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Understanding Mobile Operators' Capabilities Within Convergence Processes

A Case Study of Mobile Internet in the Netherlands

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SUMMARY

The concept of convergence has been actively used in telecommunications, IT, media and various other industries since the 1980s and 1990s. Currently, convergence is widely used to describe the changes take place in technology, services, industry structures and government policies, especially regarding the telecommunication industry. Especially in this turbulent mobile telecommunication sector, strategic challenges of convergence are related to an implied need for firms to open up existing structure and processes. Besides, convergence also challenges firms such as mobile operators to face the external phenomena through an internal response of divergence. Therefore, the aim of the thesis is to explore mobile operators' capabilities in an environment characterized by convergence.

Understanding the nature of convergence processes is a crucial first step in managing the dynamics associated with convergence. It is concluded that convergence processes start on a technological or technical level and possibly leads to industry convergence and a series of consequences. Within convergence processes, firms' need a search ability for new information outside the existing knowledge base, generally in areas unrelated to current operations. Dynamic capabilities which rely on quickly created, situation-specific knowledge, seems to be the most appropriate theory for studying convergence processes on the firm level. Relational capability and absorptive capacity are the two dimensions of firms' dynamic capabilities used to build up a theoretical framework for this thesis.

The empirical study of the convergence of mobile Internet in the Netherlands was conducted as a case study. KPN and Vodafone were chosen as case study firms. An initial framework was formed on the basis of the theoretical literature review and it was iterated and specified with the findings of the case study. The data was collected mainly from secondary sources, which archived the important activities Vodafone and KPN have taken since the emergence of mobile Internet in 1999 to the present.

The findings are especially interesting for mobile operators. Relational capabilities and absorptive capacities allow mobile operators to obtain resources, to develop new products and to obtain the market presences they needed to compete effectively within convergence processes. From empirical data, it shows that mobile operators' capability migrate from absorptive capacities towards relational capabilities over the time period.

This dissertation contributes to theory in different ways. Theoretically, I contribute to the concept of convergence processes as well as dynamic capabilities. A close relationship between the requirements for convergence processes and the nature of dynamic capabilities is derived. For managers of mobile operator, the framework of firms' absorptive capacity and relational capability contributes to define activities needed during the convergence process. Last, this thesis contributes to research protocol for research to replicate in the field of studying firms' managerial issues under the convergence phenomena.

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1 INTRODUCTION

The introduction chapter outlines the subject, its background and the main issues studied in this thesis. Additionally, the study's purpose and the outline of research design are defined.

1.1 Background

The concept of convergence was first introduced by Rosenberg (1976) who defined the term of "technological convergence." Technological convergence represents the phenomena that different industries increasingly rely on the same set of mechanical skills. Since the 80s and 90s, the term "convergence" has been actively used in IT, telecommunication, media and consumer electronics industries. Until now, convergence is often considered convenient shorthand when describing the changes taking place in technology, services, industry structures and government policies. It is especially used regarding the telecommunication industry.

In the telecommunication industry, the forces of convergence have already brought up internally and externally. With the rapid development in the telecommunication industry, the Internet, broadcast networks, and the emergence of new technologies and services, the boundaries between the different communication sectors have blurred. There is a strong competition where new players are entering the sectors to seek business opportunities in this converging environment.

The convergence phenomenon is making its mark even with ordinary people, particularly in end-user devices. The mobile handset and equipment manufacturer Nokia explains how historically separate industries, the telecommunications, consumer electronics, and media industries, are increasingly uniting to form what is known as "the converged digital industry." For consumers this results in attractive products and solutions, and from a business perspective creates opportunities in new untapped areas (Nokia, 2004).

The widespread adoption of the Internet standards in telecommunication systems has been one of the most visible facets of convergence. Driven by the mobile device industry, this evolution of mobile phones towards personal computing units has been resulted in applications and service opportunities recently. This forces the underlying networks to cope with this evolution. During the past fifteen years, modern societies have experienced grand revolutions initiated by two major technological innovations. As shown in Figure 1, mobile phones and the Internet are today on the threshold of integration, leaving us very enthusiastic about what the future can bring. Consequently, it is widely acknowledged within the field of telecommunications that the upcoming years will probably be highly crucial and significant in shaping the industry's future. Several technological innovations along with the continuous evolution of the infrastructural networks have progressively redefined the use of mobile devices. New applications are constantly added into handset devices ranging from address books and organizers to digital cameras and mp3

players, resulting in one multifunctional device. Therefore, the functional fields of mobile phones, PDAs (Personal Digital Assistants), laptops, are progressively merging together.

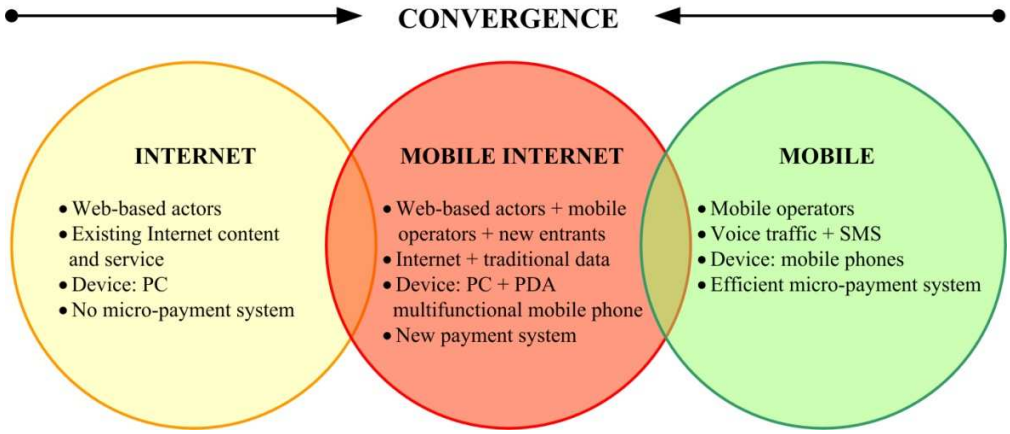


Figure 1: The convergence of the Internet and mobile telephony

Moreover, mobile operators have witnessed an evolution of different mobile networks in recent years. Initially, a move from the traditional GSM (Global System for Mobile communication), also known as 2G, to the 3G infrastructures enabling data transmission of higher capacity, marked the starting point of an evolving mobile business. Through rapid network development and investments in the mobile telecommunications, producers and operators are starting to offer a broad range of convenient and abundant Internet-features to the end user. At this point, the initial use of mobile phones and main focus of mobile operators broaden towards greater areas of activities than just voice calls. Web browsers are incorporated into mobile phones, as well as several features such as color-screens and video-calls. The major industry of telecommunications will be fundamentally transformed in one way or another and it puts especially the mobile operators in a challenging situation with an infinite set of essential strategic questions.

1.2 Problem statement

Although the telecommunication industry is experiencing a rapid growth across the world, very little is known about the effects of convergence on the mobile telecommunication sector and actors therein. Most studies about have focused on for example industry dynamics (Amesse et al., 2004), the role of innovations (Drucker, 1985; Teece, 2003), dominant designs (Anderson & Tushman, 1990), development of technological systems, technical improvements and developments (Aaltonen, 2003) and regulatory issues (Vesa, 2006). Few focus on trying to form an understanding of convergence. There are a few exceptions such as Bohlin, Brodin, Lundgren & Thorngren (1999), Stieglitz (2003) and Hacklin (2008). Pennings and Puranam (2001) conclude that all convergence processes have the effect of eroding boundaries between industries, which in turn poses challenges to firms, and forces them operate new technologies, consumers and needs. Technology bases of companies are becoming increasingly similar, which

eventually means that companies compete with the same technological competencies. Convergence also implies a need to establish business relationships with partners who possess the necessary technological skills or resources. Completely new value constellations arise due to convergence processes and the changing industry structure. However, the meaning and importance of convergence in mobile telecommunications has not been studied yet. Convergence is however acknowledged as a factor that influences the sector. Effects of convergence on a firm's behavior and capabilities are nevertheless still a rather unexplored area. From a theoretical perspective there is little consensus in what convergence means for and how it affects the mobile telecommunications sector in general. Similarly, from a managerial point of view, the effects of convergence on firm capabilities and behavior in a specific sector have not been addressed adequately. Special capabilities are required in order to be profitable in the mobile telecommunications sector. Capabilities are not solely based on technological knowledge, but also capabilities enabling an interactive and cooperative approach towards other firms in the industry.

It is therefore interesting to investigate the turbulent mobile telecommunication sector and see how strategic challenges of convergence can be related to a need to open-up existing structures and processes, and to facing the external phenomenon of convergence through an internal response of divergence. As the Internet's progressive penetration in the telecommunications offers potential applications, the traditional mobile telephony is becoming less promising and operators have to develop co-operations with Internet-giants as well as other partners. In that way they can be part of the evolution, make significant profits and avoid being restrained to the state of a simple access supplier. Consequently mobile operators are forced to offer radically new services, come up with innovative promotions and find optimal ways to protect their market shares.

1.3 Research objective, questions and limitations

On the basis of the above-mentioned challenges, which are drawn from practice and the identified shortcomings in existing theory, the main objective of this research is to study mobile operators' capabilities in an environment characterized by convergence. The mobile Dutch telecommunication sector was taken as an example in this thesis. The aim is to produce theoretical and managerial knowledge of the implications convergence has for mobile telecommunications. And with that contribute to a deeper understanding of opportunities for deliberate managerial action taking, aimed at generating sustained, profitable growth under the premise of convergence.

Furthermore, this research is aimed to develop a useful debate among involved and interested persons and companies. Strategic managers and leaders actively working within the mobile telecommunication sector might value the study and take it into account for own strategic evaluations and courses of action. Ultimately current mobile operators might be able to reassess their core capabilities on the basis of the study. Eventually the study's findings could serve as basis for future consciousness and understanding of moving markets and technological convergence.

On the basis of the research objective, the main research question is derived as following:

Main Research Question
What are the key capabilities for mobile operators to utilize within convergence processes in the Netherlands?

To answer this main question, I formed the following sub-questions, which are:

Sub Research Questions
1. ***How has the convergence phenomena emerged in the mobile telecommunication sector in the Netherlands?***
2. ***What have mobile operators done in order to cope with convergence phenomena in the Netherlands?***
3. ***What are the different capabilities that mobile operators have developed within convergence processes?***

This research is limited to reviewing theoretical approaches to convergence processes and I have focused on the activities directly affecting the mobile operators when analyzing the capabilities along with the emergence of convergence. Although the convergence phenomena happening in the mobile telecommunication sectors is complex and with many other actors involved, the focus is on the mobile operators' perspective. Although many would argue that the mobile telecommunications is global and that no national borders exist, the study is geographically limited to studying the mobile operators in the Dutch market due to the limited amount of time and resources available. From a time perspective, the study is limited to events and changes that took place in the two mobile operators KPN and Vodafone between 1999 and 2008. Since the study aims at understanding how this convergence occurs and what mobile operators' capabilities are, it is methodologically limited to qualitative data gathering and analysis methods.

1.4 Research design

The initial research mixed different areas of the industry, its actors, the existing and upcoming technologies related to mobile telephony as well as the strategic consequences and future significance for mobile operators. The collected information was primarily gathered from secondary data such as websites where the latest news, expert reviews and debates were published on a daily basis. With the information and data collected, I was able to formulate a broader view of the current mobile telecommunication sector by somewhat distancing ourselves from a more narrow mobile operator's perspective. Insights into current and emerging managerial challenges regarding the convergence of mobile Internet was developed and refined. An extensive literature study was conducted, aimed at building a picture of the current research state in the intersection of convergence and companies' specific capabilities. The specific research question was formulated on the basis of an initial study.

Theoretical and empirical parts of the study complement each other in the sense that convergence in the Dutch mobile telecommunications sector was analyzed and compared to existing research in respective fields. Theory

reflects reality in an ideal world. The aim is to find answers to the research questions stated in the previous section by empirically study mobile operators' activities in the Netherlands and compare it to theory in order.

A central decision was made that KPN and Vodafone would be the case-study firms, with that an in-depth understanding of the approaches to dealing with the effects of the phenomenon on firms' management practices could be gained.

1.5 Outline and Structure

The study's chapters are disposed as following:

Chapter 1 Introduction	The introductory chapter's prologue draws the founding facets of the mobile telecommunications and is followed by a problem discussion leading to the study's main issue and primary purpose.
Chapter 2 Foundations of the study	Discussion and motives for theoretical approaches for studying convergence and firms' capabilities.
Chapter 3 Theoretical Background	The theoretical chapter presents the chosen theories that are intended to help fulfill the study's purpose.
Chapter 4 Research Method	This chapter describes the line of action, explains and motivates the chosen methodological reasoning.
Chapter 5 The Convergence of Mobile Internet	In this chapter extensive knowledge of the mobile Internet convergence is provided.
Chapter 6 Mobile Operators' Capabilities along with Convergence Processes	The chapter deals with case studies of Vodafone and KPN in the Netherlands. Summaries of collected empirical materials and separate analyses of both companies' capabilities along with the convergence process are presented. Last, the chapter ends up with a discussion of similarities and differences between findings.
Chapter 7 Conclusions	In the conclusion, a summary and conclusions of the study are given. Besides, contributions and further suggestions are presented.

2 FOUNDATIONS OF THE STUDY

The purpose of this chapter is to shortly present possible theoretical bases for studying convergence and its influence on actors' business environment and interaction patterns. The chapter includes a discussion on different approaches, critically reviews the alternatives and motivates the selection of theories.

2.1 Studying convergence – alternative theories

Greenstein and Khanna (1997) point out several theoretical bases in the analysis of convergence which are useful and considered necessary by the authors. Greenstein and Khanna refer to theories concerning (1) general purpose technologies, (2) industry life cycle and (3) diffusion of innovation. These theories address how technologies emerge, grow and become dominant in order to eventually become ubiquitous in all sectors of economy (Lind, 2005). However, one must keep in mind that these theories have a base in technology. An analysis of convergence in mobile telecommunications through either of the above mentioned theories would result in knowledge about convergence processes on a technological level, not necessarily on a societal or industrial level. A technology can focus on a component, an entire product or an industry. When (1) the knowledge base is expanding, (2) the application to existing markets is undergoing innovation, or (3) new markets are being tapped or created, scholars refer to emerging technologies. Emerging technologies thus have the ability to create a new industry or transform an existing one. Emerging technologies might include discontinuous technologies derived from radical innovations or evolutionary technologies arisen from the convergence of previously separate research streams.

2.1.1 General purpose technologies

The most important driving force of economic growth is technological progress (e.g. Schumpeter, 1934; Langlois and Robertson, 1995). Technological progress in turn seems to be driven by a few major technical or organizational breakthroughs. Examples of General Purpose Technologies (GPT) (e.g. Bresnahan and Trajtenberg, 1995) are, for instance, the steam engine, steel, railways, telephony, electricity, automobiles, plastics, computers etc.

Christensen (2003) views the Internet as a GPT that gives rise to a wide array of new products, processes and services. The emergence of Internet services can be classified as a convergence process through technology substitution or also, what Rosenberg (1976) has labeled "technology convergence." The convergence process also affects actors on the market, as firms from established industries begin to compete with pioneering firms that contribute to emerging industry of Internet services. GPT are technologies that may be modified and extended to address a seemingly unlimited range of applications in a wide array of activities. The GPT notion tends to stress technologies as the key artifacts, which over time come to be adopted in several so-called application sectors. GPT offers information of convergence on a technical level and predicts the outcomes, but does not deliver knowledge about the market nor the actor level. The notion of GPT is an insufficient tool when analyzing convergence processes

and their impact on the business environment in mobile communications. The GPT approach rather sees larger wholes and societal issues than focuses on individual actors and their relationships.

2.1.2 Industry life cycle

Every industry begins with an initial structure (Porter, 1980). This structure is a result from a combination of underlying economic and technical characteristics of the industry, initial constraints of small industry size as well as skills and resources of early entrants. Porter (1980) argues that industries change due to the fact that some forces are in motion, which create incentives or pressures for change -- he calls this the "evolutionary process". The evolutionary processes aim at pushing the industry toward its potential structure. Porter furthermore points out that it is widely accepted that industries tend to consolidate, but stresses that this is not always true as a general statement. Change in one element of an industry's structure tends to trigger changes in other areas and there is up to now no one known way in which industries evolve.

