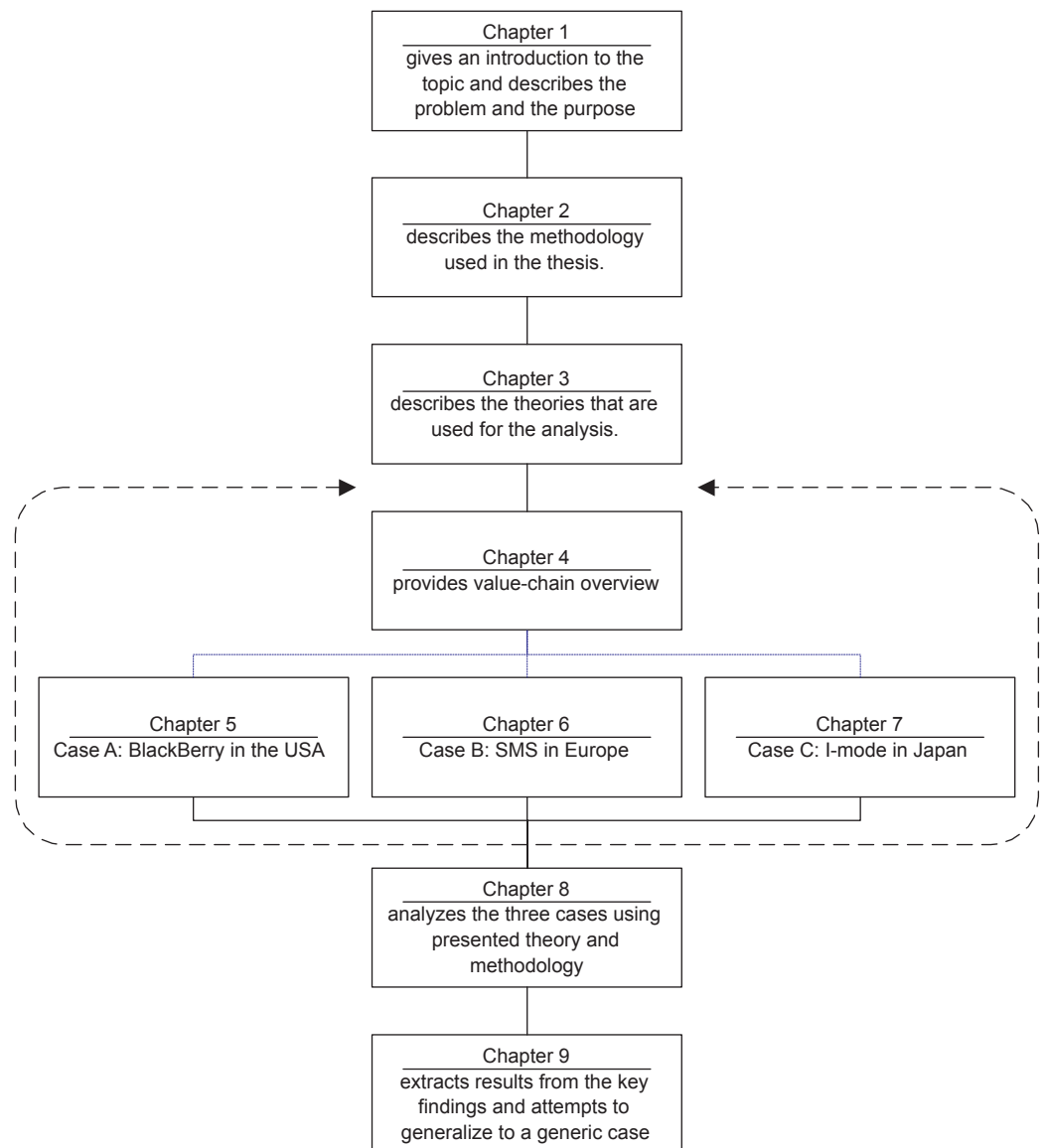
Students and teachers studying the Internet, mobile Internet, infocom industry, and service industries might also find this thesis useful.

## 1.5 Limitations

The thesis aims to have a global perspective, which is clearly applicable to the telecommunications and computer industry. At the same time, service strategies must be attuned to local conditions and culture. Data were collected and this thesis was written during the period from Fall 2001 to Summer 2002.

## 1.6 Synopsis

Figure 2: Synopsis and thesis structure



# 2

## 2. Method

*This chapter describes the method and methodology used to gather the data that support the results, interpretations, explanations, and predictions of this thesis. The empirical findings are based on secondary data gathered from industry sources, experts, and consulting firms, combined with primary data from interviews conducted in both the United States and Sweden with representatives of key stakeholders. The methodology of interviews is given special attention because it is a major determinant of the findings.*

### 2.1 Initial approach

I conducted the research for this thesis alone, which is not common practice in writing a master's thesis. To compensate for this, I relied on an informal virtual support group or network to discuss and review the research as it progressed. Their feedback was valuable throughout the process.

The work was to some extent iterative because interviews often raised new questions and ideas that were subsequently explored. During this initial period, different secondary data sources were consulted as well. UC Berkeley's online resources as well as other online Internet resources provided extensive background data. The searches were done with two purposes in mind: to find reports and articles that could provide background and a snapshot of the current situation, and to create a dynamic, constantly growing directory that could be addressed continuously during the research.

Before selecting the methodology and theories, I conducted some initial interviews to ask questions, refine initial thoughts, and set a direction for the thesis. These interviews were less structured than the later interviews and focused on establishing the scope for the thesis. My own background in research and development, as well as in sales and marketing within the telecommunications company Ericsson, provided me with a valuable network of contacts.

### 2.2 Empirical framework

The work is exploratory and the main focus has been to gather data that give different perspectives on services on the mobile Internet. In order to understand this relatively new concept there has also been a need to collect related data. The related data can be characterized as either directly or indirectly related to the main topic. Information directly related to services on the mobile Internet includes economic data, technology data, and regulatory information. Indirectly related sources are those from different areas where similar developments have occurred or where directly involved players have already acted in a special way.

The initial study was also aimed at finding cases that could illustrate successful mobile services. I chose three cases: i-mode in Japan, SMS in Europe, and BlackBerry in the United States. Many interviewees used these companies to illustrate points and make comparisons. These companies also represent different demographic customer bases, thereby illustrating different approaches to market segmentation and value. The way in which data were collected for the three cases was essentially the same, though i-mode and BlackBerry are more easily associated with one company and SMS is associated with several companies.



The selection of cases was conducted in an iterative way. The three cases seemed to represent the industry and services on the mobile Internet without making the analysis overly detailed or complicated. Further, the geographical coverage of the cases the U.S., Europe, and Japan illustrates the global reach of the mobile Internet and at the same time exemplifies the local differences.

Another objective for the study was to identify a value chain that could be used to structure the industry and show interdependencies. The immaturity of the industry makes the value chain subject to discussion, but constructing a conception of what the emergent value chain will look like is helpful nevertheless. The nature of the value chain was a recurring question in all the interviews. Although the interviewees shared an understanding of what the value chain is and represents, their descriptions of its features differed. The differences could sometimes be related to the position a company wanted to take, but in some cases there was clearly an expectation that certain stakeholders did or did not do things that they were or were not expected to do.

More of the early interviews were conducted with generalists, and more of the later ones with companies and specialists. But there were exceptions to this because the process of planning interviews is sometimes unpredictable. The mix of interviews was also inversely proportional to the collection of secondary sources and Web material, with the latter being a rather large part in the beginning.

## 2.3 Case study methodology

In case study research, individual cases are used as the foundation to develop theories to describe recurring themes or events that can be generalized. An important reference work on case study methodology is Robert K. Yin's *Case Study Methodology* (1994). According to Yin, a case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not obvious.

A case study is a useful tool for social science research strategies. Table 1 lists the characteristics of various research strategies.

Strategy / Characteristics	Form of research question	Requires control over behavioural events	Focuses on contemporary events?
Experiment	How, why	Yes	Yes
Survey	Who, what, where, how many, how much	No	Yes
Archival analysis	Who, what, where, how many, how much	No	Yes/no
History	How, why	No	No
Case study	How, why	No	Yes

Table 1: Uses of different research strategies

Source: Yin (1994).

One case study can provide opportunities for multiple levels of analysis (Yin, 1994). For example, the Warwick study of competitiveness and strategic change within UK corporations is conducted at two levels, namely, industry and firm (Pettigrew, 1998).

The case study can also be used to test theory or to generate theory. Table 2 describes how theory can be derived from case study research. According to Eisenhardt (1989), theories derived from case study research are likely to be novel, testable, and have empirical validity because of their intimate linkage with empirical evidence. Further, the contributions of case studies to theory-building make it especially suitable for new research areas where existing theories seem inadequate.

Table 2: Building theory from case study research

Step	Activity	Reason
Getting started	Definition of research question	Focuses effort
	Possibly a priori constructs	Provides better grounding
Selecting cases	Neither theory nor hypothesis	Retains theoretical flexibility
	Specified population	Constrains extraneous variation and sharpens external validity
	Theoretical, not random sampling	Focuses effort on theoretical useful cases
Crafting instruments and protocols	Multiple data collection methods	Strengthens grounding of theory by triangulation of evidence
	Qualitative and quantitative data combined	Synergistic view of evidence
	Multiple investigators	Fosters divergent perspectives
Entering the field	Overlap data collection and analysis	Speeds analyses and reveals helpful adjustments to data collection
	Flexible and opportunistic data collection methods	Allows investigators to take advantage of emergent themes
Analyzing data	Within-case analysis	Gains familiarity with data and preliminary theory generation
	Cross-case pattern search	Forces investigators to take advantage of emergent themes and unique case features
Shaping hypothesis	Interactive tabulation of evidence	Sharpens construct definition, validity, and measurability
	Replication, not sampling, logic across cases	Confirms, extends, and sharpens theory
	Search evidence for “why” behind relationships	Builds internal validity
Enfolding literature	Comparison with conflicting literature	Builds internal validity, raises theoretical level, and sharpens definitions
	Comparison with similar literature	Sharpens generalizability, improves construct definitions, and raises theoretical level
Sharpens generalizability, improves construct definitions, and raises theoretical level	Theoretical saturation when possible	Ends process when marginal improvement becomes small

Source: Eisenhardt (1989)

## 2.4 Theoretical framework

Using the theoretical framework I have selected, my aim is to extract the key elements of successful services on the mobile Internet. The theoretical framework guided all of the data collection and analysis. During the process, however, some of the supporting theories were discarded and others were added.

The starting point is an industry analysis based on Porter's "five forces" and the value-chain model. Porter's well-known model together with recent articles, validating it for the network economy as well, provides a clear understanding of the competitive landscape. The value chain outlines the value-adding activities that have to take place to be able to provide a mobile service.

The next step is focused on the core competencies of the different players to determine where their strengths are and what differentiates them from one another. This is also used to some extent to explore what possibilities are created by the three merging industries (telecom, computer, and media).

Supporting this analysis are several theories that were selected because they are directly targeted at technology-intensive industries, such as the mobile Internet. The main supporting theories revolve around open standards and technology management. Open standards are recurring phenomena in telecom and in many other industries as well. Many companies in the telecom world have declared their support for open standards, and sometimes only support open standards. The theories around standards provide a rationale for this thinking and also highlight some of the issues faced by companies that provide services on the mobile Internet.

Aside from technology, I focus on the service value chain. Some service industries do have a strong technology component, but generally service theories do not assume this. Because there is a continuum from what a service is to what a product is, the use of this theoretical framework aims to support the extraction of the service component and describe the interfaces and interaction between product and service.

There are no specific theories, at least none generally accepted, developed specifically about services on the mobile Internet. This is because the industry is still immature and the empirical foundation for theory-building has not been available until recently. This makes the case study methodology an attractive tool for formulating an approach.

## 2.5 Interviews

Interviews are the primary data source and the basis for the empirical chapter. They were conducted with the goal of describing the service environment on the mobile Internet. I attempted to find and interview people with professional expertise in this area.

To accommodate the time constraints of the interviewees, my preparation for each interview was rigorous, and the interviews were used primarily to clarify gray areas that the secondary sources could not cover. The interviews were also used to validate source material and whenever possible were set up to complement each other.

The interviewees can be divided into two basic groups: the experts and the primary stakeholders. The expert should not be partial towards a specific solution or business model and therefore could be viewed as independent, whereas the primary stakeholder has a clear bias. My feeling is that the actual difference between experts and primary stakeholders is small, but it is noticeable and understandable because company employees naturally promote their own companies' products.

## **2.6 Data sources**

As a part of the interview I included a question asking what other people I should interview and what other data that I should collect to advance my analysis (Thomas, 1989). Answers to both questions allowed me to collect more data and information that often cast further light on the interviewees' statements. I also occasionally followed up with e-mails asking additional questions or for further clarification.

As a complement to the interviews, secondary sources included business and professional periodicals, trade association reports, investor newsletters, analyst reports, whitepapers, and online articles. Other sources of useful information were lectures and classes at the University of California, Berkeley, fellow students, and invited guests from the industry.

## **2.7 Critique of sources**

I had some difficulty gaining access to the people and corporations that would be the best to interview (Thomas, 1989). In addition, there is always a concern that interviewees will tell only the official version of events and strategies in order not to reveal company secrets or jeopardize their careers.

An interviewer may also skew the interview by asking biased questions or by interpreting or transcribing information inaccurately. Although I transcribed most of the interviews within twenty-four hours of conducting them, errors still may have occurred.

## **2.8 Critique of method**

The provision of services usually brings to mind the end user. For this thesis, however, I have done no end user research; the consumer information in the cases presented is taken from prior research because a consumer study of any significance would have been extremely resource intensive. Therefore, the approach in all three cases was to rely on information from successful service providers and to try to identify key customer criteria for achieving that success through secondary sources.

The research covers a broad geographic area, and the industry investigated is large and complex. The amount of information available is so huge that the methodology of limiting the study to three cases and then extrapolating the results to the whole industry is necessarily a risky exercise.

# 3

### 3. Theory

*This chapter outlines the theories that are used in the analysis. The aim is to acquaint the reader with the theoretical foundation that underlies the subsequent analysis. The first section provides a framework for industry analysis and briefly describes Porter's five forces and the value chain. The section about resources and core competencies lists the theories for analyzing the firm's internal possibilities. Because the thesis is about services, the service profit chain is an integral part in defining and describing strategies. The last section offers some interesting supporting theories that especially focus on standards and the management of technology.*

#### 3.1 Introduction

Several theories are useful in describing and analyzing service provision on the mobile Internet. The choice was therefore to use a few well-established and generally accepted strategy theories that provide sufficient tools for analyzing the cases and the data.

The two main strategy theories are competitive strategy and resource-based strategy. While Porter's five forces focus on external factors, the core competencies model focuses internally on a firm's capabilities and what those capabilities enable. The resource-based theory stresses a firm's core competencies and takes into account nimble, knowledge-intensive, and technology-intensive industries.

I use Porter's five-forces model together with the value-chain model to do an industry overview and analysis of the competitive landscape for the different actors. The identification of the core competencies and the use of a resource-based approach make the different stakeholders in the value chain more transparent.

#### 3.2 The five forces and the value chain

Michael Porter's competition-based strategy theory is the Five Forces of Competition (FFC), which focuses on the competition between actors in the market (Porter, 1982). The theory considers a company's external environment and how this environment affects the company's competitiveness and profitability. FFC can be used to determine how and against what a company can defend itself or how a company could position itself to advance to a more profitable position. The five forces are shown in Figure 3.

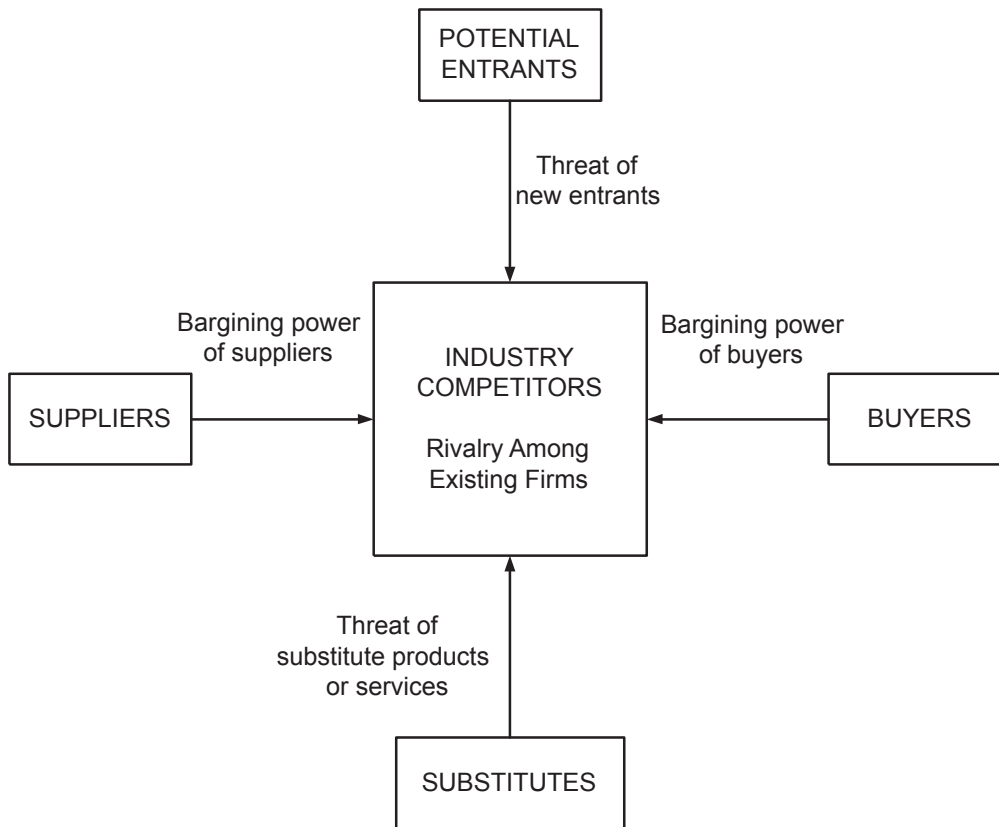
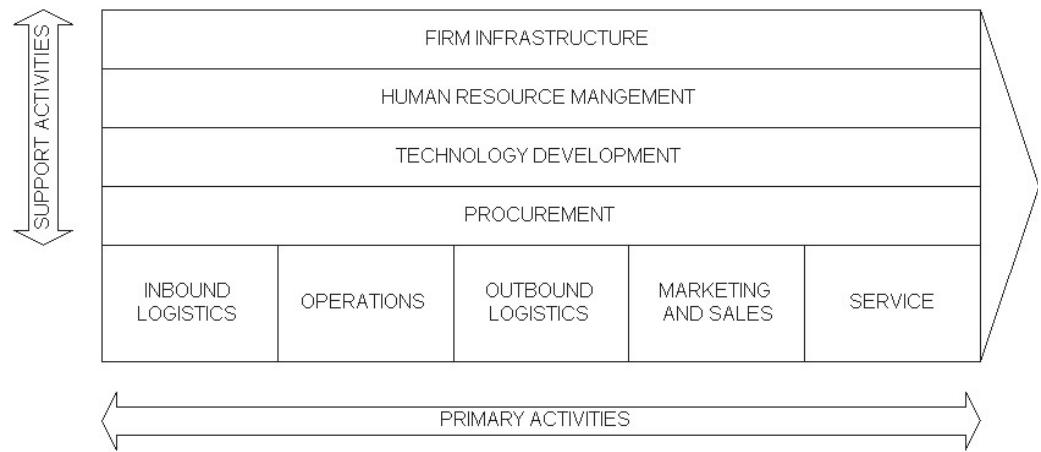


Figure 3: Forces driving industry competition (Porter, 1982)

Porter’s theory around the five forces of competition, which was developed in the 1970s before the Internet, has led to a discussion of how valid it is to describe the industry today. In response, Porter argues that industry structure in the Internet era can still be described by the five forces and that sustainable competitive advantage comes from operational effectiveness or strategic positioning (Porter, 2001). The Internet has not changed the established ways of thinking about strategy, but it has affected the five forces and the industry boundaries. Porter further argues that operational effectiveness is not a strategy and that strategic positioning can only be achieved by doing things differently than your competitors (Porter, 1996). Differently means either performing different activities or performing similar activities in different ways.

The value chain is the set of activities through which a product or service is created and delivered to customers (Porter, 1982). This is true in any industry, and it provides a framework for identifying all value-creating activities and analyzing how they affect costs for the company and the value they deliver to customers. The value chain is linked to suppliers, channels, and customers. The Internet has had a profound impact on these linkages as well as on the different activities in the value chain. This is mainly because each activity involves the creation, processing, and communication of information and data.

Figure 4: Generic value chain  
(Michael Porter)



### 3.3 Core competencies and resource-based theory

A company's core competencies are identified or classified by three different criteria (Prahalad, 1990). First, the competency should provide access to a wide variety of markets. Second, the competency should make a significant contribution to the product's or service's perceived customer benefit. Finally a core competency should be hard for competitors to imitate, and this should be viewed from the perspective that there is a complex interaction between different core competencies in the company.

It is important to be clear what your company's core competencies are or will be and to make choices based on these competencies. Otherwise it will be hard to make intelligent decisions about, for example, alliances and sourcing strategies or how to establish new competencies in order to compete with emerging businesses. There is also a linkage between the end product and the core competencies, and that linkage is the core product. The reason for distinguishing between core competencies, core products, and end products is that the nature of competition is different in each case.

A resource-based strategy complements a competition-based strategy because it looks at a company's internal capabilities and resources according to how well they are aligned with its external goals. The company's internal resources are all the assets, possibilities, organizational processes, company attributes, information, knowledge, and so on that are controlled by the firm and that make it possible to implement and execute strategies (Barney, 1991). This is expressed in the corporate strategy triangle (Figure 5), which shows that a company's resources, business, structure, system and processes should be coordinated so that the company can fulfill its goals and move towards its vision (Collis and Montgomery, 1998).



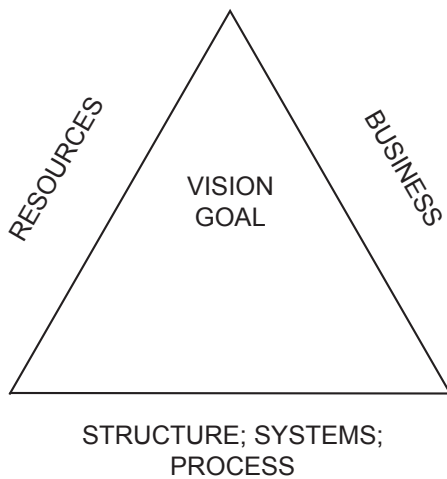


Figure 5: The corporate strategy triangle (Collis and Montgomery, 1998)

If a company has resources that can be combined in a unique way relative to its competitors, it will have a competitive advantage. This competitive advantage will be sustainable when it becomes difficult for the company’s competitors to copy the resources and execute the same strategy. Likewise, a company is limited by the resources it has and to what extent or how fast it can develop or acquire new resources.

### 3.4 The service profit chain

The service profit chain has been derived from successful service organizations and puts “hard” values on “soft” measures (Heskett, 1994). The service profit chain establishes the relationships between operating strategy and service delivery systems via the external service value received by customers and their concomitant satisfaction and loyalty, which generate revenue growth and profitability.

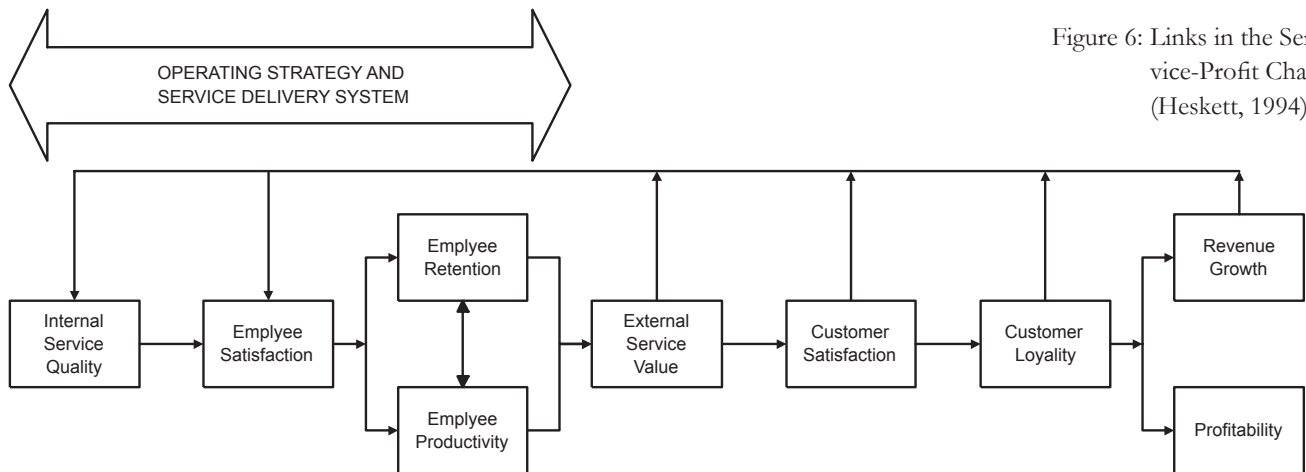


Figure 6: Links in the Service-Profit Chain (Heskett, 1994)

A key argument related to services is that the “quality” of market share, measured in terms of customer loyalty, deserves just as much attention as the quantity of market share (Reichheld and Schefer, 2000). Loyalty is, according to the service chain, a direct result of customer satisfaction, and this satisfaction is the value perceived by the customer, which means the satisfaction of the customer in relation to the total cost. The total cost is the price of the service plus the cost associated with acquiring the service.

### 3.5 Standards

The telecommunications industry is heavily influenced by standards that are often referred to as open, meaning that the standard is free to use and that licensing of the necessary patents is done under fair and reasonable terms. In contrast to open standards, there are closed standards or industry standards. Shapiro and Varian (1999) have identified seven key elements that are critical to establishing an industry standard. However, if one or more of these are not under a company's direct control, it is better to establish an open standard.

Table 3: Seven critical factors for controlling a standard

<u>An installed base of users</u>
<u>Intellectual property rights</u>
<u>Ability to innovate</u>
<u>First-mover advantage</u>
<u>Manufacturing capabilities</u>
<u>Strength in complements</u>
<u>Brand name and reputation</u>

Source: Shapiro, Varian (1994).

# 4

## 4. The value chain

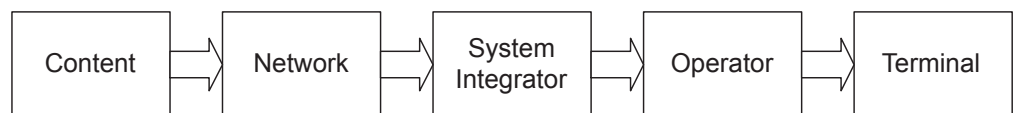
This chapter identifies and describes the value chain as well as the different players in the mobile Internet. The last chapter describes attempts to achieve horizontal integration in the value chain.

### 4.1 Value chain

The value chain for services on the mobile Internet is described by five participants: the content provider, the network, the system integrator, the operator, and terminals. The different stakeholders are today all developing services in relative isolation from each other because some elements of the value chain are still not linked. Because the mobile Internet is an immature industry, the different players are still trying to find their niches and match their future interests. In these efforts, exploratory alliances occasionally emerge (usually with a press release), some of which develop and others of which simply disappear.

Mapping the three merging industries (Figure 1) along the mobile Internet value chain illustrates some of the possible problems. All three industries already have established value chains. The telecommunications industry maps into the network and terminal manufacturers and the operators; together they have already established a relationship. The media industry is represented in the value chain by the content provider. The computer industry is more difficult to map onto a specific box in the value chain, since it is part of all the boxes (see Figure 7).

Figure 7: The value chain for the mobile Internet.



### 4.2 Content

Content on the mobile Internet can be anything that is possible to digitize. The content aggregator collects and distributes content from several content developers. From a user's perspective, it is the words, pictures, and sounds—simply, the multimedia experience—that he or she is prepared to pay for. Companies that put this content into the context of a mobile device hope consumers will be willing to pay for it, and maybe even pay more than they would for the same content in a non-mobile device.

Typical content in the media industry includes news, weather, sports scores, stock quotes, traffic information, music, movies, games, and more. The current discussion of content on the mobile Internet often includes the terms *value-adding content*, *premium content*, and *Content with a capital C*. This kind of content should also be separated from user-originated content such as SMS messages and e-mail.

There are two major issues for the content industry today: cost and security. Besides the obvious point that the content developer wants to get paid, security has become one of the major problems for the industry. DRM (digital rights management) technology aims to control the distribution of digitized content in time and space, which is just what the Internet adds. However, with this control comes a competitive advantage to the owner of the DRM system or standard that is often tightly connected to the payment system. There are also strong forces pushing for changes in legislation around digital content and how it can be used and distributed, so there is a great deal of uncertainty about the future.

The media industry is today a highly concentrated and mature market with a few players controlling most of the content: about 20% of the companies control 80% of the content. The existing content industry already has well-established distribution and promotion channels; its use of the mobile Internet for distribution as well as promotion will directly affect those existing channels. Some argue that the new ways of distribution will change the balance between existing relationships in the media industry, but others do not believe this will happen. Historically the content industry has adopted new technology very slowly, trying to exploit existing revenue sources as much as possible before changing and acting in a predatory fashion.