The structural change in an industry may also be influenced by a firm's strategic behavior. The firm can seek to influence industry structure through the way it reacts to strategic changes of competitors or in the strategic changes it initiates. A company can also be very sensitive to external forces causing the industry to evolve, and in this way influence the structure of the industry. The external forces that the company can benefit from are, for instance, licensing or other agreements with innovating firms on new innovations, influencing regulatory changes etc.

The Industry Life Cycle (ILC) was introduced in the literature as an analogous metaphor to the Product Life Cycle model from the 1970s (Lind, 2005). An industry passes through a number of phases or stages (introduction, growth, maturity and decline) and as the industry goes through its life cycle, the nature of competition will change. The ILC implies increased specialization and industry fragmentation within the techno-economic paradigm (Lind, 2005). An increasing number of new sub-markets and supporting industries will be created. For instance, an emerging industry such as the computer industry will create sub-markets, or new industries, around software, hardware, systems integration, application software, operating systems, resellers, chip design firms, contract manufacturers etc. The ILO can be viewed as a causal driver of convergence processes (Lind, 2005). However, ILC shows development on a macro level, whereas this study also focuses on a meso level analysis and therefore the ILO cannot singlehandedly explain convergence and its implications on firms' business.

2.1.3 Diffusion of innovation

Freeman and Perez (1988) have created a taxonomy of innovations, which encompasses four categories of innovations. These categories are (1) incremental innovations, which occur more or less continuously in any industry or service activity, although at differing rates in different industries and different countries, (2) radical innovations , which represent the introduction of completely new products and processes and are discontinuous events, (3) new technological systems, which are far-reaching changes in technology affecting several branches of the economy and

gives rise to entirely new industrial sectors and (4) technological revolutions or new techno-economic paradigms, that represent changes in technological systems far-reaching in their effects and having a major influence on the behavior of the entire economy.

An important part of the innovation process is diffusion of innovation. Diffusion translates as "the process by which individuals and firms in a society/economy adopt a new technology, or replace an older technology with a newer" (Hall, 2004, p. 2). As a technology diffuses, technological convergence between industries will increase (Fai & von Tunzelmann, 2001). When the rate of innovation in a new technological area is at its highest, technological innovation will occur foremost in the industry that can most easily and readily exploit the opportunities which arise. Again, theories related to innovation, diffusion and management, focus largely on the technologies themselves rather than on the implications on a micro-level.

2.1.4 Summary

In summary, one can say that theoretical approaches to studying convergence processes from a (1) business perspective and (2) on a micro level of analysis do not exist. The industry life cycle studies changes on an industry level as does GPT to some extent. Development and diffusion of innovations are rather concentrated on the effects of innovation and the contribution convergence processes can make. The processual nature of convergence is rarely highlighted in research of the phenomenon. Table 1 summarizes the theoretical approaches reviewed as alternatives. GPT and diffusion of innovation do not provide adequate analytical tools to study convergence, whereas the theoretical review of convergence (see chapter 3) is partly based on ideas which are close to theories on industrial restructuring (e.g. Stieglitz, 2003).

Proposed approach	Main idea of approach	Level of analysis	Applicability in this study
General purpose technology	Innovations transform industries	Technology	Does not take into account interaction between actors, implications of convergence for actors' environment and processual nature of convergence
Industrial restructuring/ industry life cycle	Industry restructuring through technological change	Industry	Does not take into account interaction between actors, implications of convergence for actors' environment
Development and diffusion of innovation	Technology and innovation adoption, technological progress	Technology Society	Does not take into account interactions between actors, implications of convergence for actors' environment

Table 1: Comparison of approaches to studying convergence processes

2.2 Firms' managerial issues

When it comes to studying companies' behavior in a business environment, a few possible approaches are suitable; the industrial network approach, the transaction cost approach and the resource-based view.

2.2.1 The industrial network approach

Business network theory provides an understanding of the importance of developing and maintaining business relationships in order to ensure stability and the ability to make use of business opportunities through access to knowledge. Gadde and Mattsson (1987) argue that the network approach is principally concerned with analyzing the dynamics of networks, rather than their structural form.

A network approach in research offers conceptual tools to the study of dynamics in business markets. Industrial markets are described as networks of inter-firm relationships. Companies build exchange relationships with other companies, and through these they become connected to broader networks of business relationships (Halinen et al., 1999). However, the network approach has been criticized for being too"loose" as a theory, neglecting quantitative research methods and for the lack of managerial prescription (Wensley, 1995).

2.2.2 The transaction cost approach

A transaction cost is a cost incurred in making an economic exchange such as search for information. In the transaction cost approach, firms face the choice of producing in-house, buying from the market or establishing relationships with other firms, if they wish to acquire resources. Transaction cost thus refers to the cost of providing for some good or service through the market rather than having it provided from within the firm. Transaction cost theory is still considered to be one of the principal theoretical approaches in management for understanding formation of strategic alliances (Pisano and Teece, 1989; Shan, 1990). Transaction costs, in relation to partnerships and cooperation between actors, may consist of costs incurred in searching for the best supplier/partner/customer, the cost of establishing a contract, and the costs of monitoring and enforcing the implementation of the contract. The level of analysis in transaction cost theory is on the firm. When it comes to applying a transaction cost approach in this study, the theory would fail to explain the dynamics between actors along with convergence processes. Transaction cost theory is criticized for being static in nature (Blomqvist, 2002) and thus not explaining processual and complex developments of interaction between actors. The theory furthermore does not take technological development into account. Transaction cost efficiency is regarded as the motivation for cooperation and e.g. formation of relationships to other actors.

2.2.3 The resource-based view of the firm

The resource-based view (RBV) can be seen as an alternative perspective on business networks, as it focuses on the internal resources a company possesses and the way a firm gains competitive advantage through using these

resources (Barney, 1991). Chetty and Patterson (2002) states that RBV considers the environment to be external to the company. Companies may exchange resources with other companies if the aim is to gain greater benefits, or value of some sort (Ring and van de Ven, 1992).

RBV is useful when studying convergence in the sense that it offers a starting point for developing strategies for a converging environment. For instance, Pennings and Puranam (2001) and Stieglitz (2003) have chosen the RBV as their theoretical perspective under which to analyze convergence. The traditional sources of competitive advantage (e.g. economies of scale, product differentiation, switching costs, distribution channels, government policy, etc.) have lost their importance as barriers to competition in high tech industries. Grant (1995) notes that when the external environment is in a state of transformation, the firm itself in terms of its bundle of resources and capabilities may be on a much more stable basis on which to define its own identity. Grant furthermore argues that the greater the rate of change in a company's external environment, the more it must seek to base long-term strategy upon its internal resources and capabilities than upon external market forces. Therefore, when it comes to strategy formulation the RBV is a powerful tool when companies are facing convergence in their external environment. RBV furthermore offers useful tools to study the firm and its nature but is often criticized for its static nature. Eisenhardt and Martin (2000) argue that the RBV does not specifically focus on the industry dynamics or the related necessary dynamics in firm capabilities in rapid and unpredictable change. Teece et al. (1997) point out that the RBV focuses on strategies for exploiting existing firm-specific resources and not so much on the continuous need to develop capabilities or seeking resources for new business areas.

2.2.4 Summary

Though the INA allows analyzing dynamics in business networks and the roles and positions of actors involved, it does not fit in the research objective. Compared to INA, RBV seems to be more appropriated because it is the theory concentrating on the actions of a single firm. However, neither the RBV nor the transaction cost approach takes into account dynamics and changes in the converging environment. Institutional theory offers an alternative to study the firm in its environment. Table 2 provides a summary of alternative approaches while studying firms' managerial issues. RBV seems to be the most appropriate one to fit the research objective. I will further discuss an enhanced RBV theory focusing more on dynamic environments.

Proposed approach	Main idea of approach	Level of analysis	Applicability in this study
Industrial network theory	Actors are connected to each other via relationships, forming business networks	Actor, Network, Business net	Does not focus on a specific firm level
Transaction cost approach	Deals with the costs related to producing a good and whether to produce it in-house or through partnership	Firm	Does not take into account dynamics and change in the converging environment

Resource-based view	Focus is on internal resources and the way the firm gains competitive advantage through using these resources	Firm	Does not take into account dynamics and change in the converging environment

Table 2: Comparison of approaches regarding firms' managerial issues

2.3 Chapter conclusions

In this chapter, I have examined alternative approaches from previous research related to convergence and managerial issues. However, it seems to be difficult to find one general theory on convergence that explains both its origin, its implications in specific industries and emphasizes its processual nature. Knowing that convergence processes originate in technology, I assume that technology develops regardless of the business environment and aim foremost at identifying convergence processes and understanding what the effects of convergence processes are in mobile telecommunications and firms' managerial contexts. Technological change is partly driven by companies' innovative efforts and thus convergence processes cannot be seen as purely external processes. However, convergence processes can be seen as a driver of change and firm behavior. Therefore a theoretical review of convergence related theory focusing on mobile telecommunication sector is much needed in understanding the process from a theoretical perspective. It turns out, as will be further discussed in chapter 3, that I do not know much about convergence in a mobile telecommunications setting and what I do know is related to technology: little research has been conducted concerning the influence of convergence on markets and firm capabilities for coping with technological development.

3 THEORETICAL BACKGROUND

The purpose of this chapter is to shortly present possible theoretical bases for studying convergence and firms' dynamic capabilities. The main parts consist of presentation and discussion of alternative ways of studying (1) convergence (2) dynamic capabilities and (3) summarizing the discussion by developing a theoretical framework for this study. By studying diverse theories, I enrich the knowledge base in order to propose further solutions for the research questions.

3.1 Convergence processes

3.1.1 Definition

Since the intersection of convergence and firms' capabilities are regarded as the main underlying rationale of this research, it would be preferable to start with specifying the context, defining and explaining the phenomenon of convergence, as well as investigating state-of-art research.

The seemingly most quoted source for a definition of convergence comes from the Green Paper on Convergence issued by the European Commission in 1997. The whole report is based on telecommunications, media and information technology increasingly using the same technologies. It is strongly pointed out that convergence is not just about technology, but also about services and new ways of doing business and interacting with the society. The European Commission (1997, p. 1) defines convergence as

"the ability of different network platforms to carry essentially similar kinds of services or the coming together of consumer devices such as the telephone, television and personal computer"

This definition is widely deployed by several scholars. Generally speaking, convergence occurs at different stages, namely (1) technology and network platforms, (2) industry alliances and mergers, (3) services and markets and finally, (4) policy and regulation. The OECD (Organization for Economic Co-operation and Development) explains the overall converging phenomenon as the "blurring of technology and regulatory boundaries between sectors of the economy" (OECD, 1992, p.13), and implied from that as "the growing overlaps between the technologies, services and firm active in each sector" (OECD, 1992, p.93). Similarly, Choi and Valikangas (2001, p.46) suggest another broad definition as "a blurring of boundaries between industries by converging value propositions, technologies and markets." Also, convergence can be regarded as "a market/ industry definition generated by technological change" (Lind, 2005, p.1).

Pennings and Puranam (2001, p.3) state that "convergence between previously disjointed markets can be viewed as the erosion of boundaries that define and isolated industry-specific knowledge" by introducing a more knowledge-related perspective. Similarly, convergence is defined as the process by which hitherto different industrial sectors come to share a common knowledge and technology base (Athreye and Keeble, 2000; Fai and von Tunzelmann, 2001; Lind, 2004).

Besides the general definitions of convergence, the most frequent use of the term convergence can be regarded as occurring in the context of ICT. The European Commission defines convergence within the specific context of ICT as "the ability of different network platforms to carry essentially similar kinds of services, or the coming together of consumer devices such as the telephone, television and personal computer" (European Commission, 1997, p.1). Yoffie (1997, p.3) sees the convergence in ICT as "the unification of functions – the coming together of previously distinct products which employ digital technologies." As an implication, this "dynamic approach or partial integration of different communication and information based on market application" (Wirtz, 1999) results in "the blurring of borders between telecom, computing and media" (Fransman, 1998).

Table 3 is an overview of various definitions, containing a short summary in terms of industry and management scope for each source. The researches here are chosen to focus on better understanding the phenomenon, though even recent literature does not completely leave out attempts for definition.

	Definition	Industry Scope	Managerial Scope
OECD (1992)	the growing overlaps between the technologies, services and firms active in each sector	general	competition
Adner and Levinthal (2000)	a process of convergence, in which the common domain is an application domain in which one of the two antecedent technologies is already applied	general	innovation through recombination
Choi and Valikangas (2001)	blurring the boundaries between industries by converging value propositions, technologies and markets	general	industry boundaries
Guilhon (2001)	the process by which the application of the same scientific concept allows the putting together of two or many fields of activity	general	innovation through recombination
Pennings and Puranam (2001)	the erosion of boundaries that define and isolate industry-specific knowledge	general	knowledge

Bally (2005)	the growing together of technologies, which fundamentally alters the boundaries of previously distinct industry or market sectors and merges them into a new competitive environment	general	industry and market boundaries; competition
Lind (2005)	a market/ industry definition generated by technological change	general	technological change
Yoffie (1997)	the unification of functions - the coming together of previously distinct products which employ digital technologies	ICT	innovation through recombination
European Commission (1997)	the ability of different network platforms to carry essentially similar kinds of services, or the coming together of consumer devices such as the telephone, television and personal computer	ICT	innovation through recombination
Wirtz (1999)	dynamic approach or partial integration of different communication and information based market applications	ICT	innovation through recombination
OECD (1992)	blurring of technical and regulatory boundaries between sectors of the economy	ICT, media	industry and regulatory
Fransman (1998)	the blurring of borders between telecoms, computing and media	ICT, media	industry boundaries

* Sorted by industry scope and source

Table 3: Overview of convergence definitions in literature (Adapted from Hacklin, 2008)

The above mentioned definitions already show the complexity in finding one generic definition of convergence or classifying it in a general way. One predicts that market areas merge together, whereas others predict that technologies increasingly will be integrated with each other. On one side, technology cannot be separated from the market and thus it forms an important part of convergence. On the other side, if convergence is defined as the coming together of markets and industries only, the notion of technology and technological change as a driver for convergence is left unexplored. In the next sections the drivers as well as typologies of convergence processes will be described before a final critical review of previous research on convergence.

3.1.2 Determining the convergence process

Lind (2004) suggests that instead of aligning managerial focus solely dealing with convergence, it is essential to investigate underlying reasons. Therefore, in order to generate a more sound understanding of the convergence phenomenon, there is a need to disentangle cause and effects of convergence. When studying contributions from previous research for antecedents of convergence in technological environments, one can distinguish between drivers with either endogenous or exogenous sources, i.e. either originating from within the firm, or from beyond it. On the firm level, a generic driver can be seen in deliberate search activities for innovative opportunities beyond current industry boundaries, where an existing technological base is diversified into broader scope (e.g. Lei, 2000; Fai, 2001). On the industry level, the general phenomenon can be identified as a confluence of a variety of different drivers. From a growth perspective, these comprise over all advances and technology, spill-over between knowledge bases, and the increasing similarity of markets (e.g. Choi and Valikangas, 2001; Pennings and Puranam, 2001). Besides, the social-economic drivers identified in the convergence related literature are: liberalization and deregulation. Key aspects of drivers of convergence within existing literature are summarized in Table 4.

Firm-level	
Yoffie (1997)	• start-up firms providing managerial creativity
Lei (2000)	• new technologies that link up individual products into a larger system
Pennings and Puranam (2001)	• new technologies are discovered which map onto needs already being satisfied by existing technologies
Andergassen et al. (2006)	• firms' search for innovative opportunities in other economic sectors
Fai (2001)	• firm diversification and increasingly broader technological scopes
Industry-level	
European Commission (1997); Lei (2000); Pennings and Puranam (2001)	• deregulation
Prahalad (1998)	• digitalization
Lei (2000)	• growing opportunities for product bundling
Antonelli (2001)	• emergence of pools of collective knowledge
Choi and Valikangas (2001)	• ubiquity of information
Choi and Valikangas (2001); Pennings and	• growing similarity of demands across groups of consumers

Puranam (2001)	
Pennings and Puranam (2001)	• homogenization of customer segments due to changing demographics
Andergassen et al. (2006)	• technical change, and growth
Fai (2001)	• increasing complexity of consumer demands, dispersion of technological areas

*Chronologically sorted by source.