The content aggregators gather and reprocess content from one or many content providers. Content aggregators add value by creating packages that can be more or less customized for the customer and tailored for a mobile device. The content aggregators are often called mobile Internet portals; in fact, many Internet portals also have a mobile Internet portal among their offerings.

The portals would like to be the starting place and the gateway for the user of the mobile Internet. By combining content from different sources and other services, they hope that the user will use their portal to do everything, thus making their services more valuable.

All the players in the value chain have their own approach to controlling the traffic flow and increasing the exposure of their services to the end user. Content creators use interactive content that guides end users, and operators use their control of the network to display their preferred page first. Mobile handset manufacturers use their control of the terminal to have their preferred homepage as a preset bookmark.

### 4.3 Network

The infrastructure equipment is the hardware that connects the different parts of a mobile network. Infrastructure equipment vendors for the mobile Internet are the same vendors that provided the equipment historically for the fixed networks all over the world. It is these companies that are largely pushing the mobile Internet market forward. Banking on the future, infrastructure equipment providers are building networks, even though many of the applications and services that will make those networks economical have not yet been developed.

The network manufacturers also provide network management systems and billing systems specifically for their networks. The management system physically controls the network, and the billing system keeps track of the users on the network and ensures that the operator can charge users for services provided. Once the network is installed and operating, the upgrade of these systems is a major revenue source for the network manufacturers and a way to add new features to the network.

Virtually all telecom network equipment is based on open standards that have been developed jointly by the network manufacturers and operators. However, the open standard only provides interfaces between the main building blocks and uses specialized telecom protocols. This makes these systems more integrated than the Internet-protocol (IP)-based network equipment that builds up the Internet.

The emerging trend in the telecom standard is to move towards IP-based solutions and interfaces between the different components. This will break up the highly integrated telecom networks usually built with equipment from one or two manufacturers and allow new players and a higher degree of specialization from equipment manufacturers.

#### **4.4 System integrator**

The demand for system integration—the assembly of more complex mobile networks consisting of equipment from many vendors—will increase. System integration is becoming a more important part of the traditional telecom equipment vendor business as well as a new field for system integrators that had earlier specialized in building up the Internet. However, because the network suppliers have well-established distribution channels and relationships, system integrators use those channels to gain access to the network operator.

If in the 3G value chain the network constitutes the hardware, the system integrator constitutes the software. Knowledge about equipment from many network manufacturers, as well as repeated implementation projects, has provided the system integrators with a software base that makes traditional billing systems and network management systems provided by network equipment suppliers a subset and an exchangeable part of a larger offering.

The current trend is for applications and services to be developed and implemented primarily by the system integrator. Network providers, operators, content providers, and handset manufacturers have with few exceptions abandoned this field after unsuccessful and expensive trials. One reason was the initial and still existing assumption that applications and services were the same. An application is the technical solution—for example, a billing system or a messaging solution—whereas a service is the complete offering to the customer or end user.

#### **4.5 Operator**

Traditionally, the operator or carrier has owned and operated the network and owned the relationship with the customer. There are also more and more virtual operators that do not own their own network but buy network capacity from other operators and try to differentiate through services or price. These virtual operators are in some cases new businesses with compelling new offerings for end users; in other cases they are existing businesses that have expanded to include the mobile channel as a complement to an existing business. In addition, more and more established operators are letting equipment manufacturers take over the day-to-day operation of their network in an effort to be more cost-efficient.

The first mobile operators were the same as the traditional ones, very often government-owned fixed telecom operators. However, a wave of deregulation all over the world ensured that these monopolies were dissolved and new entrants were allowed. There is, however, still government-enforced control over the air spectrum, how this spectrum is used, and who can use it. This air spectrum translates directly into bandwidth, which has become increasingly scarce, especially with the introduction of 3G, even if spectrum utilization is getting more efficient all the time with new technology. To distribute this bandwidth, many governments around the world have held spectrum auctions, and operators have spent huge amounts for licenses granting them exclusive rights for a certain amount of time (twenty years, for example).

The investment in licenses is based on the operators' expectation that average revenue per user (ARPU) will increase many times over with the new opportunities available with 3G data capacity and new service possibilities. The cost for a new 3G network is a huge investment and not a simple upgrade from existing infrastructure, and equipment vendors have been forced, just as they were during the fixed or mobile network expansion phase, to provide financing to operators to get contracts.

In the 2G networks, operators have been providing primarily voice-centric services, and new service development has been more or less the same thing as revising and upgrading the network management system. The services offered have largely been developed jointly by operators and network equipment providers and openly standardized before being implemented. Because the network features are standardized to ensure interoperability, operators have had to continuously revise and upgrade so as not to fall behind their competitors. With 3G capabilities, operators see possibilities to differentiate themselves and offer unique services, which will require a service development dynamic that is different from the 2G paradigm. The dynamic between operators and network equipment suppliers will need to change, system integrators will have more freedom, and the established role of open standards will also change.

The number of customers that subscribe to a carrier's services has been a measure of success, and terminals have been heavily subsidized by the operators in efforts to rapidly gain control over the market. Prepaid cards have increased this even more, and the number of subsidized phones has in some markets been as much as 80% of the total number of phones sold. Very little segmentation has been done, and all customers are treated equally, as measured by ARPU (average revenue per user). The lack of segmentation makes introducing new services complicated because the group of established subscribers that will be offered the services is not homogeneous. The new 3G services being explicitly aimed to differentiate product offerings might, because of the earlier non-segmented approach, make the operators' existing installed base of users less useful.

## 4.6 Terminal

The terminal is the device in the hands of the end user. It may be a cellular phone, a smart phone, a communicator, a personal digital assistant (PDA), or other device. The terminal business within the telecommunications industry is today highly concentrated and commoditized, and as margins erode, economies of scale have proven to be a key to profitability. Terminals were formerly an expanded product offering from network equipment suppliers but are now a consumer product. Today terminals are distributed and sold almost solely via channels controlled by the operator. When the terminal is subsidized to the end user, it is locked to the network for a period of time so that the operator reduces the churn rate—that is, the number of subscribers that terminate their subscriptions with the operator.

Just as with network upgrades, the possibility for terminal manufacturers to differentiate their applications has been limited and strongly influenced by standardized applications. Differentiation has instead been done on attributes such as design, color, battery performance, display, and simple proprietary games. For the end user, customization possibilities on the terminal now include exchangeable front covers, ring signals, and personal screensavers.

Just as the first handheld 2G terminals pushed the extremes of computing power and battery performance when they were first introduced, the 3G terminals are expected to do the same. The new applications brought forward by application developers will have to be terminated in small computing devices as a client-server relationship. The applications are limited to what is possible to do on a miniaturized terminal, and because of this the range of services is limited as well.

The most advanced terminals today have data capabilities such as CSD (circuit-switched data) or PSD (packet-switched data). They also have proprietary operating systems, and the applications that can run on them are limited to the applications provided by the terminal manufacturers themselves. There is no accessible open application environment that allows the user to change the applications running on a mobile phone or terminal, and because of this there is no established developer community. This is changing and terminal manufacturers are opening up their application environment for outside developers in third-party programs, and several of the larger computer operating systems are making scaled-down versions of their operating systems that should be able to function on a cell phone.

Because of the processor limitations on a mobile terminal and the availability of access via CSD or PSD, there have been some attempts to promote divided concepts where the phone simply acts as a modem and connects to a PDA via infrared or Bluetooth. Many phones do, however, have simple messaging applications and browsers that make it possible to surf the Web and thus access some services. So far these services have been largely unsuccessful according to user perception, though there are some noticeable exceptions such as BlackBerry in the United States, SMS in Europe, and i-mode in Japan.

The branding of terminals is a way for terminal manufacturers to differentiate themselves as well as attract customers and develop a loyal customer base. However, in many markets operators have forced the terminal manufacturer to remove its brand completely or to co-brand by including the operator's brand as well. Looking forward, for 3G services the branding issue is not resolved.

## **4.7 Integration in the value chain**

For several reasons, some companies have been integrating horizontally in an attempt to control the whole value chain. Two that have done so recently are Vivendi Universal and AOL Time Warner. In the case of the mobile Internet the primary reasons for control seem to be time to market and channel access. The time to market would be faster because technology choices could be harmonized in an early stage to avoid technology mismatch, and service concepts could be developed in parallel with the technology. Channel access is important because of the scarcity of frequency spectrum; if the content owner does not have an access channel, he cannot reach the end user.



# 5

## 5. BlackBerry in the USA

BlackBerry™ is a corporate service solution with 320,000 users in more than 15,000 businesses and organizations mostly in North America, but BlackBerry has recently been introduced in Europe. BlackBerry accounts for 67.5 percent of the U.S. keypad device market, which totalled 519,000 units shipped in 2001; only 4,000 units were shipped internationally.

Since it was introduced in 1999, BlackBerry has become entrenched in the enterprise market and is currently the corporate standard for wireless data communications. Initially it was an e-mail solution, and although its functionality has expanded, e-mail is still considered the core functionality. The BlackBerry PDA is essentially a wireless e-mail and paging device. Its service is hugely popular among its users and has been described as “the i-mode of North America.”<sup>3</sup>

<sup>3</sup> Interview by Om Malik with John Doerr, partner at Kleiner Perkins Caufield & Byers, Red Herring, December 5, 2000.

BlackBerry was developed by the Canadian company Research in Motion, Ltd. (RIM), which designs, manufactures, and markets wireless solutions for the mobile communications market. It is based in Waterloo, Ontario, and is listed on the NASDAQ Stock Exchange (NASDAQ: RIMM) and the Toronto Stock Exchange (TSE: RIM). It is no coincidence that much of the BlackBerry functionality and service idea is brought from the pager industry, where RIM has been an important RF (radio frequency) radio component supplier. Initially RIM bought airtime from the Mobitex network and called the service “*distributed* paging”; it was later renamed BlackBerry.<sup>4</sup>

<sup>4</sup> James Balsillie, May 21, 2002.

Users are very positive about how easy and convenient the BlackBerry makes it to receive and send e-mails. It has also become something of a status symbol among its users. Many have grown so addicted to the service that they call it Crackberry, or as Dennis Kavelman, CFO at RIM, described the BlackBerry user: “People that have BlackBerry use voice as their secondary way of communicating.”

The first two versions of the BlackBerry, the pager-sized 950 and palm-sized 957, offered basic messaging capability: a 26-button keypad, an e-mail alert system, and the ability to download and install, for example, Microsoft Outlook and Lotus address books. At this writing in 2002, there are several handheld models priced between \$399 and \$499, the monthly subscription service is \$39.99, and a multitude of upgrades and service enhancements are available for purchase. The new BlackBerry 5810 launched in March 2002 adds voice, SMS, and GPRS and uses Java 2 Micro Edition as its core operating system. With the BlackBerry 5810, RIM also made a strategic announcement that the platform, both server and terminal, will be open to outside developers.

### 5.1 The company: Research in Motion (RIM)

Research in Motion was founded in 1984 by Michael Lazaridis and Douglas Fregin. Lazaridis and James Balsillie are co-chief executive officers. The company started out as a developer, manufacturer, and worldwide original equipment manufacturer (OEM) provider of radio modem technology for the wireless messaging personal communication service (PCS) industry.

Due to heavy product development and market expansion, RIM reported a net loss of \$28.5 million for the fiscal year that ended in March 2002, more than four times higher than the \$6.2 million loss a year earlier and the net income of \$10.5 million in fiscal year 2000. However, the company's revenue keeps growing. For the fiscal year that ended in March, revenues reached \$294.1 million, an increase of 33 percent from the previous year. RIM expects revenues between \$375 million and \$425 million in the fiscal year that ends in 2003. The firm has approximately 1,400 employees and cash assets of over \$672.9 million. Even though revenues are increasing, there is a noticeable decline in the stock that is partially due to the overall declining market.

BlackBerry accounted for 54% of RIM's total revenue in 2001; other RIM wireless handhelds accounted for 37% of revenues during the same period. The remaining 9% of revenue consisted of sales of OEM radio modems, software licenses, non-recurring engineering (NRE) development charges, and wireless PC cards. The results of 2002 suggest that revenues from BlackBerry will account for an increasing amount of RIM's revenues; for the second quarter of 2002, the BlackBerry solution accounted for approximately 68% of revenues.

## 5.2 The service

With e-mail being the ultimate horizontal application, RIM addresses several vertical markets with BlackBerry.<sup>5</sup> There is no predominant vertical industry using BlackBerry today; the financial market constitutes 20% of the subscriber base. Some other vertical industry segments represented among BlackBerry users are law, government, technology, oil and gas, and entertainment. To BlackBerry's advantage is the fact that the enterprise business segment today is striving towards corporate standard environments, for cost reasons, and wants one e-mail system and one wireless system.<sup>6</sup>

Perhaps one of the biggest challenges facing today's corporate mobile professionals is staying connected to their desktop e-mail and organizer information such as contacts, calendar, tasks, and memos while out of the office. Presently, the laptop, cell phones, and wireless PDAs are common solutions for responding to e-mail while on the road.

There are several problems with each of these solutions. First, there is the inconvenience of carrying a cumbersome laptop around just for e-mail. Second, there is the trouble of finding a connection. Third, there is the difficulty negotiating corporate dial-in security. Fourth, there is the cost of phone charges when dialing into the corporate server from remote locations and hotels. Information technology (IT) managers were also not satisfied with the laptop solution because of the challenge of managing modem banks and the vulnerability of opening a path into the corporate network.<sup>7</sup> Also, keypads on cell phones are awkward for typing messages, and the display screens are generally small. Supporting dial-up PDAs is considered too risky because of the lack of security software available for PDAs.

<sup>5</sup> Dennis Kavelman, May 15, 2002.

<sup>6</sup> James Balsillie, May 21, 2002.

<sup>7</sup> James Balsillie, May 21, 2002

The BlackBerry device, RIM's premier product, is the front end of the complete service offered by RIM and what the user interacts with. The BlackBerry is a wireless e-mail pager that incorporates PDA functionality. Unlike a pager or a PDA, it also provides seamless always-on connection to the user's e-mail accounts and allows its user to receive and send e-mails in real time. The latest device from RIM is the BlackBerry 5810 (Figure 8). Although there have been changes from the earlier device presented in 1999, the core functionality is the same. The BlackBerry service solution has several features that build up the attractive offer it presents. According to James Balsillie, the BlackBerry with these features provides "high value per bit."

Figure 8: BlackBerry 5810



BlackBerry is designed to remain on and continuously connected to the wireless network so that the user does not have to constantly check for new incoming e-mails. In other words, it has "push" functionality: the e-mail finds the user. To emphasize this, RIM has trademarked the slogan "Always On, Always Connected." The difference between "push" and "pull" functionality is that with push functionality the user does not have to make a conscious choice to connect to the network, but receives the message in real time. RIM considers the push functionality to be the key factor in BlackBerry's success.<sup>8</sup> BlackBerry incorporates a wireless extension of the user's corporate mailbox, using his or her existing e-mail address. RIM also supplies server and desktop software that allow for further integration of BlackBerry into existing corporate e-mail systems and provides the software and hardware solution for carriers to communicate with the BlackBerry.