Table 4: Drivers of convergence (Adapted from Hacklin, 2008)

Previous research has rather extensively focused on the implications of convergence. In the firm-oriented perspective, entrants are suggested to primarily benefit from convergence through the emergence of new niche markets for breaking into established value chains (Lei, 2000; Yoffie, 1997). In contrast, incumbent firms may experience both chances and risks in converging environments, as current organizational capabilities can be rendered obsolete (Pennings and Puranam, 2001). In particular, although convergence opens-up opportunities for creating new functionality and extending product features into new arenas, a deliberate managerial following the convergence trajectory may cannibalize existing business (Yoffie, 1997). Hence, it is necessary to build up new concepts and approaches on a strategic level which allows not only methods for improved forecasting of emerging changes (Linton, 2002) but also enabling dramatic adjustments on various firm-internal processes to be made in time (Yoffie, 1997). On an industry level, convergence seems to predominantly cause structural changes (Fransman, 1998), i.e. the blurring, erosion, and redefinition of previously established industry boundaries (Lei, 2000; Lind, 2004; Porter, 1985). It therefore alters the competitive rules and systems (Henten et al., 2004; Kaluza et al., 1999; Lei, 2000; Nelson and Winter, 1982; Yoffie, 1997) and leads to creative destruction based on the emergence of complementary offerings across industries (Lei, 2000; Markides and Williamson, 1996). Eventually, an entirely new industry will appear (Kaluza et al., 1999; OECD, 1992, 1996; Hagedoorn, 1998). Table 5 shows the summary of previous research on the implications of convergence.

Firm-level	
Chen and Hambrick (1995); Lei (2000); Yoffie (1997)	• opportunities for existing and start-up firms to break into value chains, based on new niche markets; challenging existing industry leaders for dominance
Yoffie (1997)	• allowing companies to create new functionality and extending product features into new arenas
Yoffie (1997)	• role of standards is further reinforced because of the threats of 'lock-

	in' and 'lock-out'; the installed base can generate excessive inertia and resistance to change
Lei (2000)	• needs for internal R&D and strategic alliances across industries
Pennings and Puranam (2001)	• degrading or rendering obsolete organizational capabilities
Linton (2002)	• needs for forecasting disruptive and discontinuous innovations
Yoffie (1997)	• following a convergence trajectory may cannibalize existing business
Industry-level	
Lei (2000); Leonard-Barton (1992)	• altering the nature of firms' core competencies, capabilities, skill sets, and underlying economic assumptions about the basis of competition in the newly configured industry
Dixit and Pindyck (1994); Henten (2004); Kaluza et al. (1999); Lei (2000); Yoffie (1997)	• reducing the entry barriers and changing the nature of rivalry; structural changes and growth in competition in the sense of an extrusion process; competitive conditions in which one industry's products or services are increasingly linked, absorbed, or blended with another industry's expanded range of offerings
Kaluza et al. (1999)	• increasing the bargaining power of buyers in the concerned industries
Bohlin (2000); Henten (2004)	• changes of not only technologies, but services, markets, related actor configurations (industry alliances and mergers), policy and regulations
Fransman (1998)	• changes in industrial structure, technological evolution; fortunes of populations of firms in the industries affected by convergence, and by themselves
Lei (2000); Lind (2004); Porter (1985); Yoffie (1997)	• blurring, steady erosion and re-definition of once distinct boundaries among industries as they begin to share more similar competitive, market-based, and technological characteristics; folding whole industries together
Lei (2000); Markides and Williamson (1996)	• creative destruction; giving rise to higher-performing substitute or complementary offerings that alter the nature of demand, competition, value creation, and firm behavior among multiple industries
Guilhon (2001)	• facilitates the appearance of knowledge markets

Antonelli (2001)	● emergence of technological clusters, i.e., a flow of complementary technological innovations which draw from a renewable pool of collective knowledge
Andergassen et al. (2006)	● development of new skills and competencies which creates a technological gap with other sectors
Hagedoorn (1998); Kaluza et al. (1999); OECD (1992, 1996)	● emergence of a new industry, e.g., ICT; on the basis of two several originating industries and the support of co-operation between firms of neighboring industry branches

*Chronologically sorted by source.

Table 5: Implications of convergence (Adapted from Hacklin, 2008)

3.1.3 A critical review of convergence theory: towards managerial issues

According to the previous sections, the drivers of convergence can be found in technology (e.g. technological change and digitization of data) and socio-economic forces (e.g. liberalization and deregulation) on the industry level. One should not forget the fact that organizations as actors may contribute to the emergence of convergence processes through their actions and reactions in the business environment. The strategic implications of convergence have only recently become the focus in the research and are therefore not widely known for sure, rather only assumed. Convergence gives few guidelines for concrete strategic actions for a given firm. However, it is important to understand the very essence of such a process like convergence, which has the possibility to affect every corner of an industry or markets. To summarize the previous research, the convergence process is initiated by for example advancements in technology, consumer preferences, or liberalization forces, and leads to certain outcomes, such as new consumer devices or a technologically efficient device able to perform tasks which earlier required two or more separate devices. Therefore, convergence processes imply increased cooperative activities, increased competition, re-evaluation of industry boundaries, core competencies and business activities, value chain deconstruction and changes in regulatory issues which challenge the firms to build up relevant capabilities to react.

All convergence processes have the impact of eroding boundaries between industries, and thereby posing strategic challenges to firms, causing them to face new technologies, consumers, and needs. To reiterate, the common aspect among multiple forms of convergence is that they degrade or render current obsolete organizational capabilities. However, the ability of firms to refashion their capabilities to new demands is inhibited by path dependence (Teece et al., 1997). Firms attempt to extend their capabilities from external sources through a menu of corporate development activities. These activities include internal corporate ventures, alliances, joint ventures, R&D partnerships and mergers and acquisitions. (Chesbrough and Teece, 1998; Pisano, 1990). Mergers and alliances have been reported to increase in converging environments by many researchers (e.g. Duysters, 1995; von Tunzelmann, 1995). Hagedoorn (1998, p. 357) argue that companies from different industries and technological fields combine

their efforts as a part of a concrete process of technological convergence. Hagedoorn (1998) point out that in the past decade, the number of strategic alliances made by firms has increased substantially, especially in high-tech industries. Lind (2004) notes that the vision of convergence has justified a number of mergers and acquisitions within the ICT sector.

Based on the many examples of defining convergence by researcher in various fields and a theoretical review of studies of convergence, the following definition of the term convergence is suggested (also shown in Figure 2):

Convergence is a change process initiated by technological, socio-economical and organizational forces occurring on firm- and industry-level which removes or changes traditional industry borders, framing and enabling new resource constellations and eventually leading to industry convergence.

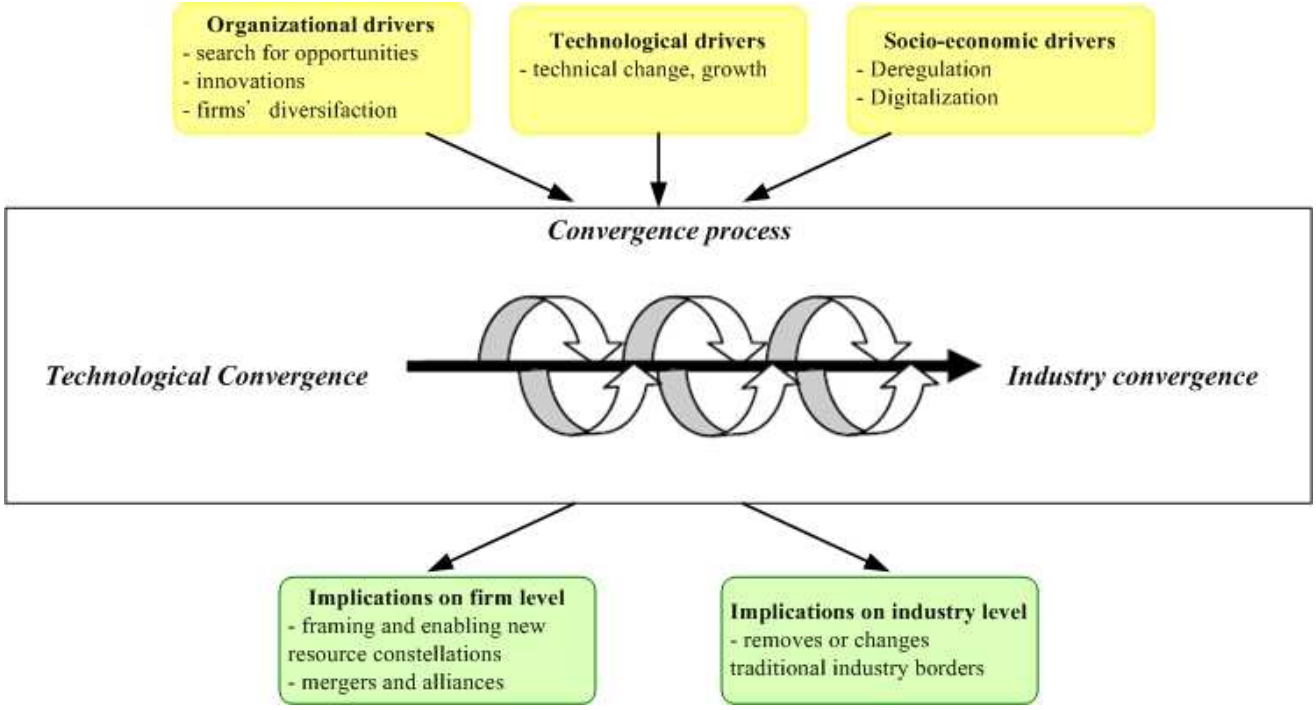


Figure 2: The definition of convergence process

On the basis of the previously identified challenges and competitive constellations within convergence processes, the following task is to identify inherent firm-level capabilities for managing the dynamics of convergence. These capabilities are based on analyzing how firms from previously introduced case set responded to their respective challenges and changing conditions.

3.2 The capability approach

3.2.1 Introduction to dynamic capabilities

Research within the field of resources based view is closely related to the performance and success of corporations, which are the exogenous variables (Priem et al., 2001). A specific problem of several research related to the resourced based view is their static characters. Because there is no time series included in many research, in particular path dependencies remained often unconsidered. Another problem is that the research on specific resource pays often less attention to the processes within a corporation. Several problems around the resource based view motivated Teece et al. (Teece et al., 1997) to invent a new approach as an explanation of competitive advantage: the capabilities based view.

One of the earliest definitions of capabilities was brought out by Richardson (1972) and includes most of the ingredients that have been identified and recombined in later research. In his research, he points out "*it is convenient to think of an industry as carrying out an indefinitely larger number of activities, activities related to the discovery and estimation of future wants, to research, development and design, to the execution and co-ordination of processes of physical transformation, the marketing goods and so on. And we have to recognize that these activities have to be carried out by organizations with appropriate capabilities, or in other words, with appropriate knowledge, experience and skill*" (Richardson, 1972, p.888). Richardson (1972) helps to explain how firms grow along paths set by their prior possession of capabilities and how these capabilities themselves slowly expand and alter.

Gaining competitive advantage is traditionally seen as based on superior resources (Peteraf and Barney, 2003) in terms of possession and resource exploitation (Newbert, 2007) with special emphasis on the ways these resources are being used (Peteraf, 1993; Barney, 2001; Newbert, 2007) as capabilities. Capabilities and resources together include all the assets owned, controlled or otherwise occupied by a firm that is leveraged to develop and implement a set of specific decision options (Hunt and Morgan, 1995). The major differences between resources and capabilities are as following:

- Resources are either tangible or intangible while capabilities combine both (Galunic and Rodan, 1998): capabilities are a cluster of tangible, input resources and knowledge-based, intangible resources.
- Unlike resources, capabilities have an operational, process dimension – they are not factor stocks, but they are factor flows (Makadok, 2001; Winter, 2000): capabilities present what a firm can do that are the organizational activities not individual skills.
- Capabilities often take a routine-like form and are path-dependent (Helfat and Peteraf, 2003; Spanos and Lioukas, 2001; Makadok, 2001; Winter, 2000): if a firm was to be dissolved, its capabilities would disappear as well.

Firms often develop capabilities in their functional areas or by combining different types of resources at the corporate level. Their primary goal is the enhancement of productivity and effectiveness (Amit and Schoemaker,

1993). However, seeking for ultimate excellence can also have a negative impact on the firm's performance. Core rigidities are the downside of core capabilities and can evolve under different circumstances. A typical example is a long period of success for a company and the corresponding loss of alertness for new market trends. In order to mitigate core rigidities, firms should regularly evaluate and rethink their business systems to overcome static processes (Leonard-Barton, 1992). This is especially important in dynamic environments where the boundary conditions change over short periods.

Within these changing environments, firms have to continually acquire, upgrade, and develop resources to grow and maintain a competitive position in the market (Wernerfelt and Montgomery, 1988). Thus, companies require the ability to adapt to new settings with minimal resources in a very short period of time (Nelson and Winter, 1982; Hayes and Pisano, 1994). The capabilities of manipulating a firm's resource configuration in order to adapt to high-velocity environments are referred to as dynamic capabilities (Eisenhardt and Martin, 2000). The term "dynamic" refers to the ability of a firm to achieve new forms of competitive advantages by renewing competences and organizational resources to achieve congruence with the changing business environment. Moreover, the term "capabilities" emphasized the key role of strategic management in appropriately adapting, integrating, and reconfiguring internal and external organizational resources, and functional competences to match the requirements of a changing environment (Teece et al., 1997, p.516). The ability of a firm to expand and develop its dynamic capabilities over time depends on its business processes (i.e. routines, current practice and leaning) and market position (i.e. current assets, market share and profitability).

Reviewing the literature reveals that researchers have tended to identify dynamic capabilities post hoc, inferring their existence from successful organizational outcomes such as profitability and growth, as prior definitions would suggest (Table 6). Since the dynamic capabilities framework as a strategic management concept is comparatively recent, there have been several discussions among scholars with respect to its meaning. Zollo and Winter (2002) question the limitation of dynamic capabilities to environments which are subject to disruptive change. They refer to the fact that firms integrate, generate, and reconfigure competencies regardless of their environment. Hence, they define a dynamic capability as "a learned and stable pattern of collective activity through which the organization systematically generates and modifies its operating routines in pursuit of improved effectiveness" (p. 340). With this approach, Zollo and Winter (2002) contradict Eisenhardt and Martin's (2000) definition of dynamic capabilities as emergent and unstable processes in high-volatility markets.

Author	Definition
Helfat(1997)	The subset of the competences/capabilities which allow the firm to create new products and processes and respond to changing market circumstances.
Teece et al. (1997)	The firm's ability to integrate, build, and reconfigure internal and external

	competences to address rapidly changing environments.
Eisenhardt and Martin (2000)	The firm's processes that use resources – specifically the processes to integrate, reconfigure, gain and release resources – to match or even create market change. Dynamic capabilities thus are the organizational and strategic routines by which firms achieve new resources configurations as market emerge, collide, split, evolve and die.
Griffith and Harvey (2001)	A global dynamic capability is the creation of difficult-to-imitate combinations of resources, including effective coordination of inter-organizational relationships, on a global basis that can provide a firm a competitive advantage.
Lee et al. (2002)	A newer source of competitive advantage in conceptualizing how firms are able to cope with environmental changes.
Rindova and Taylor (2002)	Dynamic capabilities evolve at two levels: a micro-evolution through 'upgrading the management capabilities of the firm' and a macro-evolution associated with 'reconfiguring market competencies'.
Zahra and George (2002)	Dynamic capabilities are essentially change-oriented that help firms redeploy and reconfigure their resource base to meet evolving customer demands and competitor strategies.
Zollo and Winter (2002)	A dynamic capability is a learned and stable pattern of collective activity through which the organization systematically generates and modifies its operating routines in pursuit of improved effectiveness.
Winter (2003)	Those that operate to extend, modify or create ordinary (substantive) capabilities.