<sup>8</sup> James Balsillie, May 21, 2002.

Since companies are expected to put the BlackBerry solution inside their firewall, a secure wireless end-to-end synchronized push connection is necessary. BlackBerry provides a completely secure solution between the corporate e-mail system and the handheld device. BlackBerry uses a U.S.-government-created encryption system that is used by the banking industry to protect sensitive transactions. RIM uses several strategic reference customers such as the National Security Agency (NSA), the U.S. government, the Pentagon, the CIA, the FBI, the White House, and the Navy to emphasize and validate this.

RIM has focused on user friendliness from the beginning. If the user can use e-mail, he or she can use BlackBerry. BlackBerry has a user-friendly thumb-operated QWERTY keyboard and a track wheel (see Figure 8). There is no modem to attach, number to dial in, or antenna to raise. Further, the service works immediately for the end user without a cumbersome installation process.

Besides real-time synchronized e-mails, BlackBerry also provides continuously connected PDA-like personal information management (PIM) functionality that allows organizer information such as contacts, calendar, tasks, and memos to be wirelessly synchronized with the user's desktop. Having established a partnership with Hewlett-Packard, BlackBerry is now capable of mobile network printing as well.

BlackBerry is compatible with platforms such as J2ME™ (Java™ 2, Micro Edition), and the KVM (K-Java Virtual Machine), which allow third-party solutions to integrate with built-in BlackBerry applications. BlackBerry will also be able to run on the General Packet Radio Services (GPRS) standard and support GPRS and future 3G standards such as Wideband Code Division Multiple Access (WCDMA) or the similar standard WCDMA2000. In the latest product, the 5810, voice functionality has been added to the BlackBerry device through the use of an ear-phone. Voice is a product expansion of the messaging functionality that is core to BlackBerry users.

Selling the BlackBerry service is a multilevel sale that involves the end user, the chief information officer (CIO) at the company targeted, the system integrator, and the operator.<sup>9</sup> Until today RIM has primarily addressed the end user and the CIO with a service offering, but the systems integrator and the operators will be more important in the future. The system integrator will build on the new open BlackBerry platform and create solutions where BlackBerry will be the enabling mobile channel in the service integrator's offering.<sup>10</sup> With the new strategy the operator will be the interface to the corporate customer. RIM wants to catalyze the carrier's strategic partnership with the enterprise business and system integrator. The payment for the service will also be handled by the operator rather than by RIM as before. The message that James Balsillie communicated in May 2002 was, "One device, one bill, and one carrier."

<sup>9</sup> James Balsillie, May 21, 2002.

<sup>10</sup> James Balsillie, May 21, 2002.

To execute this new strategy RIM has a dedicated sales team that provides support and training to the operators' corporate customer. The operator can also benefit from the already established relationship between RIM and the corporate data department.

### 5.3 The technology

From the beginning, RIM build up core competence around the design and manufacture of compact and energy-efficient wireless data communication products. This included competence around radio frequency engineering, electronics design, low-level software development (firmware), and product development processes. RIM has sales representation in Europe as well as in Asia, but R&D and manufacturing are located in Canada. Initially the manufacturing was outsourced, but in 1996 RIM build its own manufacturing facility, aiming to improve yield, product quality, and time to market. With the current production level and because of the complexity of new products constantly being introduced, outsourcing is not an option, but there could be a point where outsourcing would prove efficient.<sup>11</sup>

<sup>11</sup> Dennis Kavelman, May 15, 2002.

In May 2002, RIM held 39 patents covering various aspects of its technology achievements within transceivers and power management in miniature devices.<sup>12</sup> All BlackBerry devices are built with RIM's own internally developed chipset. RIM has also entered into several licensing agreements to be able to use other companies' technologies.<sup>13</sup> Two recent press releases June 19 2002 and September 18 2002 suggest that RIM is actively monitoring and pursuing patent infringements.

<sup>12</sup> [www.uspto.gov](http://www.uspto.gov).

<sup>13</sup> Dennis Kavelman, May 15, 2002.

Initially the BlackBerry service used the Mobitex packet-switched, narrowband PCS network, which is designed for wide-area wireless data communications. The Mobitex networks in North America are operated by Cingular Interactive in the United States and Rogers™ AT&T® Wireless in Canada. Cingular's wireless nationwide Mobitex packet data network provides coverage in 260 metropolitan areas in the United States. The choice to use the Mobitex network was an early and critical technology choice made by RIM because, for example, it allows the user to have an e-mail instantly pushed. The same push functionality is possible with the packet-switched GPRS technology (2.5G) that is being introduced globally, and RIM has chosen to let the new BlackBerry 5810 (5820 in Europe) support only GPRS. In the United States, AT&T Wireless and VoiceStream Wireless operate GPRS networks; in Canada, Rogers AT&T Wireless runs a GPRS network.

## 5.4 Alliances

Alliances are increasingly important for RIM to be able to develop both their market and their product and services. Three types of alliances are the most common: alliances with business SW suppliers, with system integrators, and with operators. But it has also had alliances with computer manufacturers, such as Compaq. RIM has on occasion used these alliances for U.S. national targeted advertising and co-branding campaigns.

To develop and deliver a wide range of wireless enterprise solutions, RIM is building alliances with business SW suppliers such as Microsoft, Lotus Notes, Oracle, Sun Microsystems, BEA, Computer Associates, NetIQ, Compaq, Hewlett-Packard, Xerox, Siebel, and SAP. This is a highly concentrated market with few companies, and there is not a big difference between the PIM systems from RIM's point of view.<sup>14</sup>

<sup>14</sup> Dennis Kavelman, May 15, 2002.

RIM encourages system integrators to develop vertical applications for specific industries, such as law, finance, and health care. In addition, RIM has created a reference design program to provide device manufacturers with the technology and tools needed to easily develop and deliver devices based on embedded BlackBerry and Java technologies. The alliances with system integrators (SIs) are in many cases the same as for the business SW suppliers as well as for firms such as IBM Global Services and several of the major global consulting companies.

Alliances with operators such as VoiceStream, AT&T, Nextel, Cingular in the U.S., and several others in Europe and Asia constitute a critical part of the RIM partnering strategy. Initially, RIM bought airtime from the Mobitex network and sold the airtime as part of the service directly to companies. To reach a larger customer base, strategic partnerships with operators have been formed where RIM is offering the BlackBerry service through operators, mainly to corporate customers. It is important to have alliances with many operators because corporations that use BlackBerry require a multitude of networks within a country and also a geographic spread because of the global environment they are working in.

By recently presenting a BlackBerry solution based on Java, RIM has made the service hardware and software transparent—in other words, agnostic as to what handset it is presented on as long as it supports Java. As more and more handsets are supporting Java in combination with new possibilities for operators to provide applications over the air, RIM hopes that BlackBerry will be able to reach and address a substantially larger customer base.



According to James Balsillie, RIM's offering to operators has three important components. First, the BlackBerry is a total service solution, not a single device or a piece of software or stand-alone application. Second, RIM brings to the operator a market that is already developed and established. Finally, RIM can offer operators its expertise in customer care, technical presales, channel development, and sales in an environment that is new for operators. RIM can also achieve economies of scale because there are many similarities among operators.

## 5.5 International expansion

Many of the companies that have BlackBerry solutions are multinational companies that demand a homogeneous IT solution to keep maintenance costs low. The same applies for the alliances that RIM is forming with business SW suppliers, SIs, and carriers. The companies in these alliances are also working in a global environment.

Originally it operated only in North America, but during summer 2002 the service was rolled out in Europe. BlackBerry is currently available in the United States., Canada, the UK, Ireland, the Netherlands, Germany, Italy, and Hong Kong, with additional plans announced in 2002 for Australia, Macau, and Mainland China. So far the only language provided is English, but as markets open up other languages will be available.<sup>15</sup>

<sup>15</sup> Dennis Kavelman, May 15, 2002.

In the UK, RIM announced that Vodaphone would be delivering the BlackBerry solution. Previously in the UK, MOM2 was the only carrier that had announced plans to deliver a BlackBerry solution. Hutchison will deliver Blackberry in Hong Kong. In Italy, Telecom Italia Mobile (TIM) will provide BlackBerry, with Lotus Notes and Microsoft Exchange, in addition to the i-mode offering together with NTT DoCoMo. The trials with TIM have so far shown that the BlackBerry service is received positively and with the same reactions as in the United States.<sup>16</sup>

<sup>16</sup> Dennis Kavelman, May 15, 2002.

## 5.6 Competition

Like many other small but growing companies, BlackBerry will soon appear on large companies' radar screens. There are products on the market that are similar to RIM's BlackBerry device, but few that provide the complete service offering. Many of the larger mobile phone manufacturers such as Nokia and Motorola also have a variety of models with more or less accentuated PIM solutions, but not in combination with the total service solution. Two examples that are close to substitutes are Handspring's TREO based on the Palm operating system, and Danger, which is releasing an end-to-end mobile applications platform in summer 2002 that includes a back-end service.





6

## 6. i-mode in Japan

On February 22, 1999, the Japanese wireless operator DoCoMo launched a service called i-mode, which takes the standard voice-centric phone and adds Internet access, messaging, and data capabilities into an ordinary cellular phone.

The initial i-mode service offering was access to e-mail and a few simple homepages. However, this filled a big need in Japan, where Internet access was not as common as in the United States or Europe. At the end of 1998, Internet penetration in Japan was below 10%,<sup>17</sup> as compared to 25% in the United States<sup>18</sup> and 18% in Europe.

<sup>17</sup> <http://www.asiabiztech.com>

<sup>18</sup> U.S. Government, Bureau of the Census.

<sup>19</sup> Toshimitsu Kawano, April 26, 2001.

i-mode was especially attractive to a young Japanese generation that wanted to communicate with friends. Girls in particular embraced i-mode quickly and soon could be seen typing messages everywhere, especially in the subway. There in the crowded trains, Japanese commuters, who spend two to three hours a day on public transportation, also picked up i-mode. Laptops are too bulky to use on the trains, and it's even hard to read a newspaper, but they can use their i-mode phone to access the Internet, send e-mails, and get news and business-related information.<sup>19</sup>

The success was immediate. The new service had more than a million subscribers within six months, and by the end of 2001 there were no fewer than 22 million subscribers. These figures astonished the telecom people in Europe and the U.S., whose initial skepticism turned to open admiration when i-mode started to take off: "The more users i-mode gets, the more content will be created, and the more content that is created, the more users i-mode gets. It's a positive spiral where DoCoMo is the enabler making sure that everything is working."<sup>20</sup> And as Kei-ichi Enoki put it: "We have successfully introduced the positive "feedback spiral" process of the Internet into the wireless world."<sup>21</sup>

<sup>20</sup> Norihiko Hiro, December 12, 2002.

<sup>21</sup> Enoki Kei-ichi, October 4, 2000.

DoCoMo not only worked with handset manufacturers to create an attractive cell phone according to its own specification, but it also presented an attractive business model for content providers that enabled them to design profitable services for an increasing base of customers.

### 6.1 The company: DoCoMo

Nippon Telegraph and Telephone Public Corporation (NTT) was established in 1952 using the American telecommunication company AT&T as a model. NTT remained a monopoly until 1985, when it was partly privatized into Nippon Telegraph and Telephone Corporation. NTT Mobile Communications Network Inc, containing the wireless activity within NTT, was spun off in 1992.

In 1995, NTT was fully privatized as a publicly owned corporation, and at the same time new common carriers (NCCs) were allowed to enter the Japanese telecom market. The NCCs did find their niche, but competition did not really take off until Japan enforced the World Trade Organization (WTO) agreements in 1998. As a result, NTT was broken up into smaller pieces so that competition would be fair and reasonable for all carriers. However, some still believe that NTT is too dominant in several areas.

Initially DoCoMo struggled with the new cellular technology, and the industry moved slowly, mainly because of high subscription prices. From an internal NTT engineering perspective, DoCoMo was the “black sheep” and clearly not the first choice in the early 1990s. This changed, though, and in 1998, DoCoMo was the most profitable unit within the NTT group, generating more than 50% of the total profit through its cellular phone service.

The first year that fixed telephony declined in Japan was 1997, at the same time that the wireless market was booming. The yearly growth of wireless subscribers was around 20%, and in March 2000 the number of wireless subscribers surpassed the number of fixed phone subscribers. DoCoMo clearly has the dominant position (2002), with a 53% market share of the \$50 billion Japanese mobile cellular services market.

### 6.2 The service

In the second half of 1996, the consulting company McKinsey provided DoCoMo CEO Kouji Ohboshi with a report on how DoCoMo could extend its services beyond voice services to data communication. Ohboshi decided to go ahead, and in the beginning of 1997 the electrical engineer Kei-ichi Enoki, together with Mari Matsunaga, editor for a classified advertising magazine, and Takeshi Natsumo, founder of several Internet start-ups, started to recruit a team. They began putting it together in early 1997, recruiting a cross-functional and by Japanese standards untraditional team (see Figure 9), a strategy that proved successful.

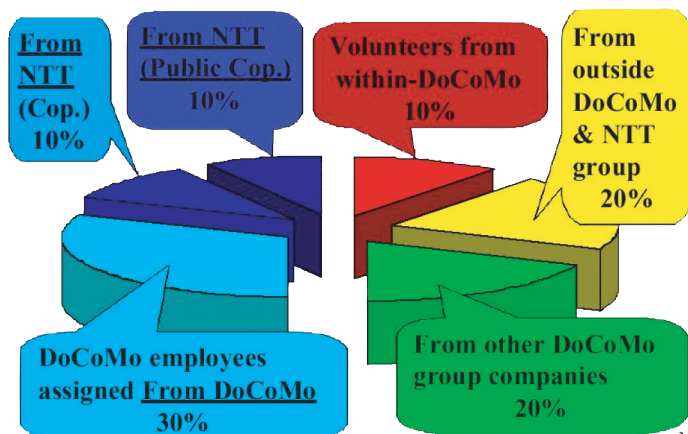


Figure 9: Cross-functional recruiting in the i-mode project team (Kei-ichi Enoki, 2000)

During 1997 the concept, business model, and development process were formed, including specifications work on terminals, network, and interfaces for content providers (see Table 4).

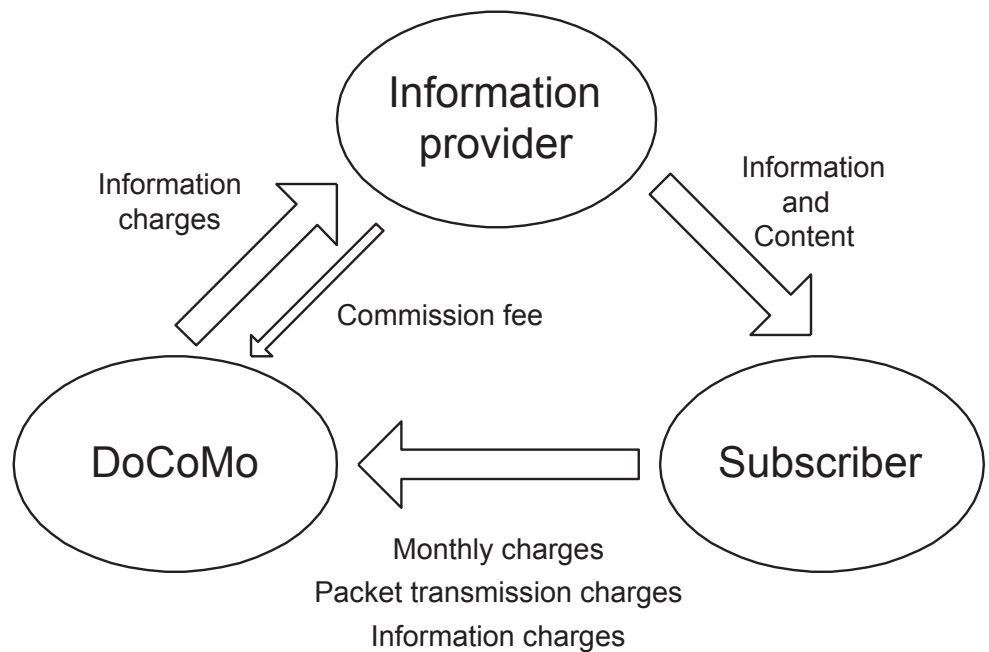
Second half of 1996	Consultant’s report
End of 1996	CEO Decision to start I-mode project
Early 1997	CEO order Kei-ichi Enoki to start project
Spring 1997	Team recruitment
Spring 1997–	Strategy-making; concepts and business
Fall 1997–	Product development; content, terminals, network
Fall 1998–	Sales promotion
February 1999	Launch i-mode service
February 1999–	New services begin

Table 4: Development process of i-mode (Kei-ichi Enoki, 2000)

Specifications need to be detailed and technical and are written mainly by engineers. In the area of providing user-friendliness, Ms. Matsunaga was a non-technical member of the team who provided a clear vision of what non-technical people would want. Her two main contributions to i-mode were to provide exceptional ease of use and to develop the business model that has proven very effective in attracting value-added content and service providers (Vincent, 2001).

Traditionally telecommunications have only two players in the value chain: the subscriber and the service provider. However, DoCoMo successfully tailored i-mode to encompass the content provider and clearly position itself in the value chain of this three-way relationship. DoCoMo describes the i-mode business model as a “virtuous circle” (see Figure 10), and DoCoMo relies heavily on positive feedback cycles that drive a virtuous circle of re-investment in successful content and provide an increase in value to the end user.

Figure 10: i-mode revenue and content flow: the “virtuous circle”



The position taken by DoCoMo early on was to not be a content or information provider. This, together with the fact that the content provider clearly understood DoCoMo’s business model, has clearly contributed to the successful relationship. By controlling the distribution channel to the millions of i-mode phones, DoCoMo is in a favorable position to negotiate terms with the content owners. However, DoCoMo provides such an attractive offer that content owners are waiting in line for access to DoCoMo’s preferred list.

### 6.3 The technology

A technology enabler for i-mode was NTT’s proprietary packet technology PDC-P, which was introduced as the pager service DoPa in 1997. The PDC-P technology could be compared to Mobitex packet-switched in the United States, introduced in 1996, and to GPRS, which was rolled out and introduced in the UK in the middle of 2001. DoPa was not an immediate success but taught DoCoMo a great deal about the packet-based technology and services in the non-voice market. It was not until DoCoMo decided to launch i-mode services based on the packet technology PDC-P that customer usage exploded.

The first assumption was that PDC-P, which only allows for 9.6 K bit/sec compared to GPRS speeds up to 56 K bit/sec, would provide insufficient bandwidth for consumers, but the rapid adoption of the i-mode service proved this assumption to be completely wrong.

There are three main reasons why the bandwidth provided a satisfactory user experience. DoCoMo realized that it needed a maximum size on a homepage (5 KB) as well as on e-mail (0.5 KB); it introduced a markup language, compact html (c-html); and it realized that small screens do not need a lot of information. Looking back, these early technology decisions were critical, though they seem obvious today.

C-html is simply a subset of html, which is the language used on all homepages on the Internet. The choice of c-html was not obvious elsewhere, as in Europe and the United States, where WAP was being developed and heavily promoted by operators as well as technology providers. Although it did not demand more bandwidth, WAP was far more complicated from a developer's point of view, and satisfying developers was a crucial feature of DoCoMo's business model. DoCoMo also provides a set of proprietary APIs (application program interfaces) that the service developer uses to tailor the service to fit the DoCoMo service. Although the i-mode technology is proprietary, DoCoMo holds only a few patents around the technology and claims that it is more or less an open standard.<sup>22</sup>

<sup>22</sup> N. Hirose, interview, December 12, 2002.

There are two other unique aspects that were inherited from the PDC-P but still instrumental to the success of i-mode: "always on" and "pay-per-bit." "Always on" means that voice and data are separated and can be used in parallel, in contrast to the CSD (circuit-switched data) solution initially used for WAP, where the user dials a number and then establishes a data connection. The advantage with packet-switched data (PSD) is that the phone is not busy when using data services, the connection time is much faster, and e-mails are showed instantly. "Pay-per-bit" allowed DoCoMo to charge for the data transmitted and received.

DoCoMo has a very strong and dominating relationship with the handset manufacturers and provides them with clear and detailed specifications for what functionality a handset should have to be able to be sold as a DoCoMo branded handset. The ability to write good specifications is a legacy of NTT's strong background in writing detailed specifications for technology providers.



Figure 11: Selection of 503 Java-enabled i-mode phones

The phone manufacturers are free to decide on design (see Figure 11) and features as long as they follow DoCoMo's technical specifications. From a branding perspective, the difference between a DoCoMo 503 and a 503 from a different manufacturer is that a NEC phone is called N503, a Panasonic P503, and a Fujitsu F503. Every new phone generation with increasingly advanced features is massively promoted by DoCoMo, and the different phone generations are called 501, 502, 503, and 504 (see Table 5). The transition from phase-in to phase-out in the lifecycle of a phone model tends to be short. DoCoMo is subsidizing new phone models to consumers to speed up the adoption of i-mode, but also to make consumers more willing to switch from an old model to a newer one, thus being able to sell more services.

Table 5: History of i-mode handset capabilities

i-mode name	Main Feature
501i	The first i-mode terminal
502i	Part color liquid crystal, arrival of the melody download function and wallpaper modification function.
503i	Java loading SSL
504i	(due Q1/2 2002) Java program size 30K bytes. Transmission speed 28.8 K bit/sec (expectation)

## 6.4 Alliances

Besides technology relationships, DoCoMo has started to build new and important alliances with content providers. DoCoMo also segmented its content providers early on to build up a diversified content portfolio that would add value for i-mode users. The four categories that DoCoMo used to classify content were: transaction, information, data base, and entertainment (see Figure 12).

Figure 12: i-mode content portfolio (Kei-ichi Enoki, 2000)



DoCoMo collects two types of fees from the subscriber: (1) the packet transmission fee that is based on the volume of bits carried, and (2) the monthly subscription and information fee. The charges for these value-added services are added to the subscriber's monthly bill, and DoCoMo acts as a payment broker between the subscriber and the content or information provider. The content provider pays a commission to DoCoMo for this service.



In return for this commission, DoCoMo also provides the basic service framework, the navigation facilities (directory service), and the active promotion of i-mode in Japan. With the potential to reach 38 million i-mode subscribers, the content providers are lining up for an appointment with DoCoMo, and there is a 3-month wait for even an initial meeting.

The price to subscribe to a value-added service is around ¥100–¥300 (\$0.70–\$2.50) per month (see Table 6), and from this DoCoMo takes around 10%; the rest goes directly to the content providers. The basic i-mode subscription is ¥300 (\$2.50) per month, to which the customer has to add the packet transmission charges of ¥0.3/packet (\$0.002) (1 packet = 128 bytes). The costs for some common transactions are approximately: ¥3 (\$0.02) for downloading a menu; ¥8 (\$0.07) an image, and ¥3 (\$0.02) for a music clip. The cost to check one's bank balance is ¥20 (\$0.17), and the cost to check the current packet transmission charges is ¥6 (\$0.05). The rates are considered reasonable by the Japanese, and when multiplied by 38 million subscribers the revenue adds up to a profitable business for DoCoMo and for the content providers.

Service name	Information provider	Description	Subscription fee per month
Weathernews	Weather news	Daily and weekly forecasts	Free
CNN	CNN	24 hours news and information	¥300(\$2.50)
Asahi Shimbun	The Asahi Shimbun	News	¥100(\$0.70)
People's Daily	People's Daily	Chinese news	Free
Nikkei News	Nihon Keizai	Nikkei English	Free
Bloomberg	Bloomberg LP	News, market data, stock quotes, personal watch list	¥300(\$2.50)
Dow Jones	Dow Jones	Global financial news	¥300(\$2.50)
TMTDW	Tokyo-Mitshubishi TD Waterhouse	Latest financial market news; U.S. equity trading services	Free
Disney-i	Disney	Disney character, ring tones, games, and info	¥100(\$0.70)
Pokemolo JOY	XING	Ring tones	¥300(\$2.50)
Miracle GP	Hudson	Car game	¥300(\$2.50)
Imahima!	ImaHima, Inc	Check the status of friends, contact and plan things; create personal pages	¥100(\$0.70)
Cooking Japan	Osaka gas	Recipes and cooking hints	Free
TokyoFoodPage	NokiaJapan	Guide to eating and dining	Free
i-townpage	NTT	Yellow pages (English)	Free
Fedex	Federal Express	Track the status of your package	Free

Table 6: Selection of i-mode services

## 6.5 International expansion

DoCoMo is using its experience in implementing i-mode to license its technology in an attempt to expand internationally, primarily to Europe and the United States.

In Europe, DoCoMo has announced agreements with several operators that will provide access to 20.3 million users (see Table 7). The two main contributions from DoCoMo to the collaborations are technology and know-how around the i-mode service offering. However, the underlying packet network used will be GPRS, which has been rolled out widely in Europe.

The first European collaboration agreement was signed in May 2000 between DoCoMo and KPN Mobile. DoCoMo paid almost \$4 million for 15% of the company and became a minority stakeholder; KPN will license the i-mode business model from DoCoMo.

Getting access to the market through KPN also enables DoCoMo to access the market of E-plus. E-Plus is the third largest operator in Germany, and its shareholders are KPN Mobile N.V. with 77.49% and the BellSouth Corp. with 22.51%. BellSouth exchanged its shares in E-Plus for ordinary shares in Royal KPN N.V. in the second quarter of 2002, after which E-Plus will be fully owned by the KPN group. In the collaboration with the smallest French operator, Bouygues, there has been no capital investment by DoCoMo.

Table 7: i-mode European expansion

Country	Operator	Launch date	Subscribers (million) / (%)
Germany	E-Plus	March 02	7.5 (13%)
Netherlands	KPN Mobile N.V.	April 02	5.2 (42%)
Belgium	KPN Mobile N.V.	June 02	1.0 (12%)
France	Bouygues	Late 2002	6.6 (18%)
UK	Hutch3GUK	Late 2002	0 (3G only)
Total			20.3

Source: NTT DoCoMo (9437) Dresdner Kleinwort Wasserstein.

The first i-mode-enabled GPRS handsets in Europe are from NEC (NEC N21i) and almost identical to their Japanese counterparts. This is an opportunity for NEC as a handset manufacturer to enter the European market, where it has only a 3% market share. In Japan NEC is the leading supplier to DoCoMo and the largest handset manufacturer in Japan.

In an attempt to enter the U.S. market, DoCoMo paid \$9.8 billion, in January 2001, for 16% of the U.S. telecommunication company AT&T Wireless. Due to the strategic alliance with NTT DoCoMo, in April 2001 AT&T decided to divest its 10% ownership in Japan Telecom, which is owned by the Vodafone group. In the agreement between AT&T and DoCoMo, there is a provision that restricts AT&T future operations and provisions that may require AT&T to repurchase DoCoMo's interest in AT&T, if certain specified conditions are not met.



## 6.6 Competition

The GSM Association, representing operators and manufacturers using Europe's prevailing mobile technology, in 2001 revealed their answer to i-mode, called m-services. The m-services initiative set standards designed to increase the use of wireless Internet services. The standard has not been adopted by anyone other than Telecom Italia Mobile (TIM), but the association plans future revisions.

The primary goal of the industry association WAP Forum is to bring together companies from all segments of the wireless industry value chain to ensure product interoperability and growth of the wireless market. Most of the global handset manufacturers (90%), carriers with approximately 650 million subscribers, and infrastructure providers have chosen to work with WAP within the WAP Forum. NTT DoCoMo is also a member.

WAP addresses only the technical feasibility and not the business model, which is up to the service provider to establish. The WAP standard was heavily promoted at the time that i-mode was introduced, but the expectations raised were not met. The combination of hype and miscommunication generated a discrepancy between expectations and what can be done. WAP did not meet initial end-user expectations, as Robert Brown, chief executive of the WAP Forum, stated in an interview: "I wasn't impressed with the first versions of WAP. It was tough to use."<sup>23</sup> However, the WAP Forum is continuously working on the standard, and the current release is supposed to incorporate c-html.

<sup>23</sup> Robert Brown, Reuters, November 15, 2001.

Microsoft is trying to establish itself as a player in the wireless sphere both with operating systems that can run on a small footprint such as a cell phone and on the server side as a technology provider to operators. Samsung has announced a phone with Microsoft Mobile Explorer 3.0 with support for html, c-html, and WAP 2.0. So far there has been little interest among operators in working with Microsoft; they see Microsoft's move into services as a potential threat. Although there are some Microsoft-enabled phones with GPRS on the market, the installed base has not reached the critical mass needed for developers and content providers to start developing services.

In Japan, DoCoMo faces competition from two other operators, KDDI and J-Phone (part of Vodafone group), which have launched services similar to i-mode's but with different proprietary technology. KDDI operates five cellular networks comprising two cdmaOne networks, two PDC networks, and one PHS network. Japan Telecom operates two PDC networks, one being the former Digital TU-KA brand. Astel competes with DDI Pocket and NTT DoCoMo Personal in the PHS market.