Table 6: Definitions of dynamic capabilities

In summary, the definition in this study integrates elements of both seminal publications discussed in the previous paragraph. Thus, I characterize dynamic capabilities as:

The organization's learned patterns that enable the firm to configure its organizational setup, comprising the adjustment of the resource base as well as the generation and adaptation of organizational routines in response to the changing environment to attain and sustain competitive advantage.

3.2.2 Dynamic capabilities for convergence processes

Given that convergence processes represent a high degree of change and uncertainty, it would follow that dynamic capabilities are necessary components of the processes. Convergence processes requires a firms' search ability for new information outside the existing knowledge base, generally in areas unrelated to current operations (Nelson and Winter, 1982). It is an uncertain process, the nature of which is specific to the particular context – providing few predictable and repeatable elements (Nelson and Winter, 1982). Likewise, dynamic capabilities rely on quickly created, situation-specific knowledge (Eisenhardt and Martin, 2000). They require ad hoc problem solving (Winter, 2003) and iterative adaptation to unpredictable outcomes (Eisenhardt and Martin, 2000). Therefore, one can derive a close association between the requirements for convergence processes and the nature of dynamic capabilities, implying that dynamic capabilities are close related to convergence processes.

Firms' dynamic capabilities can have many dimensions such as technology capabilities, advertising capabilities, financial capabilities, etc. Capabilities are context-specific (Hannan and Corroll, 2002). In this study, my main interest is to understand firms' capabilities within convergence processes, which is characterized by a series of change from technological convergence to industry convergence. Therefore, I am mainly concerned with two important integrative dimensions relevant to this premise: the first is relational capability which is defined as a firm's ability to interact with and manage other firms in interfirm relationships (Lorenzoni and Lipparini, 1999), and the second is absorptive capacity which is described as a firm's ability to discover and to learn from any other firm.

Relational capability

Relational capabilities are the results of gradual processes in which one or more companies decide to broaden their vision of relationships in order to improve their competitive position in the market (Fawcett et al., 1997). An organization's willingness to make relational investments reflects its level of commitment to the relationships, and the extent to which individual partners are valued. Accordingly, the relational dimension refers to the extent to which partners are mutually oriented towards one another. A relational orientation tends to be characterized by greater trust, flexibility and resilience (Dyer and Singh, 1998) and is manifested through the extent to which an organization engages in informal interactions and normative mechanisms that are cooperative in nature and serve to bind partners together through shared understandings and norms. A relational orientation enables partners to engage in a more dynamic process of interaction and value creation than would be the case in situations where there are significant imperfections in the relationship.

Relational capability of a firm, like other capabilities, is a function of prior related experiences from which firms obtain such skills (Cohen and Levinthal, 1990). A firm with more experience in interfirm relationship is generally likely to be more capable in relational management. Prior experience provides opportunities for the firm to learn about issues that could arise in interfirm relationships and to develop routines and strategies to deal with these issues (Anand and Khanna, 2000). Lorenzoni and Lipparini (1999) study three successful packaging machinery firms. They find that these firms developed internal technical and coordinative capabilities, which made them more effective in

getting access to the knowledge of their linked alliance partners. Gulati et al. (2000) also argues that firms with prior alliance experience could learn from their experience and develop managerial capabilities to form new alliances.

Once a firm develops certain relational capabilities, it is more likely to exploit them by establishing more interfirm relationships with other firms, thereby gaining economic benefits (Nelson and Winter, 1982; Gulati et al., 2000). Anand and Khanna (2000) reckon that firms with dedicated alliance functions in their structures are more likely to have capabilities to perform well in the future alliances. Researchers on dynamic capabilities of firms similarly argue that it is possible for firms to develop certain routines from past experience to deal with organizational changes. Relationship-specific routines, like all routines, only become effective through repeated applications (Nelson and Winter, 1982; Gulati et al., 2000). This includes internal routines that are especially suited for interacting with specific partner (Levinthal and Fichman, 1988) and routines that span the partner organizations (Mitchell and Singh, 1996). It can also conclude such mundane factors as individuals within the firms getting to know each other well enough to know who knows what and where critical expertise resides in each firm (Dyer and Singh, 1998). These routines allow the firms to gain cost, quality, and timeless advantage that in turn lead to superior performance.

To analysis of relational capabilities an evaluation of the strategic contribution of the activities to the company's goals is necessary. The study of the strategic value of activities will identify three groups of activities. The first group comprises those to be retained in-house since they constitute the core competence. The second contains core activities with the peculiarity that the focal company does not have a high level of competence and therefore, a service company that gives value to the activity is required, while the third comprises non-core activities, which should be outsourced.

Absorptive capacity

The ability of a firm to adapt to changing business requirements depends in part on a capability called 'absorptive capacity' (Cohen and Levinthal, 1990). Cohen and Levinthal (1990, p.128) refer to absorptive capacity: '*the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends … the ability to evaluate and utilize outside knowledge is largely a function of the level of prior knowledge*.' The definition suggests that a firm has an ability to learn from any other firm. Firms with higher absorptive capacity demonstrate stronger ability of learning from partners, integrating external information and transforming it into firm-embedded knowledge. The differential absorptive capacity across firms is exhibited in several aspects: (1) demonstrate long-term commitment of resources in the face of uncertainty (vs. short-term limited commitment and reverse at the first sign of failure); (2) learn from various partners and own research and experience and develop first-hand knowledge of the new technology (vs. competitive imitation and second-hand knowledge); (3) thoroughly analyze the new drilling technology and share information within multidisciplinary teams (vs. superficial analysis and functional structure); (4) develop and use complementary technologies (vs. no complementary technologies used); and (5) possess a high level of knowledge and skills in areas relevant to applying the new technology (Woiceshyn and Daellenbach, 2005). Other empirical studies (e.g. Salvato, 2003; Verona and Ravasi, 2003) also reveal that firms' ability to acquire external, new knowledge, assimilate it with existing, internal knowledge and create new knowledge

is an important factor of dynamic capabilities in several industries. The more a firm demonstrates its absorptive capacity, the more it exhibits dynamic capabilities.

Moreover, Zahra and George (2002) reconceptualize absorptive capacity as a set of organizational routines and processes, by which firms acquire, assimilate, transform, and exploit knowledge. They also suggest that the four organizational capabilities build on each other to yield absorptive capacity, a dynamic capability that influences the firm's ability to create and deploy the knowledge necessary to build other organizational capabilities. Zahra and George (2002) further differentiate two types of absorptive capacity— potential and realized, where the former consists of acquisition and assimilation and latter of transformation and exploitation.

Consistent with Heeley (1997), this study posits that absorptive capacity consists of two major components: external knowledge acquisition and intrafirm knowledge dissemination. Acquisition refers to a firm's capability to identify and acquire externally generated knowledge that is critical to its operation (Zahra and George, 2002). Acquisition of external knowledge reflects the identification function, which represents the "generator" of intelligence for the organization. External environmental signals are identified, and information on those signals is gathered and transmitted across the organizational boundary. The generation of external information should not be the monopoly of any one department but rather an organization-wide activity. Additionally, firms need to scan frequently and broadly. The more information the organization gathers through the search process, the more options there are for identifying changes in the environment, and therefore, the better the company can perform.

Information gathered from the business environment should be transferred to the organization and then transformed through the internalization process that requires dissemination and assimilation. Just as successful acquisition of knowledge requires the participation of many organizations' departments, successful dissemination also requires significant knowledge flows and sharing to ensure that the knowledge reaches the relevant people. Without knowledge transfer and dissemination, no viable response can be designed and implemented. Sinkula (1997) pointed out ways to disseminate knowledge, such as interdepartmental meetings and interdepartmental cooperation.

Although Cohen and Levinthal (1990) primarily focus on absorptive capacity at the firm level, several observations are made regarding the interfirm level. For example, critical remarks are made regarding a firm "buying" absorptive capacity though hiring corporate acquisitions. The importance of considering the absorptive capacity of the partner in interorganizational relations has been pointed earlier by for instance Veugelers and Kesteloot (1996). They investigate, among others, asymmetries in absorptive capacity between partners and likelihood of establishing successful R&D joint ventures.

3.3 Towards a theoretical framework

According to Yin (1989) a theoretical framework needs to state the conditions under which a particular phenomenon is likely to be found as well as the conditions when it is not likely to be found. In this study a theoretical framework is developed as a base for the empirical data collection. The theoretical framework of this research consists of specific parts of extensive material on convergence processes and the firms' dynamic capability approach. The theoretical framework served as a basis for the choice of data collection method.

The theoretical model in Figure 3 explains and presents the reasons and possible outcomes of convergence in an industry based on communication. Thus, the model implies that (1) convergence is driven by different factors on both firm- and industry-level, (2) The convergence process is the process of convergence from a technological level to an industry level and finally, (3) the convergence processes has different implications.

Convergence processes requires a search for new information outside the existing knowledge base, generally in areas unrelated to current operations (Nelson and Winter, 1982). It is an uncertain process, the nature of which is specific to the particular context. Likewise, dynamic capabilities rely on quickly created, situation-specific knowledge (Eisenhardt and Martin, 2000). They require ad hoc problem solving (Winter, 2003) and iterative adaptation to unpredictable outcomes (Eisenhardt and Martin, 2000). Therefore, one can derive a close association between the requirements for convergence and the nature of dynamic capabilities, implying that dynamic capabilities are beneficial to convergence processes.

Given that convergence processes represent a high degree of change and uncertainty, it means that dynamic capabilities are essential for firms within this process. Therefore, I found the linkage between the requirements for convergence processes and the nature of dynamic capabilities, implying that dynamic capabilities are close related to convergence processes. In this research, two important integrative dimensions for the dynamic capabilities were chosen: one is relational capability defined as the way that companies foster collaboration, while the other one is absorptive capacity described as structures that facilitate the discovery of new knowledge. In many respects, relational capability and absorptive capacity are different capabilities which result in different strategic activities such as alliances and acquisitions involving different organizational routines. An alliance is a short-term cooperation, typically based on certain specific joint projects. It does not require firms to integrate their operations fully. Some personnel from each firm may be assembled to work on the alliance projects, but the rest of the firm operates as through it were independent of the alliance. Firms are able to explore new knowledge and timely learning from partners appears more appropriate than control through formal and hierarchical organization as such (Eisenhardt and Schoonhoven, 1996). In contrast, an acquisition is a long-term plan for firms to come together. It requires firms to fully integrate their operations. These activities have been commonly seen in the mobile telecommunication sectors these days; therefore, I am motivated to get a deeper understanding about how mobile operators act strategically in order to survive in such a converging environment and which capabiliti(es) they have developed along with the convergence process.

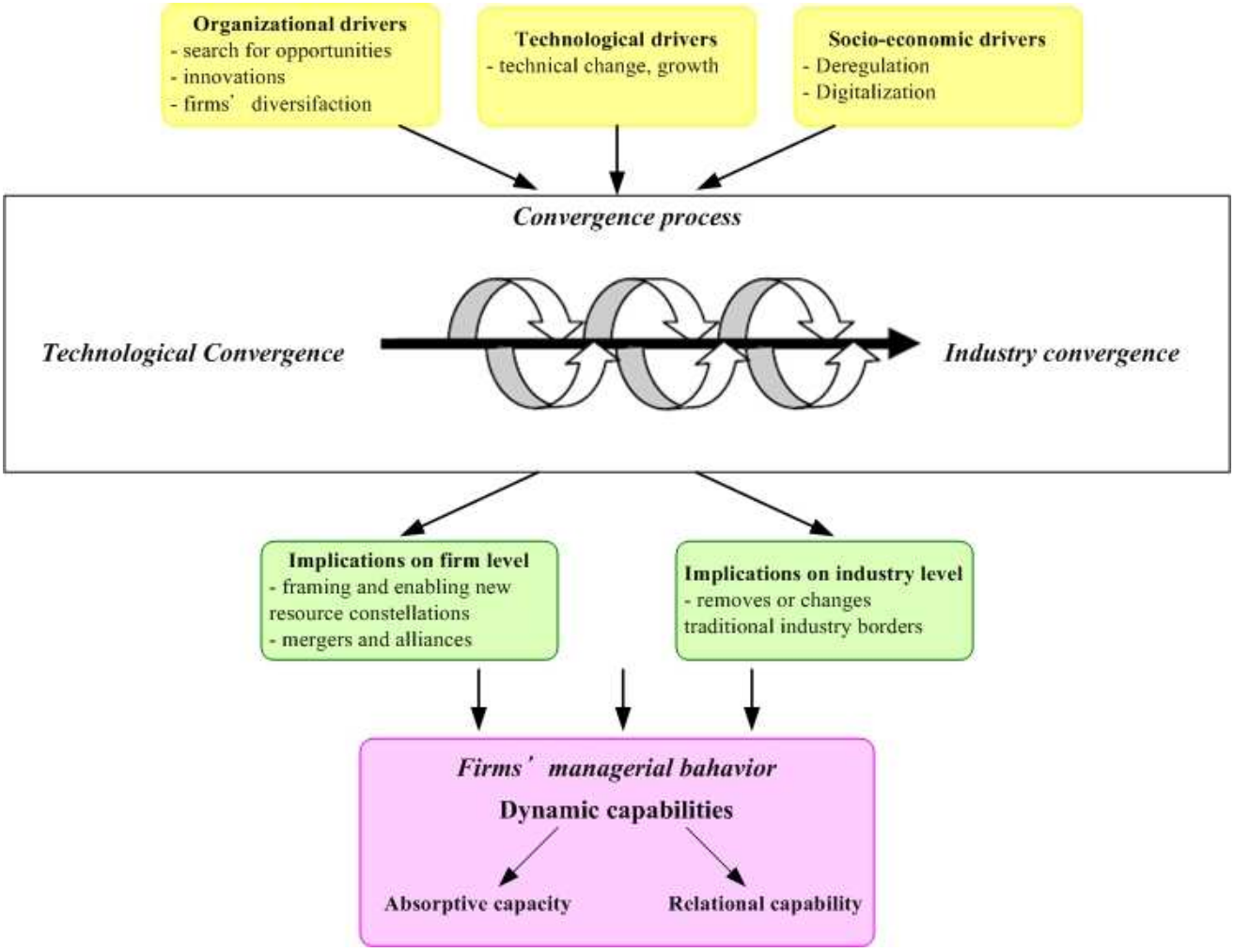


Figure 3: Theoretical Framework

4 RESEARCH METHOD

This chapter presents the methodological choices made when conducting the study. It is intended to facilitate the understanding of how I have proceeded in every stage of the study by presenting the motivation for the most influential choices.

4.1 Case study as a research strategy in managerial studies

The choice of research strategy is determined by (1) the objective of the study, (2) the nature of the research questions, and (3) the theoretical framework adopted. The objective of this thesis is to provide a deeper understanding of how the Dutch mobile operators could implement their objective for sustainable, profitable growth, and to contribute to a deeper understanding for managerial decisions under the premise of convergence. The mobile operators' capabilities are therefore of special interest. A qualitative approach for case study was chosen because it is thereby possible to look directly and longitudinally at processes, states and events, and to show how these have led to specific outcomes (Ghauri, 2004). Furthermore, qualitative approaches primarily take a perspective of understanding. The aim is to gain a deeper understanding of the problem being studied.

Eisenhardt (1989) and Yin (1989) all propose that case studies are beneficial in situations where only little is known about the issue at hand and in situations where current theories seem inadequate. Case studies allow the study of a contemporary phenomenon, which is difficult to separate from its context, "but necessary to study within it to understand the dynamics involved in the setting" (Halinen and Törnroos, 2005). Case studies are therefore optimal for studying convergence processes and mobile operators' capabilities, as the context is complex, but the issues cannot be separated from it. Mobile operators' capabilities must, in this case, be analyzed in their current setting and context, which in mobile telecommunications is characterized by convergence processes.

There are three types of case studies (Stake, 1995): (1) intrinsic case study focuses on the case itself to have a deeper understanding of the case; (2) instrumental case study mainly explores the case to form a picture of the issue while the actual case has a supportive role; and (3) collective case study emphasizes several cases in order to investigate a phenomenon, population or general circumstances. The two latter types require the researcher to choose the cases before a formal study can begin (Stake, 1995). Based on this, this study is not a pure example of these types, but there are characteristics from the instrumental case study, because the cases are investigated to identify the mobile operators' capabilities and, thus, for the comprehensive picture of such phenomenon.

According to Yin (1989), the explorative and explanative case studies form the research questions based on (1) *how* and *why* contemporary events exist and happen, while (2) *what* refers to the descriptive or predictive case studies. The types of research questions, the extent of control over actual behavioral events and the degree of focus in contemporary or historical events will determine which strategy to use. Given the theoretical framework (capabilities that companies have developed within the convergence processes) and the main concepts under scrutiny (capabilities,

exploration and exploitation), the case study was considered to be the most suitable research strategy. Godfrey and Hill (1995) advocate viewing firms as natural laboratories in which theoretical propositions can be tested. They emphasize the importance of using qualitative methods in 'observing the unobservable' – the effects of intangible resources on business strategy. Moreover, researchers point out that capabilities are very difficult to identify through quantitative research (e.g. Eisenhardt and Martin, 2000).

4.2 Case study design

4.2.1 Case selection

Although case studies occur in natural settings, issues concerning the manipulation and control of variables are crucial in terms of the research design. The case selection in this study was influenced by the need to control extraneous variables, thus the domain chosen was that of large, established companies operating the mobile telephony in the Netherlands.

In the business context, the unit of analysis – the 'case' – usually refers to the type of organization that is to be studied, i.e. a firm, a division, a department, a project or a corporate function (Remenyi, 1999). In this research, the main unit of analysis was an independent mobile operator which might be part of a larger corporation, a subsidiary or part of it. I chose large, established mobile operators in 1999 to 2008 for the following reasons:

- Larger, established companies sensitive to the technological uncertainties and economic fluctuations frequently face the dilemma of combing opportunity-seeking and advantage-maintaining growth.
- The large companies are, in many ways, the potential forerunners in their industry. They have a wide geographical scope, they have more resources to fund innovation, and their customer base connects them to a wide network that can be used in market sensing (Ahuja and Lampert, 2001). Thus, by observing them, it was possible to describe the general trends in the industry in foresight.

Therefore, I chose the largest two mobile operators in the Dutch telecommunication sector, namely **KPN Mobile NV** and **Vodafone Libertel**. Koninklijke KPN is the leading provider of telecommunications services in the Netherlands. It provides services ranging from fixed and mobile telephone operations, Internet to television through its fixed national network. However, the company's core business is KPN Mobile which serves more than 27 million subscribers in the Netherlands, Germany, and Belgium. Recently, KPN has seen a dramatic change in the telecommunication sector and is moving along with the trends of converging internet, fixed telephony, mobile telephony and multimedia. **Vodafone Libertel**, part of the Vodafone Group is one of KPN's competitors in the Dutch market which mainly provides mobile-telephony solutions to their end customers. Previously, it was called Libertel which was acquired by Vodafone Group and then underwent a series of rebranding exercises. By going through similar transitions, Vodafone Group built up the first truly global mobile telecommunication company with its unified brand image throughout the world. Remarkably, Vodafone NL was the first operator in the Netherlands to

launch UMTS (Universal Mobile Telecommunication System), which is one of the 3G network technologies. More information of these two mobile operators will be provided in Chapter 6.

4.2.2 Data collection

In the qualitative research, there are four major methods used: observations, texts and documents, interviews and finally recording and transcribing (Silverman, 2001). Many case studies combine data collection methods such as interviews, questionnaires, archives and observations to find evidence which may be qualitative, quantitative or both (Eisenhardt, 1989). Due to the time constraints and lacks of contacts with the target companies, secondary data was used as the main information source in this research.

In order to answer the first sub-question, the reports from two national research institutions Centraal Bureau voor de Statistiek (CBS) and Onafhankelijke Post en Telecommunicatie Autoriteit (OPTA) provided extensive information to understand the convergence phenomena happening in the mobile telecommunication sector in the Netherlands. Regarding the second and the third sub-questions, the main source of information was from the companies' website where the relevant historical background, important activities, annual reports, publications, press releases and public financial statements could be acquired. Especially, both companies' annual reports for the period 1999 to 2008 have been carefully examined. The main benefit of annual reports as a data source is that it is written at the time of interest. Previous research has shown that annual reports provide a fairly comparable set of data for a broad sample of corporations (Bettman and Weitz, 1983) and can be a rich source of information concerning company strategies (Bowman, 1978). On the other hand, annual reports contain an arbitrary mix of items that corporate management wants to highlight, for example, business results, technological investments, the assessment of market trends, and strategies for the positioning of the company (Bergek et al., 2008).

Moreover, suitable information and abundant studies have been found through Erasmus University Rotterdam's databases. From the academic perspective, I primarily used Proquest to find academic papers, essays and theories. Business Monitor International (BMI) and company.info provided the latest information from the practical business perspective. The comprehensive BMI reports contain the latest available data, forecasts and analysis on economic performance and outlook, the business environment and finance on the basis of industry sectors. Company.info provides a variety of business information of both Dutch and international companies active in the Netherlands. The information includes general company description, financial reports, director information and market trends.

In addition to the information mentioned above, abundant data was collected from other specialized sources: telecom magazines, Internet sources, surveys conducted by consulting agencies, books and industry papers.

4.2.3 Data analysis

Ritchie and Lewis (2003) distinguish between naturally occurring data and generated data. The former involves, among others, observation and documentary analysis and relies on the researcher's interpretation. The latter involves interviews and therefore means that the participants have a direct and explicit opportunity to convey their own meanings and interpretations through the explanations they provide. Merriam (1998) points out that data analysis is the process of making meaning which contains summarizing, classifying and interpreting.

In this research, manifest and latent content analyses were applied to each firm's corporate documents describing their products and services. Manifest content analysis examines the actual words and phrases making up content, while latent content analysis focuses on the content's underlying meaning, which may or may not be easily detectable solely by examination of content in its manifest form (Babbie, 1992). In order to determine each firm's capabilities, documents either authored for or approved by the firm were analyzed. However, no confidential documents were used. All analyzed documents were publicly available. These documents were designed to provide a reader with an overview of the firm's capabilities and strategic activities.

In both manifest and latent analysis, the most general materials were analyzed first, such as business statements within annual reports as well as corporate fact books. Then, the more specific documents with more detailed content about the firm's capabilities and operations, such as acquisitions announcement, and collaboration agreements were analyzed. Using publicly available, rather than private, documents authored or approved by a firm for analysis accomplished two things. First, it helped ensure that the knowledge and skills isolated for inclusion were in fact ones which people employed by the firm considered themselves to have. Second, it avoided inadvertently disclosing the firm's confidential information. One disadvantage of analyzing public documents, however, was that the documents by themselves did not always penetrate completely to the real capability since the firm intended to present tangible products and services rather than drawing attention to its underlying strengths making those services and products possible.

One important step in the data analysis was that I attempted to distinguish firms' "absorptive capacity" and "relational capability" from my collected data. As mentioned in chapter 3.2.2, relational dimension refers to the extent to which partners are mutually oriented towards one another. A relational orientation tends to be characterized by greater trust, flexibility and resilience (Dyer and Singh, 1998) and is manifested through the extent to which an organization engages in informal interactions and normative mechanisms that are cooperative in nature and serve to bind partners together through shared understandings and norms. On the other hand, absorptive capacity demonstrates firms' ability to learn, to integrate external information and transform it into firm-embedded knowledge. These capabilities result in firms' strategic choices between alliance and mergers & acquisitions (M&A) to converge new sources into their core business. Besides alliance, we further reckoned that firms' relational capability appears in the forms of collaborations, partnerships and joint ventures; in the mean while, M&A subsidiaries and buyer-supplier contracts were considered as firms' absorptive capacity in this study.

According to Ford (2001) the study of a business relationship involves two levels i.e. the overall relationship itself and the individual episodes of which the relationship comprise. Throughout the "story" that I will be telling when describing the empirical case in chapter 5, I will go through different episodes and consistently make an effort to relate them to the overall relationship as the story unfolds. Essential events considered as firms' absorptive capacity and relational capability during convergence processes of both Vodafone and KPN are highlighted and discussed separately.

4.3 Evaluating research validity and reliability

4.3.1 Validity

An overview of the concept of validity to measure "the right things" reveals several rules and guidelines for the qualitative analysis (van der Velde et al., 2004). Validity of the research signifies the entity, where the results correspond to the objects of the study. It has been argued that no single or collection of methods can be the ultimate source of authentic truth, whereas the role of the interpretation process has also received attention (Lincoln and Guba, 2000).

Construct validity concerns the question on how well a study measures what it is supposed to measure. Yin (1989) presents three tactics for avoiding researcher subjectivity, namely (1) the use of multiple sources of evidence, (2) the establishment of a chain of evidence, such as clear links between the data gathered, the questions asked and the conclusions drawn, and (3) the opportunity to have the draft case study reviewed by key informants. Having used many different sources, I felt that the first tactic could be utilized to the extent that this research permits in terms of time and resources available. Regarding establishing chains of evidence, I planned to achieve coherence from the initial research question to the final conclusion. Concerning the last tactic, it was a pity that I did not have enough time to conduct interviews with relevant informants who are more aware of the convergence process and the relevant activities happening in the Dutch mobile telecommunication sector.

Internal validity refers to the extent to which it can be inferred that a causal relationship exists between two (or more) variables. It is important that the researcher sees all possibilities and does not miss factors that can influence the relationship between variables. Yin (1989) defines this as '*establishing a causal relationship, whereby certain conditions are shown to lead to other conditions, as distinguished from spurious relationships*'. The relationship between cause and effect was difficult to clarify in a case study.

External validity concerns the question of whether the results of the study's findings can be generalized beyond the specific study. Yin (1989) recommends replication logic to improve the external validity. The reasoning behind replication logic is to test the findings from one case study on other cases in order to find out if the findings are valid. I believed the external validity to be weak concerning the ability to generalize the analysis to other industries. In my

opinion, the identified capabilities resulting from the impact of the convergence process most probably could be generalized to the convergence emerging within other industries where the circumstances are similar to the telecommunication industry. However, I did believe the external validity to be semi-strong concerning the ability to generalize the findings from the convergences studied within the telecommunication industry.

4.3.2 Reliability

Reliability refers to the replication and accuracy of measurement results (van der Velde et al., 2004). Reliability refers to the operations of a study such as the data collection procedures that can be repeated with the same results (Yin, 1989).

To optimize the quality of the study it is absolutely necessary to question the secondary data. Valuing the reliability of the chosen sources of information is a matter of assessing the grade of distortion. Many factors can affect the information process and should therefore be treated appropriately. When conducting a research with rapidly changing conditions such as within the mobile telecommunication sector, it is important to consider the topicality of the information used. The secondary data has to be up-to-date and actual to avoid inaccuracy. For that matter I have aimed for an optimum of accuracy by constantly re-evaluating the assembled material and amend it to later data.

Additionally, an abundance of secondary data restricts the risk of being misled. To a great extent, it is very plausible that an author's lack in objectivity but the margin of error needs to be reduced to a minimum. To avoid the risk of bias, various data and information has been selected from literature, articles, and Internet with careful attention for diversity and conflicts of interests. The overall reliability would have been enhanced with a greater number of interviewed persons but ineffective considering the limited time-frame.

4.3.3 General assumption of the study

Generalization can be approached from different directions. Qualitative research does not aim for statistical generalizations, but instead, it pursues to describe the occasions, to understand a specific action or to give an explanation or theoretical interpretation of the examined phenomenon. The generalizations cannot be done from the evidence directly, but from the conclusions and the interpretations based on the evidence and, thus, the criterion for`` the generalization is rational data collection. The research process and its different stages must be written down to prove the scientific validity and, therefore, the reliability of the research process and the valid conclusions are significant in the assessment of the qualitative analysis. The replication of the analysis refers to the principles of classification and interpretation, which are stated so clearly that another researcher can apply the principles to conclude the same results (McKinnon, 1988). Kvale (1996) has also outlined similar conclusions and mentions that the validity is less a matter of specific techniques and definitions, than of lines of questioning and search of relevant

contexts for inquiries into the truth. In this study such issues refers to the coding and conceptualization (empirical data and evidence) presented above as well as theoretical data collection from the current literature.

4.4 Chapter conclusions

The current study was set in the Dutch mobile telecommunication sector; therefore the largest two mobile operators KPN and Vodafone were chosen to be the case-study firms. The approach of systematic combining is adopted in this research as it allows the researcher to go back and forth "from one type of research activity to another and between empirical observations and theory (Dubois and Gadde, 2002). The researcher is thus able to get a wider understanding of both theory and empirical phenomena. The research process relied on pre-understanding, theory, data collection, analysis, reading, reflecting, discussing, theory again, and reflecting again, and finally on telling the story in a way that communicates the message to the public.

Relying on only two cases limited in the Dutch mobile telecommunication sector might be seen as a serious shortcoming of the study. However, considering the aim of the study and the conditions explicated above, the approach can be justified.

5 THE CONVERGENCE OF MOBILE AND INTERNET

This chapter offers the background information of mobile Internet. This insightful overview is meant to help the reader understand the emergence of this convergence as well as the reality of mobile operators' current and upcoming challenges.

5.1 Background

Between the late 1970s and early 1990s, development and inventions in two different areas – Internet and mobile phones – were going on roughly at the same time, each in its own world. Especially, in the 1990s, each area grew and blossomed tremendously. 2G digital mobile communication phones were acquired by significant portions of the general population. Meanwhile, the Internet also became popular, due in large part to the success of the WWW (World Wide Web).

Just as market exuberance for Internet companies peaked in early 2000, tender offers and contests for 3G licenses and the 3G network of mobile carriers were beginning across Europe. From the literature, 'mobile Internet' is commonly defined as the part of the current stationary Internet that can be accessed from a mobile device such as a mobile phone, a PDA, or a laptop (Ott, 2006). However, there are some distinct characteristics that separate mobile services consumption from Internet services consumption. In Table 7 the difference between Internet and mobile services characteristics are summarized.

Area	Internet	Mobile
Customer access cost	Low	High
Standardization	Highly standardized	Multiple incompatible standards
Identity	URL with IP and domain name	Phone number
Application development	General	Device specific
Interface device	Computer	Mobile phones and PDAs
Mobility	Fixed location (expect WLAN enabled mobile location)	Mobile
Main input mode	Keyboard	Small key pad and voice
Processing power	Powerful	Limited
Timing	Less time critical	Time Critical

Table 7: Differences between Internet and mobile services characteristics

The main condition of mobile Internet is focused on users' mobility. It is necessary to take into account customer demand for access to the current stationary Internet and the services offered via the Internet platform not only 'anytime' but also 'anyplace.' Mobile Internet can offer a range of new services specifically targeting mobile users.

5.2 WAP vs. i-Mode

The main challenges of bringing Internet to mobile devices are on the one hand how to interface between wireless carriers and the TCP/IP based Internet, and on the other hand how to present the information of the various services on the handheld appliance.

WAP (Wireless Application Protocol) was designed as a solution to insulate the Internet-based application from the wireless mobile network infrastructure. The WAP Forum was founded in 1997. The Forum's main aim was to bring together the various wireless technologies by a standardized protocol. In 2002 the WAP Forum was consolidated into OMA (Open Mobile Alliance), which covers virtually everything in future development of wireless data services.

WAP is actually a set of technical standards that allow users to access and receive content from the Internet similarly to using a web browser. WAP transfers via a micro-browser in a mobile-phone specially-processed Internet information. To achieve this, the specially developed language WML (Wireless Mark-up Language) is used. WML is a tag-based language like the HTML (HyperText Mark-up Language) that is used in the web. WAP today is a world-wide accepted standard for the transfer of Internet-services to mobile phones. The architecture for this standard was published by the WAP-Forum. The forum planned to upgrade the WAP protocol to ensure compatibility with 2.5G and 3G wireless standards.

A so-called WAP Proxy makes possible that contents and application of web providers can be shown on the mobile phone screen. Figure 4 illustrates by means of an example of how WAP can be used. The mobile phone with the WAP client communicates with two providers in a wireless network. The WAP Proxy translates the WAP-requests into WWW-requests and enables the WAP client to input a request to the Web provider. The Proxy converts the answers of the Web provider into the more compact format of the WAP client. If the web provider makes available WAP-contents (e.g. in WML), the WAP Proxy takes them over directly from the web provider. However, if the web provider has only WWW or HTML contents available, a converter must be used for the translation of the WWW contents into WAP-contents. Finally, a mobile phone can also directly retrieve contents from a WTA (Wireless Telephony Application) provider.