The overall dominant position of NTT DoCoMo has not discouraged KDDI and Japan Telecom because they are designing and conducting tests for 3G cellular services. The initial response to the 3G network launch in Japan is that DoCoMo is not growing as fast as expected and losing share of the market to KDDI and J-Telecom.



# 7

## 7. SMS in Europe

The first short message is believed to have been sent in December 1992 from a PC to a mobile phone on the Vodafone GSM network in Newberry in the UK. Three years later, in 1995, Short Message Service (SMS) was being introduced as a service for commercial use. In September 1999, SMS use exceeded 100 million messages per month, and in August 2001 SMS traffic reached 1 billion a month in Europe. SMS is the dominant data contributor to carriers' average revenue per user (ARPU) and accounts for approximately 10% of total revenues. Person-to-person (P2P) messaging is the most popular form of SMS at present, accounting for 95 percent of total text messaging traffic.

SMS is one of the few services that have grown very fast without corresponding decreases in pricing. Usually price reductions in the cost of the phones and phone service have led to increases in usage. Even as these factors have helped to bring younger people into the mobile market, the price of SMS itself has stayed steady because the networks have had trouble handling the volume of messages being sent.

The accidental success of the SMS revolution took the whole mobile industry by surprise. There was hardly any promotion by operators until after SMS appeared on its way to becoming a winner. Then SMS advertising went from showing businesspeople in suits entering text messages to brightly colored advertisements aimed at youth markets. According to Jim Healy, chairman of the GSM association, "What was relatively a cult following just a couple of years ago is a mass-market phenomenon today."

Initially, SMS was very difficult to use because of the complicated man-machine interface. Because the entry barriers to learning how to use the service were so high meant that parents, teachers, and other adult authority figures were unable and unwilling to use the service.<sup>24</sup> But the young generation overcame this to become the SMS or text generation.

<sup>24</sup> <http://www.mobilesms.com>

### 7.1 The standard: SMS

The infrastructure that is used to send an SMS and to make a regular mobile phone call in Europe is called Global System for Mobile Communications (GSM). GSM is the dominant non-proprietary mobile standard in Europe and is jointly developed by operators and equipment manufacturers within the framework of the European Telecommunications Standards Institute (ETSI).<sup>25</sup> GSM has been largely successful in Europe, but also in many other places around the world. In March 2002 there were 400 GSM operators with 677 million customers (71% of the total digital wireless market) in 178 countries. The top 12 markets in Europe sent almost a billion SMS's per month in the beginning of 2002, and this number is still increasing. The GSM penetration is 69% in the same market (see Table 8).

<sup>25</sup> <http://www.etsi.org>



Country	Population (million)	GSM subscribers (million)/%	SMS messages per month (million)
Germany	82.2	55/67	200
Italy	57.8	47/81	150
Finland	5.2	4/77	75
UK	60	43.4/72	70
Norway	4.5	3.3/73	70
Sweden	8.9	6.7/75	70
Portugal	10	7.5/75	60
France	59.2	33.7/57	60
Spain	39.8	26.8/67	60
Denmark	5.4	3.9/72	50
Belgium	10.3	7/68	25
Greece	10.9	7/64	15
TOTAL	354,2	245,3/69	1 Billion

Table 8: Top SMS volumes in the European market, 2001

The introduction of SMS in Europe led by Vodafone and the other UK operators was immediately followed by most of the other European operators. The UK was influential in the introduction of SMS and its ongoing development; Table 9 shows some of the milestones. Besides the fact that all European operators are part of the GSM family and use the GSM standard, there are some factors that have been instrumental in the success of SMS, namely prepaid subscriptions, new services, improved devices, and Internetworking.

December 1992	The first short message is sent in from a PC to a mobile phone on the Vodafone GSM network in Newberry in the UK
January 1995	SMS messaging introduced on mobile networks for commercial use
January 1999	Inter-carrier SMS enabled in the UK (40 million SMS messages recorded)
September 1999	SMS usage exceeds 100 million messages per month
May 2000	SMS traffic hits half a billion a month
June 2001	BBC airs a 45-minute documentary dedicated to SMS
August 2001	SMS traffic hits 1 billion a month
2002	43 million texts sent every day; 1 billion per month

Table 9: Short SMS timeline with a UK focus

## 7.2 The service

The introduction of heavily subsidized prepaid mobile tariffs in which people could pay for their airtime in advance and thereby control their mobile phone expenditures was a key factor that accelerated the acceptance of SMS. Initially the network operators were technically unable to pre-bill customers for their SMS usage because the links between the prepay platform and the billing system and the SMS centers were not in place.

A problem for the operators was that the prepay phones supported the SMS service, and this loophole soon spread through the Internet and word of mouth to many youngsters. This resulted in additional millions of SMS messages being sent, with some individual mobile phone subscriptions accounting for thousands of SMS's per month alone as they set up automated message generators.

Network operators worked with their infrastructure suppliers to sort this out and to begin charging for SMS for prepaying customers. Meanwhile SMS incubated and spread because it cost people nothing to use, whereas carrying out the same transaction using voice clearly did cost. After a few months, the network operators finally managed to implement a way of charging for SMS use by deducting the cost of an SMS message from the prepayment.

A mass SMS message distribution campaign was typically sent out at this time so that everyone who had used SMS received a text message informing them that from a certain date forward there would be a fee for SMS. This led to an immediate decline of 25–40% in SMS usage. However, within months the volume of SMS messages increased again and soon reached its previous levels.

The growth in SMS volume was fueled by simple person-to-person messaging (P2P) as people told each other how they were feeling and what they were doing. While it was free, SMS had become an important part of the way that young people communicated with each other in their daily lives. SMS would have taken off without the prepayment factor because it was already being used before that time, but it would not have taken off as quickly.

Even though all SMS functionality is standardized and described in the GSM standard, the freedom to design and implement features is up to the manufacturer. Nokia, the leader in mobile phones, realized early on that SMS messaging was a source of revenue for the operator and was first to market with a phone able to send SMS, a phone with predictive text input, a phone with binary SMS possibilities thus enabling “ring tones,” and picture “picture messaging,” a phone with concatenated SMS, a phone with chat messaging functionality, and several other types.

The first SMS was voicemail notification, which simply indicated that there was a voice message waiting. This was usually indicated with an icon that lit up on the small screen and beeped. Voicemail was important because mobile phones are often turned off for charging or for privacy or are out of reach of the network. Here Nokia launched the first commercially available phone that could send and retrieve SMS. The input was made using the number keypad where each number corresponded to three characters. All other manufacturers soon developed the functionality to send SMSs. Some kids had an amazing ability to use their thumbs to tap in SMS messages using abbreviations such as “c u l8er” for “See you later” and “smiley faces” to convey their mood.

To make SMS input easier, Nokia licensed predictive text input algorithms called T9 from a U.S. company, Tegic Communications, that anticipate which word the user is trying to generate using a linguistic data base. The algorithm supports several languages and significantly reduces the number of keystrokes required to input a message. Today most phones use T9 from Tegic or similar algorithms, but there has also been attempt to attach a QWERTY keyboard to a mobile phone. For example, Ericsson launched such a keyboard as an accessory named chat-board. There are also high-end terminals such as smart phones that make it easier for users to originate, reply to, and access messages through the built-in QWERTY keyboard rather than the limited keypad on standard mobile phones.

The next great success for SMS-based services was ring tones. Once again Nokia was first. Nokia had started its smart messaging protocol based on binary SMS rather than the standard text SMS. Nokia had expected this technology to be used for information services. It had languished for years until suddenly, in 2000, it found an application that allowed users to change the way their mobile phones rang. Nokia had now reached a clearly dominant position with more than 30% market share and could therefore introduce this service that was not compatible with the GSM standard; it actually created problems when users not using Nokia phones received binary SMSs that appeared as nonsense on the screen.

Several operators objected that Nokia did not follow the existing standard and thus created problems in their helpdesks, but end users as well as ring signal developers loved the new service, and operators gave in to customer pressure. Because the network operators were unable to offer the ring tone suppliers fair and flexible revenue sharing, the service providers started using interactive voice response (IVR) platforms to trigger the transmission of ring tones. The ring tones market soon became a billion dollar market that few network operators even offered. This market was completely dominated by independent service providers who advertised in newspapers and magazines using so-called bulk SMS to distribute their ring signals and pictures.

Following the success with downloadable ring signals, Nokia introduced phones that could handle concatenated SMSs that were marked as optional in the standard by the time and not used by anyone else. Concatenated messaging allows longer messages, and the Nokia 3310, for example, automatically connects up to three messages to create a message almost three times longer than the standard SMS message. Strengthened by its success with ring signals, Nokia once again disregarded the standard and the GSM community and implemented a feature that was not supported in other handsets. To further build on this new capability to send and receive more information in a concatenated SMS and to handle binary SMSs, Nokia introduced picture messaging. Picture messaging allowed the user to download pictures that could be used, for example, as screensavers; just as ring signals had been, this new service was dominated by independent service providers. In addition, Nokia introduced Club Nokia, which allowed a user to buy and download both ring signals and pictures.

The rest of the phone manufacturers did not have the installed base and pull factor to drive the product development as individual companies. Therefore, initiatives were made in the standardization bodies to standardize around these new attractive services introduced by Nokia, and the first outcome was EMS (enhanced SMS). EMS standardized what Nokia phones already could do with ring signals and picture messaging, but now it was harmonized within the GSM standard, and Nokia after some pressure agreed to open up its specifications. The next real development in messaging was MMS (multimedia messaging), heavily pushed by Nokia, but now it had no difficulty convincing other manufacturers and operators what direction messaging was going.

## 7.3 The Technology

An SMS consists of text of up to 160 characters, which can be sent to a phone whether or not it is engaged in a call. Those 160 characters can consist of words or numbers or an alphanumeric combination. Non-text-based short messages in binary format are also supported. The effect of this is to give the mobile phone the facilities of an alphanumeric pager, but with confirmed delivery of messages. Unlike with a pager, the system holds undelivered messages and resends them at intervals until receipt is confirmed.

The Short Message Service is a store-and-forward service; in other words, short messages are not sent directly from sender to recipient, but always via a short messaging service center (SMSC). Each mobile telephone network that supports SMS has one or more messaging centers to handle and manage the short messages (see Figure 13 for a network overview and Table 10 for an explanation of abbreviations).

Discussions of SMS usually refer to two basic point-to-point services. One is mobile-originated (MO) short messages that are usually typed into the handset and then transported to the SMSC where they can be sent to another mobile or on to a network service, such as a Web application. The other is mobile-terminated (MT) short messages that are transported from the SMSC to the handset and can be sent to the SMSC from other mobile subscribers via MO or by other sources.

Figure 13: SMS network structure

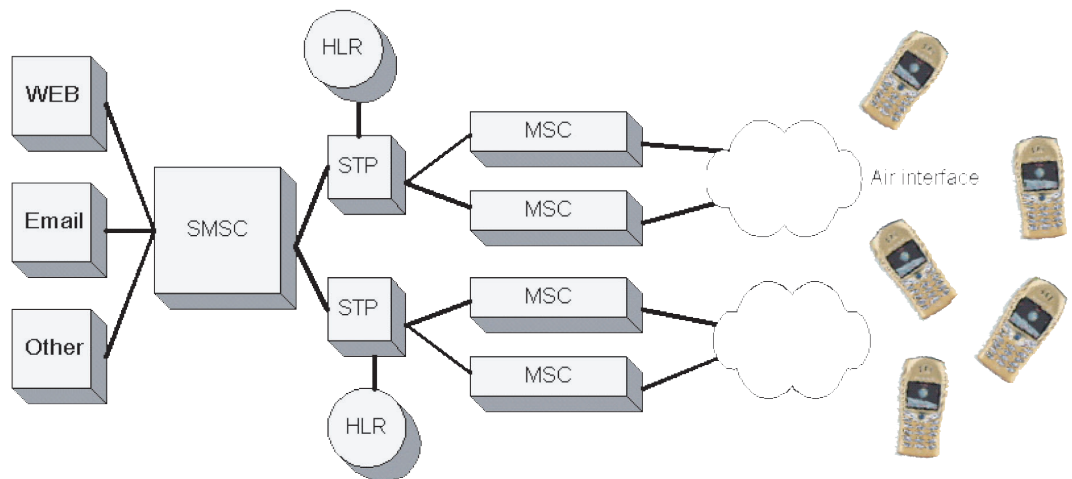


Table 10: SMS network structure overview

MS	Mobile station
MSC	Mobile services switching center
HLR	Home location register
SMSC	Short message service center
STP	Signal transfer point



The Short Message Service features confirmation of message delivery. This means that, unlike with paging, users do not simply send a short message and trust and hope that it gets delivered. Instead the sender of the short message can receive a return message indicating whether the short message was successfully delivered.

It is possible to send longer short messages with the help of concatenation (stringing several short messages together) and SMS compression (getting more than 160 characters of information within a single short message). These features have been defined and incorporated in the GSM SMS standards.

Short messages can be sent and received simultaneously with GSM voice, data, and fax calls. This is possible because voice, data, and fax calls take over a dedicated radio channel for the duration of the call, and short messages travel over and above the radio channel using the signalling path. Thus users of SMS rarely if ever get a busy signal, even during peak network usage times. Even though SMS uses a dedicated signalling channel, it is not really possible to talk about bandwidth because only one packet is sent. It is, however, possible to use the SMS signalling channel to WAP as defined in the WAP standard, and then the effective transmission is 2 to 3K bit/sec.

The SMSC is an integral part of the network—surprisingly so since this part of the network is not manufactured by the traditional network manufacturers. One reason for this was that the network suppliers did not realize the full potential of data communication until after the new SMSC suppliers had established a firm position on the market. Ericsson, for example, did not offer a stand-alone SMSC but integrated the SMCS with a voicemail answering service. This was the logical solution because this was what the standard described, and according to the standard was what the SMS should be used for. When SMS usage exploded, the integrated SMSC voicemail did not follow the market need and was soon terminated.

### 7.3 Alliances

One of the key features of SMS is that the voice and signaling channels are separate and therefore can be used in parallel. This way the data transmission and messages can be both sent and received while the user is talking; the user does not have to dial a modem to set up a data connection but is always connected.

No one would buy a phone that could only call within a mobile network. Likewise, it is natural that a user should be able to call another user subscribing to another carrier's services and regular landline phones. However, initially this was not the case for SMS, and interoperability for SMS traffic was not possible until 1997 in Germany and not until April 1999 in the UK, with the rest of Europe following within a year. Once the interoperability problems started to be resolved, SMS traffic increased many times over.

In the same way that the calling party pays for the phone call in Europe, the sending party pays for the outgoing SMS. When interoperability started to become more and more common and operators started to consolidate, the foundation for bulk SMS was laid. Bulk SMS is used by service providers who want to send SMS as part of a service offering such as a stock information service. Another such service could be sending a free SMS from a webpage to a mobile phone. The service provider uses this free service to attract users to the homepage and expects revenues from the other services on the homepage or simply banner advertisements.