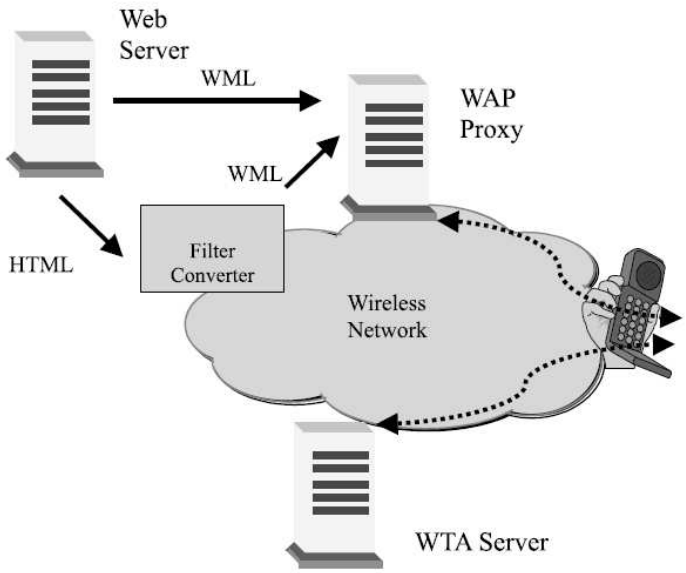


Figure 4: WAP application

On the other hand, NTT DoCoMo, the wireless subsidiary of Nippon Telephone and Telegraph, had rolled out i-mode, a modest, low-band mobile Internet service that had quickly become a huge success in 1999. With i-mode, users were allowed to access the Internet from a mobile phone, making simple transactions, searching for a variety of information, accessing databases, and downloading favorite character, ringing tones or songs for entertainment. NTT DoCoMo designed i-mode as a packet-switched network alongside its existing digital mobile network; later on, they created a new evolution i-mode, a 3G mobile phone service, under the concept of FOMA (Freedom of Mobile Multimedia Access).

One of the many success reasons of i-mode was that NTT DoCoMo sought to deploy it as soon as possible. This led to pragmatic utilization of the existing technology, rather than waiting for more elegant solution. Equally significant was that NTT DoCoMo's decision to go with an HTML-based system for i-mode web sites. WAP, put forward by a consortium of European and American concerns as the new standard for wireless web sites, utilized a system incompatible with HTML, but the i-mode team decided to go with C-HTML (Compact Hyper-Text Markup Language), a form of HTML with a reduced instruction set, thus easing the transition of content providers from their already existing HTML web sites to i-mode-ready content. Figure 5 illustrate the programming model shown on NTT DoCoMo's website. From this, we can recognize some technological similarities between i-mode and WAP.

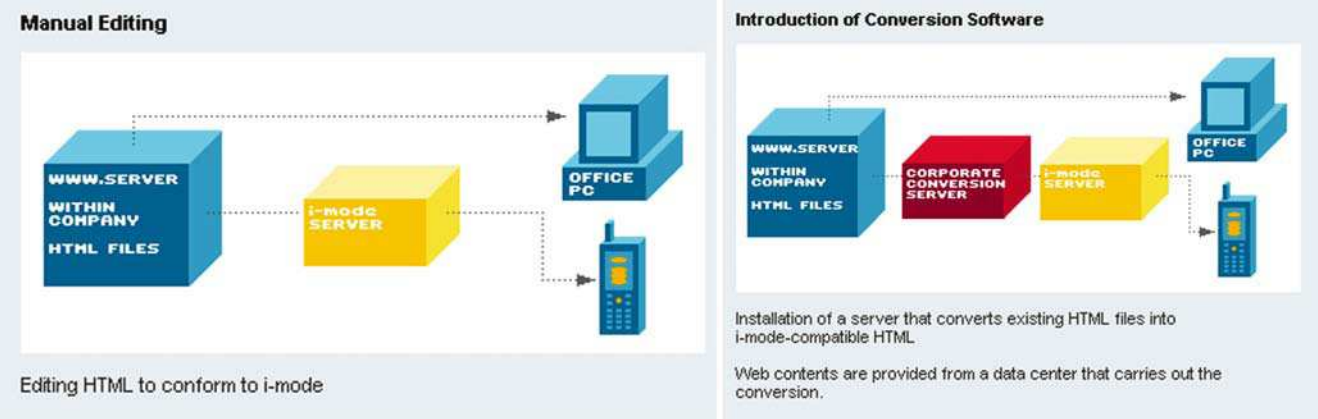


Figure 5: i-mode programming model (Source: DoCoMo)

Unlike WAP, i-mode encompasses a wider variety of internet standards, including web access, e-mail and the packet-switched network that delivers the data. I-mode users have access to various services such as e-mail, sports results, weather forecast, games, financial services and ticket booking. Content is provided by specialized services, typically from the mobile carrier, which allows them to have tighter control over billing.

5.3 The evolution of mobile network technologies

Mobile networks have now undergone a significant enhancement which allows them to grow from a voice call based system to efficiently carry IP data traffic at significantly higher speed. Therefore, mobile operators have been busy upgrading their 2G networks to evolved 2G (also known as 2.5G) and 3G systems in the past few years. These advanced systems allow for mobile subscribers to instantly connect to the Internet or a corporate IP network to exchange information and access service tailored for mobile users.

The early mobile communication systems in the United States and Europe were very fragmented in geographical terms. From 1920 to the end of the 1980s, the United States was the leader in mobile communications. In Europe, the Nordic countries introduced the NMT network which proved that it was possible to agree on a common standard among different countries and this enabled the benefits of roaming (Agar, 2003). During 1970s and 1980s, the cellular systems used analog signals for voice transmission. The analog cellular systems were mainly used for voice services, but the quality was bad. In addition, the analog cellular systems were not suitable for developing a data service due to slow transmission rate. These major drawbacks caused analog cellular systems fail to be an ideal communication technology.

Therefore, 2G systems were developed and gradually replace the analog cellular systems since its first launch in 1992. The most significant difference between the first and second generation of cellular systems is signal used for conveying information. The 2G cellular systems are digital, not analog. The 2G systems include GSM, PDC (Personal Digital Cellular), TDMA IS-136 (Time Division Multiple Access IS-136). However, The 2G cellular

systems are still mainly used for voice communication. As for 2G data services, the most popular services are SMS, E-mail and web portals. These 2G data services have different development results in different countries. As mentioned in chapter 5.2, i-mode is a very successful portal in Japan. It provides games, music, news and the other services, and WAP also provides similar services in Europe.

Between 2G and 3G, there was an intermediary step, which is called 2.5G. As shown in Table 8, the transmission rate of the 2.5G systems is slower than the 3G ones, but it is much faster than the 2G ones. Therefore, 2.5G is sometimes regarded as an early stage of 3G. The most common 2.5G technologies are CDMA 2000 (Code Division Multiple Access 2000), GPRS (Global Package Radio Service), and EDGE (Enhanced Data for GSM Evolution).

GPRS is the 2.5G standard in European and the upgrade of GSM. According to the GSM Association, GPRS is "*a non-voice value added service that allows information to be sent and received across a mobile telephone network*" (GSM World, 2003). EDGE is another European 2.5G standard. Besides the average of transmitting data three times faster than GPRS (Table 8), it also provides the possibility to upgrade from both the GSM and TDMA networks. 2.5G network systems, compared with 2G systems, provide an increased data rate, and therefore are more suitable for both text and graphic transmission. Users can mail images, download music and video clips, access the Internet or get other information that contains graphics over 2.5G networks.

In 1999, IMT-2000 (International Mobile Telecommunications-2000) was approved by ITU (International Telecommunication Union) to be the standard for 3G communication systems. WCDMA (Wideband Code Division Multiple Access) is the European 3G standard which is synonymous with UMTS (Universal Mobile Telecommunication System). Since WCDMA is the next generation for the GSM system, it is the best choice of 3G technology for operators with GSM networks in Europe.

In short, 3G systems fulfill the needs of mobile Internet and there are several advantages of 3G applications. First, they can be put in use anytime. The main characteristic of mobile Internet is always on; therefore users can apply 3G applications with their handsets anytime they want. Besides, receiving and searching for timely information will be easy and convenient. Second, they can be put in use anywhere. The vision of 3G mobile communication is to provide seamless services anywhere on earth. As long as users can receive the signals, they may enjoy the use of 3G applications anyplace indoors, outdoors, on trains, in cars, and even in foreign countries. Third, there are a broad variety of 3G applications. They can contain lots of functions and be the synthesis of all the media and communication tools. Fourth, 3G applications can be personalized. Users can choose application based on their likes and demands. Also, 3G applications can be sensitive to users' location. They can provide appropriate location-based services no matter where users are.

In short, the mobile industry development has been strongly driven by technological development. Table 8 summarizes this.

Generation	Main Standards	Speed	Time	Services
1G	NMT (Nordic countries)		1983 to 1992	• Analogue • Capable of voice services
2G	GSM (Europe) TDMA (Americas and Asia) PDC (Japan)	Up to 28.8 kbps	1992 to the present	• Digital • Capable of voice/ data/ fax transfer and SMS
2.5G	GPRS CDMA 2000 EDGE	64-144 kbps	2001	• Always on technology • Evolved 2G systems
3G	WCDMA UMTS	2 Mbps and up	2001 to the present	• Always on broadband networking • Enable enhanced multimedia and performs at high speed

Table 8: A short summary of the key mobile network technologies

After 3G expectations are targeted towards 3.5Gs such as HSDPA and 4G. HSDPA enables data rates as high as 14.4 Mbps, even faster that today's fixed-line broadband service. HSDPA is already being tested by NTT DoCoMo and 3.5G roll-outs are expected by the end of this decade. Currently 4G only exists at a conceptual framework level. 4G mobile networks are expected to work seamlessly with WLAN (Wireless Local Area Networks) at hot-spot areas, enabling broadband services.

5.4 Actors involved in the convergence of mobile Internet

Two features categorize the convergence of mobile Internet: the importance of technical standards that enable the complementary use of products, and the relevance of new actors that offer complementary products for the sectoral system of innovation. Two levels of standards seem to be especially relevant. Broadband access standards enable the connection between terminal devices and wireless networks, while communication protocols allow the wireless retrieval of data services.

In the past, Internet services and mobile communications developed autonomously. This is changing, since new access technologies and communication protocols allow the Internet to be accessed from mobile handsets. From the perspective of the mobile communications industry, Internet services turn into a new source of knowledge for innovations and their vendors become new relevant actors. The complementary product of mobile terminals, wireless networks, and Internet services entails new interdependencies of actors in the converging process. The commercial success of 3G access technologies depends on the introduction of attractive new mobile Internet services. Therefore, it is important for us to recognize the players in this converging environment before the start of the in-depth analysis. Kalakota and Robinson (2002) categorize the players on the mobile marketplace according to business areas:

(1) One business area within mobile communications concerns *network infrastructure*. Examples of network infrastructure actors are Ericsson, Motorola and Nokia.
(2) *Access* is provided by companies, which sell dedicated network connections. Examples of access providers are mobile operators KPN and Vodafone in the Netherlands.
(3) *Content* is an increasingly important business area. These firms include portals, which organize, aggregate and provide access to content created by other companies. Examples of global content providers are Yahoo! and Google.
(4) *Commerce* is furthermore a mobile business area and encompasses companies selling merchandise or information, or acting as intermediaries, facilitating the matching of buyers and sellers. Examples include Amazon.com and eBay.
(5) *Software* companies facilitate inter- or intra-enterprise communications and commerce. The software area includes operating systems, security and applications software. Microsoft is an example of a software company.
(6) *Hardware* such as portable personal computers (PC) or mobile devices facilitates mobile applications. Hardware companies, such as HP or Sun Microsystems, sell servers and equipment directly to users or network operators.
(7) The business area of *application* is dominated by companies providing a wide variety of services. These actors were based on business area, but practitioners within mobile communications often refer to the following distinctions among actors:

Network operators, service operators and MVNOs: a network operator is defined according to the fact that it owns a backbone network of its own. Owning and maintaining the network used to be the core competence of every network operator on the market. Service operators are often referred to as mobile operators and are, to a large extent, subsidiaries of traditional fixed-line telephone operators. Mobile operators are the ones that are most dependent on the mobile market place, as they have invested heavily in building the network infrastructure. A service provider, which owns only a small amount of important network elements, and buys network capacity from a network operator, is called a mobile virtual network operator (MVNO).

Content providers: Content is a strategic resource for content providers. Content providers are those who provide other carriers with content that is eventually transformed to content services offered either directly to end-users or indirectly via other actors in the network. Content providers can sell their content to different media types, such as TV, radio, newspaper, internet and mobile portals, but are at the same time dependent on network and/or service providers, who charge the end-users.

Mobile portals: Portals are those that customers turn to when they are looking for content or services. As the mobile marketplace is increasingly becoming an extension of the Internet, the presence of Internet portals becomes a vital part.

System and platform providers: Manufacturers of mobile phones supply the mobile networks with the physical infrastructure, such as Ericsson and Motorola. But in order to deliver mobile Internet services, hardware and software are required to connect the mobile network with the mobile operator sites and customer sites.

Software companies: develop software products for devices and platforms. Software includes operating systems, databases, micro-browsers, data transfer in the internet, personalization, billing, customer relationship management and security (Sadeh, 2002). For example, Windows CE is a competing operating system developed by Microsoft (Sadeh, 2002).

Technical enablers: In addition to the above mentioned types of actors, there are a number of technical enablers such as application providers and technical integrators (Taipale et al., 2007). These actors technically enable service provisioning in mobile networks.

Mobile handset manufacturers: Mobile manufacturers provide the market with handsets and they also control which standards or technologies will be adopted due to the fact that they design and launch mobile handsets supporting.

Regulator: A regulator can also be counted as an actor within traditional mobile telecommunications industry borders. A regulator sets the legal environment for actors operating within a particular industry.

In sum, the ability to provide mobile Internet to end-users requires the collaboration between a number of players within the telecommunication sector. The value chain has been deconstructed into a value network. A single company may have different roles depending on its operating environment, the service, or country of origin (Taipale et al., 2007). Mobile operators and handset manufacturers play the most important roles in the mobile telephony network, due to the fact that they are big in size and a large part of the revenue generated accrue to mobile operators. Figure 6 illustrates a possible value network of mobile Internet according to the discussion in this section.