Rather than paying the same price as a mobile user, the service provider negotiates a bulk price with an SMS wholesale activity provider. The SMS wholesale agreement is made by someone who buys capacity from operators or by someone who owns an SMSC that is interoperable with other SMSCs. As an example, the Vodafone-affiliated operator D2 received nearly one-third of data revenue, or 5% of total revenue from bulk SMS.

As a result of the escalating interoperability and the increased use of bulk SMS, operators such as Vodafone started to complain about the escalating number of incoming SMSs that spammed its users. The initial response was to simply block SMS from some SMSC owners, such as Swisscom's SMSC, which was charged very little for sending an SMS. Vodafone was followed by other operators who felt that the number of outgoing SMSs was far less than incoming SMSs, and since mid-2001, several mobile operators have introduced an interconnect charge per message for every SMS sent to their subscribers. The interconnect fee is meant to balance the SMS traffic between, for example, operators with many users and wholesale SMS providers with no users and only outgoing SMSs.

Table 11: Examples of interconnect charges

Operator/Country	Interconnect charges
Vodafone/UK	0,08 Euro
Bouygues/France	0,08 Euro
Amena/Spain	0,10 Euro
Telefonica/Spain	0,10 Euro
All/Sweden	0,04 Euro
Quam/Germany	0,025 Euro
E-Plus/Germany	0,065 Euro
Viag Interkom/Germany	0,05 Euro

Source: <http://www.smsitaly.com>

The network operator in a country will not allow roaming or interoperability between different networks. This means that a subscriber can receive a signal from a network, but if this signal is not from the carrier subscribed to, the network will be blocked and inaccessible.

## 7.5 International expansion

SMS usage in the United States is not high compared to that in Europe and some parts of Asia. One of the major reasons for this is the lack of one standard such as GSM, even though this is changing with announcements from AT&T and others. Moreover, interoperability between U.S. operators is still far from being realized, and pricing is not consistent.

Unlike in Europe, the U.S. cellular industry and cellular operators had little incentive to standardize services. For example, most U.S. operators chose not to implement two-way SMS, with the result that AT&T and Verizon phones could receive messages but could not originate them. Sprint phones are two-way, although the subscriber must choose the plan as part of the service package. Voicestream/Omnipoint is a GSM carrier that includes two-way SMS as part of the basic service.

The interoperability issues could change as many U.S. operators begin to implement and shift to GSM technology. This is the same technology that is used in Europe, except for frequency. With a mobile phone replacement cycle of approximately 18 months in the United States, and with interoperability issues being resolved, SMS usage is predicted to increase. Pricing and billing issues are also being discussed but will not be resolved until the service is fully available.

The U.S. pager industry is still larger than that in Europe because of the good coverage provided by the Mobitex system. In Europe most pager communication is now done over mobile phones using SMS. If Europe sets the stage for what is to come in the mobile market in North America, it is only a matter of time before pagers become obsolete in the U.S. as well.

There are two other dynamics at work in the U.S. that need to be factored into the future of SMS: instant messaging and two-way paging. American teens, used to zapping instant messages (IMs) in multiple windows, will be a tough crowd to convince that tapping short messages on cell phones is useful. And U.S. paging users prefer the small devices like the BlackBerry and the Motorola equivalents for sending messages, especially after these devices were picked up by everyone from kids to Capitol Hill staffers.

## 7.6 Competition

Direct competition today to SMS is almost nonexistent in Europe because of the strong dominance of GSM. The introduction of new packet data services in 2.5G and 3G will enable a range of new applications. However, new service offerings such as multimedia messaging, i-mode, instant messaging, and e-mail on a multitude of different devices will very likely substitute for SMS. MMS is an expansion of SMS in functionality, but even more important it is a continuation of the established business model for SMS. The pay-per-message model would not likely be accepted for e-mails or instant messages, for example.







## 8. Analysis

*This chapter analyzes the cases, applying the theories and using the methodology discussed earlier. The cases are analyzed within themselves and compared with each other as well as with the theory in an attempt to extract the key elements of a successful service strategy for the mobile Internet.*

### 8.1 Standards and the mobile Internet

When comparing the factors that are key assets, the difference between i-mode and BlackBerry is small, whereas they both differ greatly from SMS (see Table 10). The reason is that SMS is an open standard and i-mode and BlackBerry are industry standards. The SMS column should be viewed subjectively as typical for an operator providing SMS.

Table 12: Comparison of critical factors for standard development

Critical factor	i-mode	BlackBerry	SMS
Control over an installed base of users	yes	yes	no
Intellectual property rights	yes	yes	no
Ability to innovate	yes	yes	no
First- mover advantage	yes	yes	no
Manufacturing capabilities	no	yes	no
Strength in complements	yes	no	yes
Brand name and reputation	yes	yes	no

#### Control over an installed base of users

Both i-mode and BlackBerry have clear control over their installed base of users; SMS does not. The control consists of mainly three factors and is aiming at increasing switching cost and customer loyalty. First, these companies segmented the customer base and thus know more about the customer than just the phone number and billing address. Second, they keep personal user information for each customer, which is valuable and not easily or conveniently recreated. Third, they lock the user into a user paradigm, which includes the functionality of the service, the way of billing, and the graphical user interface (GUI).

DoCoMo's strategy for geographic expansion of i-mode is to license and in some cases be a part-time owner of the operator that deploys i-mode. When doing this DoCoMo loses the control of customer base. In product expansion DoCoMo is trying to keep its customers while moving to the new 3G technology. The challenge DoCoMo faces is that the installed base of users is only interested in switching if there is a clear benefit in doing so—for new services, for example—but the content provider is not interested in developing its service offering until the installed base is large enough.

RIM is making a strategic geographic expansion with its BlackBerry service and licenses out its BlackBerry solution to European and Asian operators. In these markets it can benefit from relationships with global companies already using BlackBerry in the U.S. and from their relationship with systems integrators and computer software manufacturers that sell to a global market. This means that RIM is giving up control over the installed base of users.

SMS is dependent on the GSM standard for its geographic expansion because of its deep technical connection to the GSM architecture. As the telecommunication systems are opened up in the 2.5G and even more in 3G, the connection between next-generation SMS—e.g., MMS—and the network is much smaller. This means that another solution or group of solutions originated from, for example, the computer industry could replace MMS. MMS allows for a great deal of new services to be delivered, but the lack of customer segmentation by the operators makes the service rollout hard. The operator therefore needs to gain control over the installed base of users or lose business to service providers that have such control.

### **Intellectual property rights**

All three service solutions have extensive intellectual property and know-how protection. The GSM standard is protected by patents held by the different participants in the standardization forum but licensed from them to the same forum. The dependence between the networks and the SMS application makes it hard to separate out patents directly relating to SMS, but this is not the case when looking towards the follow-up MMS. The new multimedia messaging includes multimedia components, security components incorporated from other companies, and standardization bodies within both the computer industry and the media industry. Know-how, held by the various implementers of the standard within the telecommunication industry, has been a barrier to entry because of its complexity. These barriers will be reduced as, for example, the multimedia components of MMS are developed outside the telecom world.

DoCoMo does not have many patents protecting the i-mode service but has extensive know-how of the solution and owns the specifications as well. It is dependent upon technology providers to supply network and terminals as well as content providers to create value-added content that will fit its technology solution. DoCoMo's competition in Japan can supply the same content as DoCoMo, but the content provider needs to format the content to fit. The reason for DoCoMo to choose proprietary solutions is mainly to be first to market, but by not following standards DoCoMo has encountered problems when expanding to new markets outside Japan.

RIM's BlackBerry solution and its handheld devices are patented. The enforcement of patents by legal action is traditionally stronger in the United States than in Europe, and RIM is actively protecting its intellectual property rights.

### **Ability to innovate**

The ability to innovate would allow companies to make proprietary extensions to an existing standard. This is, for example, highly important for implementers of SMS and is exemplified by Nokia, which repeatedly and aggressively developed and implemented new solutions that in some cases did not even follow the standard. By focusing on messaging and putting resources into the development of applications as well as services, its rate of innovation was much higher than that of its competitors; and even more important, Nokia's decision to focus on messaging was strategically correct.

Early on, DoCoMo made a strategic decision to focus on the i-mode service. By rapidly forming a team to execute it, it quickly went through the development process and successfully launched the service. However, the other operators in Japan are positioning themselves as price pressers like KDDI and as product differentiators like J-Phone, thus attacking DoCoMo from two flanks.

RIM's ability to innovate and extend existing standards has been successful, and the service is constantly expanding to satisfy new needs within RIM's target market.

### **First-mover advantage**

Both DoCoMo and RIM early on gained a first-mover advantage by having done a lot of product development and being far along the learning curve when competition finally appeared. This advantage needs to be protected, but since both services are built on industry standards the first-mover advantage becomes even stronger.

Because the SMS standard is open to all companies participating, both Vodafone and Nokia were able to gain a first-mover advantage. Their active involvement in the standardization and aggressive product development ensured that they had products on the market early. One problem is that products being launched before the standard is ready and finalized could be forced to be changed to comply. Individual companies are making enormous political efforts to get standardization bodies to position the standard in ways that are most advantageous to their companies' products. The attempts to openly standardize service models are very complicated because these are directly linked to a company's business models and therefore mendaciously protected.

### **Manufacturing capabilities**

To be able to successfully execute a product strategy based on an open standard such as SMS, it is clearly beneficial to have good manufacturing capabilities because the competitive advantage of having patent protection is limited. Nokia is one example how the mix of the right product and market strategy turns into volume and economies of scale.

BlackBerry has chosen to maintain and expand its own manufacturing capabilities by focusing on being the first to market with complex products. When opening up the BlackBerry platform to Java, the manufacturing capabilities of devices will be less important to RIM.

DoCoMo only designs and makes specifications and therefore exercises a high level of control over technology providers. DoCoMo does not have its own manufacturing.

### **Strength in complements**

Companies with strength in complements will add to their overall profitability by increasing their sale of core products.



BlackBerry is promoting complements but lacks the financial resources to really make a significant difference. DoCoMo is pushing to have i-mode accepted and is working on several fronts to increase the acceptance of i-mode by promoting media components of the standard, micro billing systems, and other features that would allow i-mode to expand.

Nokia is trying to complement SMS in various ways to make SMS even more adopted and thus sell more phones. Club Nokia, for example, is building up an online community that promotes value-added services such as ring signals, icons, and other features specifically for Nokia phones.

### **Brand name and reputation**

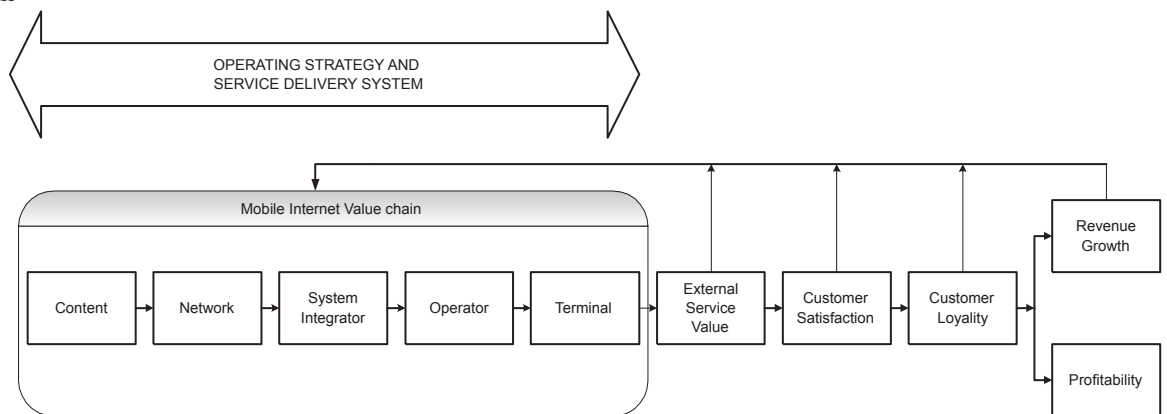
Both BlackBerry and i-mode are well-recognized brand names, and both have been heavily promoted by RIM and DoCoMo. RIM has benefited from a grass-roots campaign and tremendous media exposure through well-managed public relations. In the same way, i-mode has become synonymous with mobile Internet services, and there is no other mobile service that is close in comparison. Consumers who buy an i-mode phone or a BlackBerry associate the brand names with many values.

SMS as well as GSM are both well known and can be used in marketing by companies that design, manufacture, and sell compatible products. The positive impact of the words “GSM approved” is, however, more limited to business-to-business relationships and not interesting for end users or consumers because they can only choose from approved products.

## **8.2 Service profit chain and mobile Internet value chain**

The service profit chain establishes the relationships between operating strategy and service delivery systems via the external service value received by customers and their concomitant satisfaction and loyalty, which generate revenue growth and profitability. By replacing operating strategy and service delivery systems in Figure 6 with the mobile Internet value chain in Figure 4 we establish the service model that can be applied on the mobile Internet (see Figure 14). The extension from the original service profit chain model is to apply it to technology development, which in this thesis is called service-driven technology development, and more complex and yet undefined value chains such as the mobile Internet value chain. The extension from the value-chain model constituting the value-added activities is that the service and the feedback from the service become an integral part of the mobile Internet value chain.

Figure 14: Service profit chain and mobile Internet value chain



The feedback to the different parts of the value chain from external service value, customer satisfaction, customer loyalty, and revenue growth, as well as profitability, is described in Table 13 for all three cases. The feedback from the elements in the service profit chain should be viewed as a subjective average and to what extent the whole service profit chain correlates to the five different stakeholders that constitutes the mobile Internet value chain. High correlation could, for example, be mean that a technology provider has direct interaction with customers in billing and/or feedback, and low correlation could mean that a technology provider has little or no end-user interaction.

In a successful service offering the external service value is not only the cost but also the result achieved for the customer. Value is always relative and based both on perceptions of the way a service is delivered and on initial customer expectations. The wireless application protocol (WAP) introduction is a good example of how expectations were raised to a level beyond what WAP could offer. When the service has the right external value, customer satisfaction and customer loyalty would be the next two steps that would drive growth and profitability. DoCoMo exemplifies this with the virtuous circle illustrated in Figure 10. In the virtuous circle DoCoMo creates the external customer value by increasing and refining the available content, which attracts more customers; likewise, with more customers DoCoMo is motivated to provide more customer value. BlackBerry can grow and become more profitable by increasing geographic coverage through agreements with operators, thus allowing corporate customers to have one global mobile service solution.

An important argument in services is that the “quality” of market share, measured in terms of customer loyalty, deserves just as much attention as quantity of share. This is exemplified best with RIM’s BlackBerry enterprise solution, which has a segmented approach to targeting the enterprise market in a way that that can extract premium prices from traditional email by adding the value of mobility. In contrast, short messages are an example of quantity: the content—that is, the actual SMSs—is created and received by the users in a mobile environment that makes the ability to send and receive messages valuable.