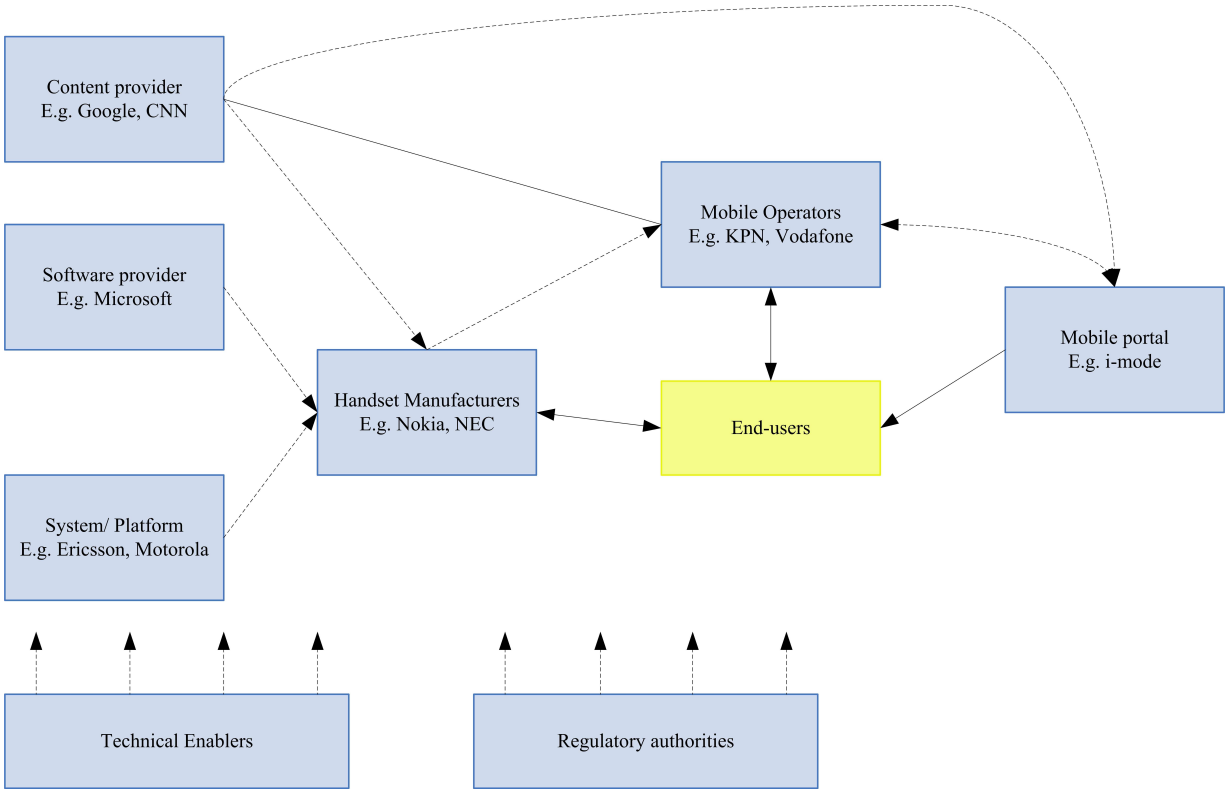


Figure 6: The overview of the actors involved in the convergence of mobile Internet

5.5 The emergence of mobile Internet in the Netherlands

Within Europe, the Netherlands is one of the technologically advanced countries with an excellent transportation and telecommunications infrastructure. The country offers a compact market, which is used by many electronics and IT companies from abroad as a pilot market and as a central point for distribution of products and services throughout Europe. The Netherlands' telecommunications market was fully-opened to competition from July 1, 1997. Here I list the current status and implementation of mobile Technologies:

- GSM: Mobile GSM-based telephony was initially introduced in the Netherlands around 1994.
- GPRS: EDGE is the recently introduced faster version of GPRS. In November 2000, Telfort was the first operator to offer a countrywide GPRS network, followed by KPN, Vodafone, Orange and T-Mobile. i-mode is one of the first consumer services for GPRS.
- UMTS: Among the first in Europe, the Dutch government auctioned five new licenses for the use of IMT-2000/UMTS frequencies for 3G mobile telecommunication during the summer of 2000. Use of the UMTS frequencies will open up opportunities for service providers to introduce many new value-added services based on high-speed data and video communications via phone.
- WLL: radio technology that enables wireless connections – 2.6 and 3.5 GHz licenses were granted in 2003. In April 2005, KPN acquired one 2.6 GHz license and T-Mobile acquired two licenses until 2017.
- WiFi/WLAN: There are about 700 public "hotspots" in the Netherlands. Most hotspot providers currently target the Dutch business market. KPN and T-Mobile are active in the WiFi market.

In 1999, with the launch of some WAP portals, mobile Internet in the Netherlands officially started. KPN first raised a number of information services such as news, weather and sports to the mobile phone. The first generation WAP handsets offered still very limited possibilities: a small black and white screen, with a slow data connection via 2G networks. The actual use of these services was therefore quite low. In 2002, with the introduction of i-mode in the Netherlands, KPN again tried to open the Dutch market up to mobile Internet. Devices were available on a color screen and a slightly faster data via GPRS networks. In Japan, i-mode was an unprecedented success with millions of users, while in the Netherlands and the rest part of Europe, it was found out that many people were still reluctant to use mobile services. The next step was that Vodafone Nederland introduced UMTS services and products, which was quickly followed by KPN and T-Mobile. Later there was also the even faster UMTS variant HSDPA (3.5G) available. 2007 is a fruitful year for the development of mobile Internet in the Netherlands: there were whole new generations of phones with larger display launched as well as the increasing numbers of mainstream websites are available on the mobile phones now. Moreover, all the mobile operators introduced so-called 'flat fee' data subscription with which users were allowed to unlimitedly access the Internet via mobile phones. Mobile surfers were no longer confronted with unexpectedly high phone bills. A final important development was the emergence of 'open' mobile Internet sites for example, web search engines Google and Yahoo!. Users were no longer just limited to the offer for selected sites within the operator portals.

From the report launched by OMI[2] (Open Mobile Internet) recently, it is concluded from the various interviews with

the Dutch mobile operators that approximately 1,600,000 users have visited the Internet with their mobile phones at least once per month (OMI[2], 2008). That is 12% of the population that uses 'regular' mobile services such as call and SMS. In an explanation of the annual results 2007, KPN CEO Ad Scheepbouwer indicated that "the mobile data traffic (for mobile phones and laptop plug-in UMTS) increases dramatically in sales from 50% to 100% per year" (BNR News Radio, 2008). Although the number of users in comparison with the fixed Internet is still modest, I can still optimistic see that with 1.6 million active users the 'Early adopter' phase of mobile Internet is over.

In addition, from the data published by Dutch regulatory authority OPTA, it is suggested that there might have been as many as 200,000 3G subscribers in the Netherlands at the end of 2005, two years after the first services were launched commercially. OPTA data also suggests that the 3G market grew by 194% in 2006 to serve 588,000 customers. It is expected that the 3G subscriber base will grow by approximately 41% during 2008; this would give a total of 1.46mn subscribers, or nearly 7.6% of the overall mobile subscriber base (BMI, 2008).

In sum, the use of Mobile Internet in the Netherlands has taken a flight in 2007/2008 and a basis for further growth has been laid. More and more mobile handsets have a good standard screen and fast data connection, which are essential for a pleasant experience. That all the mobile operators now offer flat-fee subscription is more attractive for the users. And the rise of the mobile Internet, facilitated by search engines, makes much more content easily available.

5.6 Chapter conclusions

This chapter gave an overview of the mobile Internet and its relevant applications, technologies as well as the emergence of this convergence in the Dutch mobile telecommunication sector. It is seen that mobile Internet has enabled Internet service to become accessible via mobile devices as well as has derived the convergence between stationary Internet and mobile networks. During the emerging phase, the Internet and mobile telecommunication market has multi networks (e.g. GSM, CDMA, WiFi, and WiMax) with multiple access protocols (e.g. WAP and i-mode).

There are several drivers that led to the convergence of mobile Internet in the Netherlands, such as technological development and innovations which have been mentioned in this chapter. When Internet services became available through the mobile network and the mobile devices, the convergence process started. Therefore, mobile Internet has driven the convergence process. On the other hand, the convergence process has also influenced the mobile Internet development and deployment. Along with the convergence process, several innovative technologies have been introduced in order to create value-added services to fulfill customers' needs.

There are various actors involved in the convergence of mobile Internet. Though the main research is taken from mobile operators' perspectives, to know who are also contributing to such a convergence is still helpful for me to

conduct further analysis in the next chapter. Four main components of mobile Internet convergence are derived from Figure 6: (1) system providers, (2) software/ service providers, (3) handset manufacturers and (4) content providers; wherein software providers, technical enablers and mobile portal providers are generally reckoned as software/ services providers. The discussed actors will be further used in the analyses and discussions in the chapter 6.

Finally, the convergence of mobile Internet in the Netherlands was discussed. There are several drivers that have lead to such a convergence process, including technological development and innovations, deregulation and liberalization of the mobile telecommunication market, and changes in customers' preferences. Firms have been busy catching up the converging trend and introducing new technologies and tools that enable new services and product concepts. In the next chapter, I will further discuss firms' capabilities along with this convergence process happening in the Dutch mobile telecommunication sector.

6 MOBILE OPERATORS' CAPABILITIES WITHIN CONVERGENCE PROCESSES

In this chapter, both Vodafone and KPN's capabilities will be analyzed on the basis of the theoretical framework. The two cases will first be presented separately according to the following sequences: an introductory of the company, a summary of the empirical data and then a descriptive analysis of the company's capabilities. Consequently, in-depth discussions of these two cases and examine the similarity and differences will be followed up.

6.1 Case 1: Vodafone

6.1.1 The overview of Vodafone

Vodafone Group is one of the world's leading mobile telecom companies, with a significant presence in Europe, the Middle East, Africa, Asia Pacific and the United States through the company's subsidiary undertakings, joint ventures, associated undertakings and investments. Until 31 March 2008, Vodafone already had 260 million customers across 25 markets and partner networks in 42 more countries (Vodafone Annual Report, 2008).

Vodafone offers voice, messaging, data and fixed broadband services through multiple solutions and supporting technologies to deliver on its total communication strategy. Voice services, which include outgoing voice, incoming voice, voice roaming and fixed location based services, make up the largest portion of Vodafone's revenue. Messaging services available in every Vodafone's mobile operating countries allow customers to send and receive messages using mobile handsets and various other devices. Vodafone offers a number of products and services to enhance customers' access to data services, including Vodafone live! for consumers, as well as a suite of products for business users such as Vodafone Mobile Connect data cards, internet based email solutions and Vodafone Office. Besides, Vodafone on the one hand provides additional services from fixed services, mobile advertising to business managed service in order to meet customers' total communication needs and provide additional revenue streams. On the other hand, Vodafone offers a wide range of devices such as handsets and the Vodafone Mobile Connect card with 3G broadband for the customers to utilize its services.

To be able to deliver the services and products mentioned above, Vodafone owns the technologies and resources including the telecommunication licenses and the related network infrastructure. Figure 7 shows how Vodafone's network infrastructure works.

- 2G/ 3G mobile access network: When a voice call or data transmission is made on a mobile device, voice or data is sent from the device and transmitted by low powered radio signals to the nearest base station.
- Fixed broadband access network: When communication takes place over fixed line networks, the traffic flows over a traditional wired infrastructure until the point it reaches Vodafone's access device such as a DSLAM (Digital Subscriber Line Access Multiplexer).

- Access transmission infrastructure: The access transmission network is connected between a base station, a DSLAM, or a corporate customer's dedicated line, and the core network.
- Core network: The core network is responsible for setting up and controlling connections between mobile and fixed line customers attached to access networks by locating the called party and routing networks. The circuit switched, the packet switched and IMS (IP Multimedia Subsystem) are the three domains comprised in the core network.

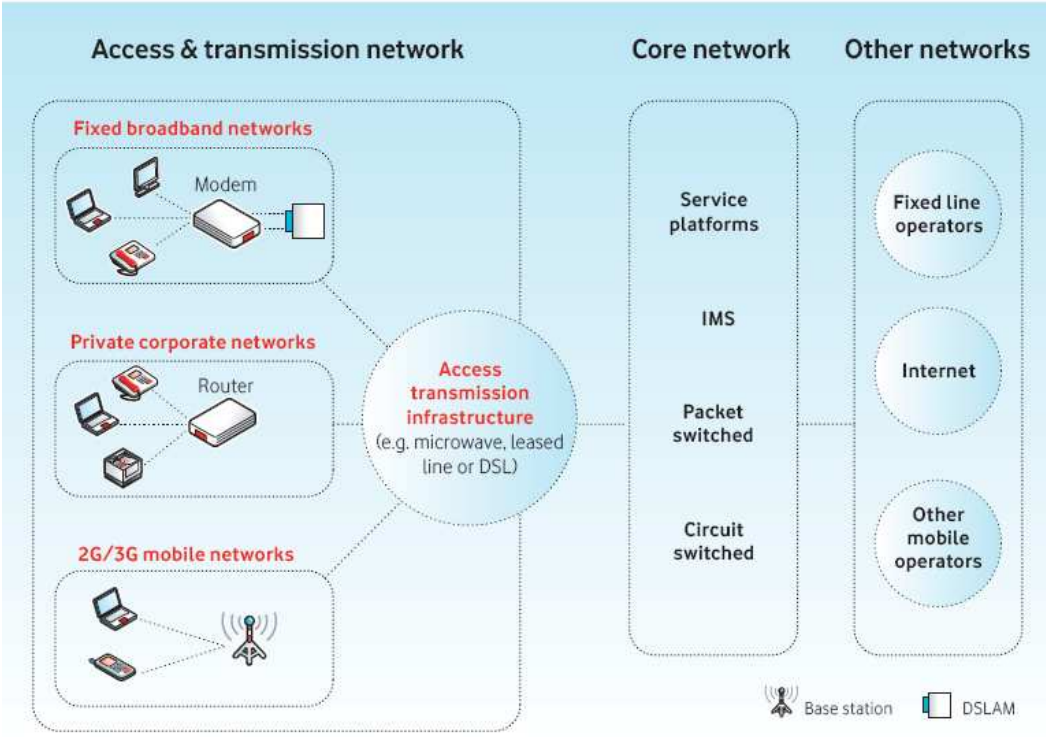


Figure 7: Vodafone's network infrastructure

Organizational structure

In the first half of 2008 (ended March 31, 2008), Vodafone changes its organizational structure with the overall objective of focusing its business according to different market and customer requirements. There are three key principles to the new structure:

- To drive operational benefits and cost reduction from local and regional scale in more mature markets;
- To drive profitable growth from the company's emerging market portfolio; and,
- To position the company to capture new revenue streams by extending its reach into converged and IP services.

As shown in Figure 8, the Vodafone Group is structured into two regions, namely: Europe and Eastern Europe, Middle East & Africa, Asia Pacific and Affiliates (EMAPA). Apart from these two units, "Group Business Development" and Group Strategy and New Business" were set up to focus on the converged and IP services from which Vodafone seeks to provide services to its customers and generates new revenue streams.

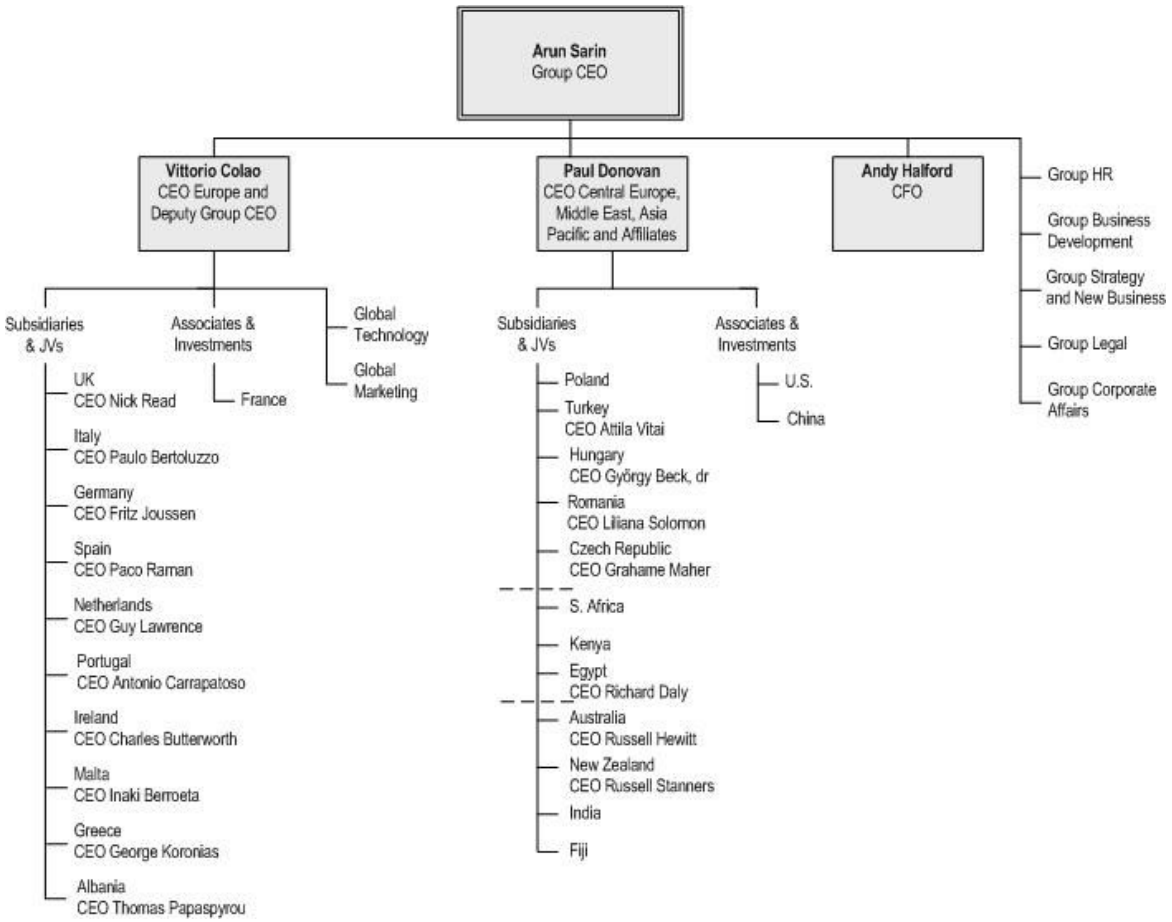


Figure 8: Vodafone's organizational chart

Vodafone Libertel

Ever since the Dutch government officially stated its intention to introduce mobile competition in 1991, the liberalization of the Dutch mobile communication market did not go into effect until 1995. The Dutch consortium Libertel then became the supplier of the second 900MHz GSM network, directly competing with PTT Telecom, the telecommunication division of KPN. Libertel was composed of ING (Internationale Nederlanden Groep, a Dutch banking and insurance group) in partnership with the British corporation Vodafone. Libertel Groep held the company with two operating companies: Libertel, the network operator, and Liberfone, the Service Provider. Later on, in 1998, Vodafone increased its interest in Libertel to 70 percent, with ING retaining 30 percent. In November 2002, Vodafone continued to increase its shareholdings in Libertel from 70 to 77.564 percent by acquiring the extra 7.564 percent from ING Group for cash. In the beginning of 2003, Vodafone pursued for more control over Libertel that it first increased its stake to 82.4 percent and later up to98.2 percent. Until then, Vodafone completed the series of acquisition and finally gained the total control of its Dutch subsidiary.