CORRELATION	I-MODE	BLACKBERRY	SMS
Content	High	High	Low
Network	Low	Low	Low
System Integrator	Low	Low	Low
Operator	High	Low	High
Terminal	Low	High	Low

Table 13: Correlation between service profit chain and mobile Internet value chain

## Content

In the i-mode and BlackBerry cases the correlation between content and the service profit chain is high. In all three cases messaging and communication was the initial driver, but the transition to more value-added content-oriented services has been made by i-mode and BlackBerry, but not in SMS. Simplicity has been a driver in all cases, where simplicity means how complicated it is to activate and access the service. Simple access means that the service is just a click away without a complicated configuration procedure.

DoCoMo succeeded in the i-mode case at implementing the virtuous circle, which exemplifies a service model where the user can subscribe to value-added content and the content provider can get feedback about subscribers as well as service usage. By segmenting the content, DoCoMo ensured its ability to collect data about what segments were popular and use this to improve and refine their offering. This approach has given DoCoMo valuable information about its customer base. DoCoMo can use the same segmented approach globally to make i-mode successful in new markets by allowing for local content.

By approaching a specific segment, RIM has to tailor its expanded service offering accordingly. This is in strong contrast to the top-down technology and industry led approaches to other non-voice services such as WAP without a target market. RIM's initial mobile email notification and reply service has developed into a mobile personal information management (PIM) system and incorporates interfaces to the largest business software vendors.

The SMS service is still a pure messaging service, and the incorporation of value-added services has not been easy. The standard was not initially aimed at value-added services, and many of the pieces required to make a complete service offering were missing. SMS was a triumph of the consumer and grassroots revolution that the mobile industry, with few exceptions, had next to nothing to do with and only passively reacted to. Content providers have tried to create solutions with the existing structure based on SMS, but have encountered problems, such as interconnect fees, because of conflicting business interests.

## Network and systems integrators

The network and systems integrators have little or no interaction with the customer but have an important part in the mobile Internet service chain because they will supply the hardware, and to some extent the software, that will enable services. The telecommunications industry (unlike the computer industry) is highly integrated, and there are high barriers to entry for new companies and new solutions. Even a large company like Microsoft has problems entering this market for this reason.

Creating the new applications that are needed to successfully support a service offering is difficult because of the high integration unless a company, like DoCoMo, can influence and control the network and system integrators—through specifications, for example. BlackBerry created its own solution and was able to do so because of its experience in the telecom industry and its acquired knowledge of the business software industry. The initial success of SMS was immediately explored by nimble and agile companies on the server side doing SMSCs, but because of their limited control over the other parts of the system they could not expand their offering.

Network manufacturers have also pursued a different approach depending on the market requirements. In Japan, DoCoMo makes highly detailed specifications that force manufacturers to produce specialized products for DoCoMo. The manufacturers' economies of scale are of course limited there because they are not able to sell their products to other operators and markets unless DoCoMo approves of this in their franchise model. In Europe, where the GSM standard is stronger, special solutions are rare, although they exist. The lack of customization possibilities affects the service offering because there is little or no unique functionality to a network built on the GSM standard, and the high degree of integration makes it hard for customization in an application layer.

## **Operators**

The biggest difference in the operator's relation to the service profit chain and the customer is evident when comparing i-mode and BlackBerry. In the i-mode case DoCoMo controls every piece in the value chain and profits from the charges for both subscriptions and traffic. However, in the BlackBerry case the operator was initially a "bit-pipe," meaning that the operator was not directly involved in the service but simply provided the access channel to the customer.

RIM and DoCoMo are also using different strategies to expand their markets. DoCoMo has decided to franchise its service model to other operators, giving them access to the i-mode specifications as well as the network of other established i-mode players in the value chain, such as content providers and terminal manufacturers. RIM is leaving its earlier business model of buying airtime from operators; it is partnering with and offering the BlackBerry service to operators that need a complete corporate service offering. By doing this RIM is giving away control and is making the operator more actively involved in the BlackBerry service model.

In SMS, the operator has a strong relation to the service profit chain, but its role has been to promote the functionality and to find offerings, very often new handsets, that attract younger customers. Service development is restricted to what equipment manufacturers can offer; even if there is an interaction between operators and equipment manufacturers about functionality, the standard is likely to be followed without exception.

## Terminals

The terminal has a high correlation to the service profit chain in the BlackBerry case and a lower correlation in the i-mode and SMS cases (Table 13). As discussed earlier, the SMS service provider is a traditional telecommunications operator. An analysis of Nokia and Club Nokia would have shown that the correlation between the service profit chain and the mobile Internet value chain for the SMS case is similar to the BlackBerry case.

The concept of Club Nokia sprang from Nokia's messaging achievements; Club Nokia is a portal for Nokia owners where they can access content and download supplements to their phones. With this service Nokia is competing with operators, and once again the strength Nokia possesses as the largest handset manufacturer allows the company to pursue this track even if it infringes on the GSM standards and conflicts with operators business models.

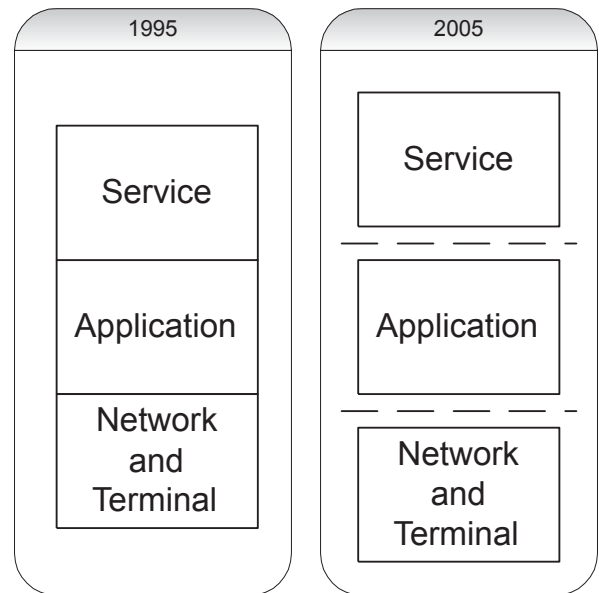
In the i-mode case the terminal manufacturers are controlled by the operator to a higher degree than both the SMS and BlackBerry. The highly integrated handsets are more or less custom designed for DoCoMo and not compatible with any other network. In contrast, the phones built on the GSM standard can function in any GSM network unless they are locked with the help of the SIM card (Subscriber identity module). The ability to lock a handset to a network is important for the operator because operators subsidized the terminals heavily and therefore need to keep their customers long enough to recoup their investment.

RIM designs and manufactures its own terminals. Those terminals are only compatible with the BlackBerry solution and will not function unless the customer also subscribes to the service. The ability to control the handset is clearly important, and in RIM strategy the control will shift from controlling the integrated handset to controlling the Java application. This is done in the expectation that terminals in the future will be less integrated and open up their interfaces for outside applications and remote management.

### 8.3 Service, application, and network

The services on the mobile Internet will become more and more competitive with time, and timely launches of new and improved services will be critical to success. To bridge the gap between the service profit chain and the parts of the mobile Internet value chain that have little interaction with consumers, it will be important to ensure that network technology providers and system integrators develop technology in line with service requirements. The complexity of the systems and the problems developing an integrated approach indicate that the industry is breaking up in a similar way as the computer industry. It is clear that service and applications are separating from the network and the terminal (Figure 15). RIM, for example, has announced its strategic attempt to offer the BlackBerry solution on a Java platform, which would make the service agnostic as to what terminal it is running on as long as there is Java support.

Figure 15: The separation of service, application, and network-terminal



A stand-alone application is not the same as a complete service offering. In i-mode the email client would not have been enough to create value for DoCoMo, and BlackBerry would not have been successful with simply a device. SMS was successful initially, but the application-only approach has been a limiting factor to all parties in the value chain when trying to create value-added service based on SMS. SMS has been successful as a communication solution, involving only the operator and the traditional technology provider, being a two-communication expansion from voice. Further, the lack of a service approach has been limiting in the WAP case, and that is likely because of the similar approach to standardization. SMS is an application and not a service, whereas i-mode and BlackBerry are service solutions.

The key to managing this separation is to use service-driven technology development and thus maintain complete control over the mobile Internet value chain by connecting it to the service profit chain. The approach has proven successful for BlackBerry and i-mode, and the lack of service-driven technology development has stopped the progress of SMS. Complete control does not necessarily mean that everything has to be in-house, but it needs to be under control by the service developer through, for example, alliances (as in the BlackBerry case) or core knowledge translated into specifications (as in the i-mode case).

Separation with clear interfaces also allows for open standards to function without trying to openly standardize the business models, which has proven to be unattractive to service providers. The open standards should be concentrated in the infrastructure and to some extent in applications that need to be built so that services can reach a critical mass. The mobile industry needs to realize either that it can delay the mobile Internet revolution by refusing to cede control to the end user and application and service development communities—or that this will be taken away from it by the markets by force.





## 9. Results

*This chapter primarily sets forth the results of the analysis, but also evaluates the theories and methods used. The three main results relate to the differentiation between applications and services, the effect of mobile Internet services on standards, and service-driven technology development. The main conclusion is that service-driven technology development can be applied to the mobile Internet value chain as a way of developing, implementing, and maintaining profitable services on the mobile Internet.*

### 9.1 Service-driven technology development

The service-driven technology development model is based on a requirement that the service profit chain receive feedback in an efficient way. This has proved to be successful for both BlackBerry and i-mode because all players in the value chain are clearly aligned with the services offered. The study shows that the availability of good quality content, a clear billing structure, revenue-sharing, and a sustainable service business model among network operators, service providers, content providers, and equipment vendors needs to be established before wireless data services will boost return on investment (ROI). The key to profitable services on the mobile Internet is a service-driven approach, which in this thesis is called service-driven technology development.

The service profit chain is a model of a profitable service chain, and as such it can be used as a design guideline for the total service offering. The complete value chain has to be considered from the beginning. When the development stage is completed and service is launched, the service-driven technology development model should be used to make incremental changes and refinements. There is clearly a need to have a good connection between service and technology development. The DoCoMo case shows the importance of having a complete and cross-functional team executing a clear service-driven technology strategy.

In the SMS case the service profit chain was initially closed, but when the value chain expanded from simple SMS messages being sent via the operator to incorporate value-added services and content providers, it broke down. Standardization has helped to incorporate some of the missing parts, but with little success so far. The companies involved in standardization are willing to standardize on technology but unwilling to give information on business and service models. This is especially true for smaller companies that are typically inventors of new technology.

### 9.2 Mobile Internet and standards

All cases show that the key to profitability is when the service profit chain directly controls the seven critical factors in the value chain (see Table 3). From this it follows that open standards do not work on mobile Internet services. In addition, profitable business models are achieved by doing things differently than your competitors. Doing things differently means either performing different activities or performing similar activities in different ways. The service loop does not give feedback to a standardization body; it gives feedback to stakeholders who are directly involved, who use this feedback to make strategic decisions about development, implementation, and maintenance.

There could be several reasons why these companies do not provide feedback; for example, the people representing the companies in the highly technical standardization bodies may not have access to business related information and strategy intentions within the company, or the companies could fear losing a competitive advantage by giving information away. In addition, changes in the value chain will change the control of the critical standards factors (Table 3) and thus take away companies control of the industry standard. Finally the open standard is not moving fast enough just because they are compromised by business objectives.

The mobile industry would do well to realize that success in providing nonvoice services involves setting the right environment to allow them to succeed: ensuring that everyone implements the same open standards in the same ways, putting the right payment and micro billing technologies in place, and recognizing that it takes time to build a critical mass of usage.

### 9.3 Application versus service

By separating services, as illustrated in Figure 10, this control becomes possible because the services and their business models will be separated from the more highly technical applications and networks as well as terminals.

Facing a mature market for voice service forced operators to merge in order to achieve economies of scale. They were thus easily persuaded by technology providers to invest in new products that would expand their product offerings. The mobile industry now needs to realize either that it can delay the mobile Internet revolution by refusing to cede control to the end user and application and service development communities, or that the markets will take control away from it by force.

### 9.4 Evaluation of theories and methods

Resource-based and competitive industry analysis is clearly valid to analyze and describe services on the mobile Internet (Prahalad 1990; Porter 1996). Porter argues both that earlier business strategy theories hold true for the Internet and that they are even more necessary to analyze the changes that have occurred (Porter, 2001). I would like to argue that the same applies for the service profit chain: it holds true for the services on the mobile Internet and is a valuable framework for analyzing and describing new service offerings.

The case methodology (Table 1) together with the framework of building theory from case study research (Table 2) provide valuable insight into the cause and effect of successful services on the mobile Internet. Further, the novel combination of the value chain (Figure 4) and the service profit chain (Figure 6) to form a theory of service-driven technology development can be specifically applied to services on the mobile Internet (Figure 14).

The introduction of service-driven technology development expands both the service profit chain and the value chain. The service profit chain is expanded by applying the service model to the whole value chain; together with the seven critical factors (Table 3), this illustrates what level of control the service provider, independent of its position in the value chain, needs to apply to be profitable. The mobile Internet value chain as a business model is expanded by adding profit and growth feedback on all activities and by focusing on external service value and customer loyalty.

The need for successful service offerings and the convergence of industries to form the infocom industry (Figure 1) are forcing the highly integrated mobile industry to break up (Figure 15), similar to the computer industry as described by Geoffrey Moore (Moore, 1991). This breakup will change the marketplace and force involved players to adapt to the situation or be left out. The key to establishing a service profit chain is to gain control using the seven critical factors and successfully implement service-driven technology development.

## **9.5 Precision and generalization**

Because the industry is immature and is going through a highly volatile period, these results may not be completely accurate. The vast amount of information available and the scope of the thesis made the selection process difficult and likely reduced the precision of the details. However, I believe that the interviews provided valuable and accurate information and that the cases are representative as success stories.

I believe it is possible to generalize the results for services on the Internet; the theory around standards is evenly based on examples from the Internet and from the networking economy (Shapiro and Varian, 1999). However, there are some differences between the mobile Internet and the Internet besides the wirelessness of the mobile Internet: the biggest are the payment infrastructure and the need for a higher level of security on the mobile Internet.

## **9.6 Suggestions for further study**

The limitations of time and resources available for this study present several opportunities for further investigation. Topics of interest might include a service chain audit and a product development study for services on the mobile Internet.

A service chain audit study could result in an expansion of auditing questions (Heskett, 1994) and provide further insight into critical factors in the service profit chain as they apply to the mobile Internet.

A product development study might expand on service-driven technology development. A more detailed description of the product development process might outline necessary activities as well as milestones using the foundation described in this thesis. An audit could serve as a checklist during the development process.

10

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