6.1.2 Vodafone's path towards the convergence of mobile Internet

Vodafone Group believes that the mobile data and the Internet represent the biggest growth opportunity. It expects to derive significant increases in revenues as customers take up data and the Internet services. The first step was taken in 1999 when Vodafone announced its collaboration agreement with Ericsson to develop and evaluate 3G wireless technology (Appendix A, event 1). This collaboration encompassed early extensive technical experiments and followed separate announcements by the two companies on 3G/UMTS trials. Vodafone actively participated in this early phase to further understand the potential strengths of the new technology in delivering 3G services.

In 2000, Vodafone Group launched its single global platform and branded portal for mobile data and the Internet (Appendix A, event 3). According to Chris Gent, Chief Executive of Vodafone Group, Vodafone's objective was to become the world's leading mobile multimedia operator. It was aimed to empower the mobile phone to deliver the best multimedia information and services, anytime, anywhere. To fulfill this vision, it was necessary to create a system that runs over different networks, such as CDMA and GSM, as well as public switched-telephone networks. Besides, the service accommodated different Internet-access "languages," such as short messaging services, the WAP, Java, voice or HTTP (hypertext transfer protocol). In this project, IBM played an essential role as a prime contractor and a system integrator. Sun's Microsystems was contributing most of the hardware and software for the system, including servers and data storage technologies that run with Solaris operating system and iPlanet software, providing unified messaging, calendar and e-commerce functions with needed security. All of the services were accomplished with Sun's programming language, Java, which enabled customers to download applications from the network. Vodafone worked with Sun to enable a scaled-down version of Java, called the J2ME (Java 2 Micro Edition platform), to run on customer mobile devices. Regardless of the application, content providers already joined with Vodafone to provide information and services, including InfoSpace.com and Travelocity.com. Subscriber devices were under development by Palm Computing, Ericsson and Nokia.

In the same year, Vodafone Group made an agreement with Vivendi in which the two companies created a new joint venture company, VIZZAVI, to establish a multi-access Internet portal for Europe (Appendix A, event 6). Vodafone and Vivendi both had a 50% share in VIZZAVI. The new venture, operating under the VIZZAVI global brand name, became the default home page for Vodafone's operating companies throughout Europe, including the Netherlands. The multi-access Internet portal provided services to customers in a consistent format across different platforms, including mobile handsets, personal computers, televisions and PDAs. Later in 2002, Vodafone completed the acquisition of Vivendi's 50% share in the Vizzavi joint venture, brining Vodafone's share in Vizzavi to 100% (Appendix A, event 13). Within the seven Vizzavi subsidiaries, which excluded France, the Vizzavi name was migrated to the Vodafone brand with operations being fully integrated into the local Vodafone subsidiary and the portal was reintegrated into Vodafone's core business. Few months late, Vodafone Live! was launched in seven EU countries including the Netherland (Appendix A, event 14). Vodafone offered its Global Content Services consisting of the usual selection of mobile content from news and information. Vodafone Live! was the front of these services,

packaging the pick of the crop to distribute over customized handsets. Subscribers could choose custom-designed handsets from Sharp GX10 model, Nokia 650 or Panasonic GD87.

To increase the penetration of its mobile Internet services, Vodafone did not forget its corporate customers. Vodafone signed an agreement that its "Connected by Vodafone" service was pre-installed in IBM and Dell Computer mobile devices sold in Europe (Appendix A, event 15). The partnership enabled Vodafone's customers to buy PDAs and portable computers from the two computer giants with pre-installed mobile connection SIM cards that would then automatically connect to Vodafone GPRS network available in the Netherlands. For Dell and IBM, they were responsible for testing, configuration and support for all "Connected by Vodafone"-enabled PCs.

In 2006, Vodafone collaborated with Google to develop innovative mobile search services for its customers (Appendix A, event 23). Google's search results were delivered through Vodafone's high speed data networks. By combining Vodafone's mobile expertise with Google's search capability, customers could quickly and easily find the relevant information. Besides, Vodafone and Yahoo! also agreed to extend their partnership in 2007 to bring their instant messaging services to both the mobile phone and PC, providing customers with a seamless mobile Internet communications experience (Appendix A, event 32).

With more and more value-added services distributed to individual and corporate customers, both Vodafone Group and Libertel also were also busy upgrading their networks with Ericsson and other system providers. In 2006, Vodafone Libertel and Ericsson entered into an exclusive managed service partnership (Appendix A, event 25). Under the contract, Ericsson was responsible for engineering, implementation and operation of the access part of Vodafone Libertel's GSM, GPRS and UMTS networks in the Netherlands. Vodafone then retained ownership of the network and IT assets, as well as responsibility for the strategic direction of the network and IT infrastructure. On the other hand, Vodafone Group worked alongside Ericsson, Huawei and Qualcomm to trial HSPA+ which had the potential to handle data even more efficiently than the existing HSPA technology (Appendix A, event 34).

Last but not least, Vodafone Libertel recently announced its sponsor of Mobile Monday Amsterdam until September 2009 (Appendix A, event 35). Mobilizing the Internet has been one of Vodafone's strategic goals; and the success of mobile Internet depends on a number of things. In addition to a high-speed, good quality network and suitable handsets, the relevant content and services are also determinants to the success of mobile Internet. Vodafone Libertel supported Mobile Monday Amsterdam since it actively facilitated meetings for other relevant contacts in the field and stimulated mobile Internet usage. Later in June, Vodafone Libertel further launched competition for start-ups in the Mobile Monday community in the Netherlands. By doing this, Vodafone Libertel aimed to challenge the ambitious entrepreneurs to make mobile internet even more attractive.

The above mentioned activities have shown Vodafone's main activities which influence the convergence of mobile Internet in the Netherlands. More events and the details about these activities can be found in Appendix A.

6.1.3 Analysis of Vodafone's capabilities

Figure 9 represents an overview of Vodafone's activities under the convergence of mobile Internet derived from Appendix A; wherein the circles are the events representing Vodafone's relational capabilities and diamonds are the ones representing Vodafone's absorptive capacities. In this section, the analysis of Vodafone's capabilities development pattern will be taken from three different perspectives, namely (1) the overall time-period; (2) the launch of significant services; and (3) the main components[1] of mobile Internet which have been discussed in chapter 5.4.

There are 37 events listed in Appendix A since the emergence of mobile Internet in 1999 to the present. On the one hand, some of the events are only listed as milestones for Vodafone's distribution of mobile Internet; on the other hand, some of them are involved in several components of mobile Internet. These events are tagged either as a relational capability or an absorptive capacity. In chapter 4.2.3, I have clearly defined that relational capabilities appear in the forms of alliances, collaborations, partnership and joint venture, and the absorptive capacities are shown in the forms of M&A, subsidiaries and buyer-supplier contracts. As a result, only 34 tags are shown in Figure 9 as either a relational capability or an absorptive capacity. Among all, 17 events are tagged as absorptive capacity and 17 events are tagged as relational capabilities. One can simply conclude that both relational capabilities and absorptive capabilities are equally important for Vodafone within the mobile Internet convergence.

In chapter 6.1.2, it was reported that the launch of Vodafone Live! in the Netherlands was an important step. Therefore, it is interesting to see that from 1999 to 2002 before the launch of Vodafone Live! that 8 events are tagged as absorptive capacities and the 6 activities tagged as relational capabilities are relatively less. From 2002 to 2008, the activities tagged as absorptive capacities slightly increase to 9 events; on the other hand, it shows that Vodafone largely has increased its ability to make relationship with other partners (11 events). It is interesting to observe that Vodafone focuses more on developing its relational capability than absorptive capacity over the years.

Next, I will discuss if Vodafone had a different attitude towards the different converging components of mobile Internet. The components of mobile Internet are derived from the discussion in chapter 5.4, which comprise (1) system providers, (2) software/ service providers, (3) handset manufacturers and (4) content providers. First, regarding to the system providers, 3 events are tagged as absorptive capacities while only 2 events are tagged as relational capabilities. Vodafone and the system provider such as Ericsson have had multiple relationships over the years. First, they have the supplier-and-buyer relationship that Ericsson updates the latest network infrastructure in order to fulfill the needs for the mobile Internet services. With the successful experience, their mutual trust increases as well as their relationship becomes much closer. As a result, they also started to cooperate on designing innovative services and leveraged the knowledge to each other.

[1] The components of mobile Internet are contributed by different actors, which have been discussed in chapter 5.4.

Secondly, with the software providers, 12 events are tagged as absorptive capacities while only 5 events are tagged as relational capabilities. All the activities representing both capabilities are well spread out over the years. It shows that Vodafone tends to absorb new technology and resources from different software providers and adopts the ready-made software solutions on its own services. Relying on its previous experiences and knowledge focusing in the mobile communication sector, Vodafone therefore has a better sense to acquire and assimilate the external knowledge, and technologies within the convergence process. On the other hand, Vodafone also tries to build up partnership with some large IT companies such as IBM and Oracle. Convergence within the class of platform consolidators seems to lie in the ability to align internal and external technological competencies into a platform, which through confluence allows Vodafone to explore and to shape the emerging multidisciplinary knowledge base. Hence, instead of constructing a new platform completely from scratch, Vodafone decides to leverage core assets of the firm into a platform strategy, aiming at developing and shaping assets which complement emerging convergence applications.

Regarding to the relation with handset manufacturers, it shows that 6 events are tagged as relational capabilities. The relationships between Vodafone and the exclusive manufactures are quite close. By the time when Vodafone Live! debuted, there were only Sharp and the other two manufacturers supporting Vodafone's new portal. To win the Vodafone Live! contract, Sharp gave up all control of the handset it delivered: The GX10 supported Vodafone's content standards to the letter, sports a dedicated "Vodafone Live" button, and came emblazoned with a Vodafone logo. Currently, Vodafone has a more open attitude toward handset manufacturers and its service plans are compatible with a variety of handset brands and models. This would be beneficial to the handset makers since its products can be purchased by every consumer no matter who their service providers are. However, Vodafone might lose it advantage over handset makers to develop phones with unique appearances or functions for its services.

Last, with the content providers, there are 2 events tagged as absorptive capacities and 4 events tagged as relational capabilities. Vodafone has been active to partner with the content providers, especially established and recognized companies, such as Google. It usually establishes reciprocal partnerships with those companies instead of being a content gatekeeper or controller. Vodafone content services, a central content broker, seeks mobile entertainment and information content for Vodafone users.

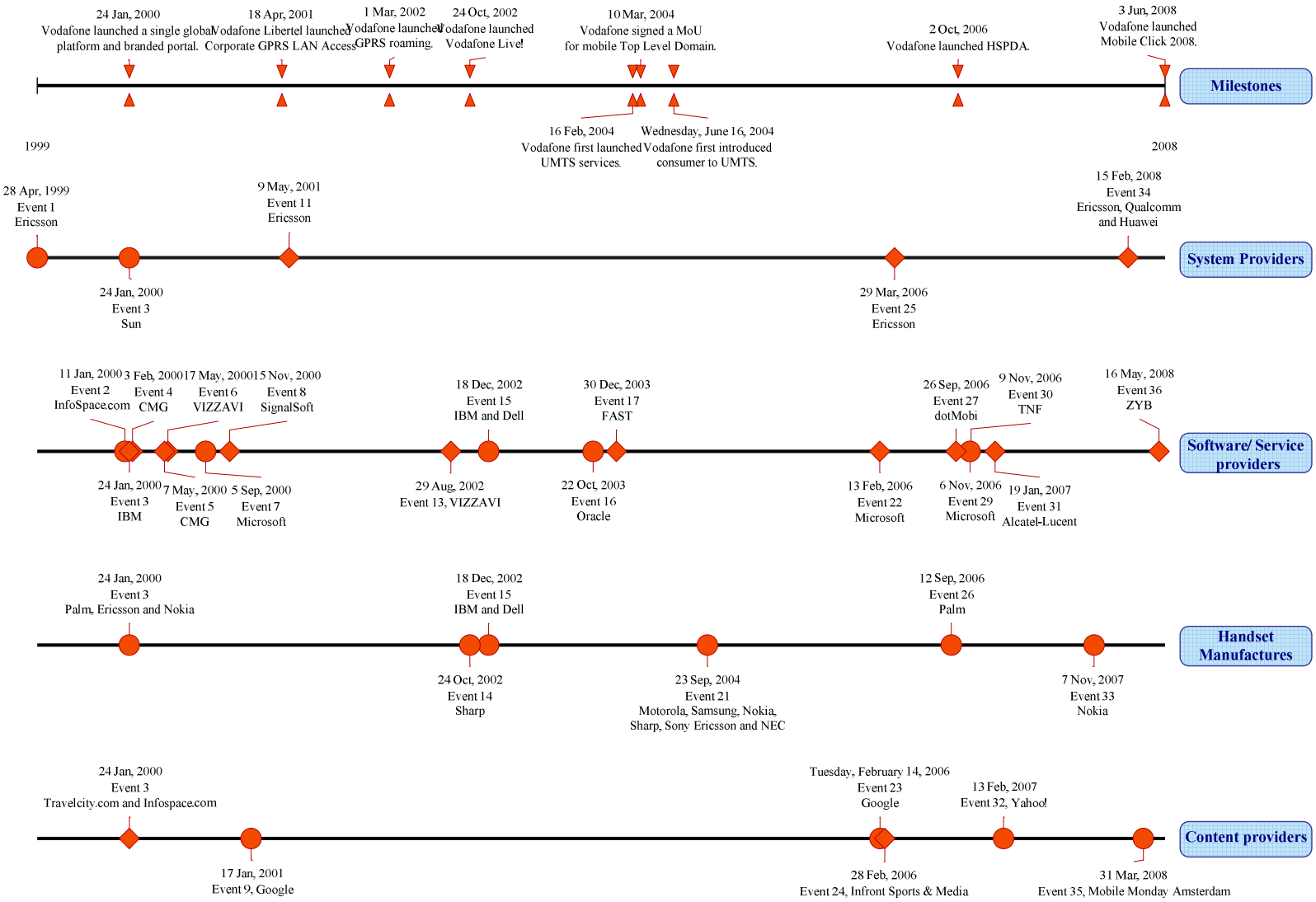


Figure 9: Overview of Vodafone's activities under the convergence of mobile Internet

6.2 Case 2: KPN

6.2.1 The overview of KPN

In 1998 the name of Koninklijke PTT Nederland N.V. was changed to Koninklijke KPN N.V. Netherlands. KPN was incorporated with two main subsidiaries: PTT Telecom B.V., offering telecommunication services, and PTT Post B.V., serving as the primary postal company in The Netherlands.

Until 1994 the Dutch government was the sole shareholder of KPN. In 1994 the shares of KPN were listed on Euronext Amsterdam, and the government's ownership was reduced to 70%. A second offering, on the Amsterdam and New York exchange in October 1995, reduced the state's interest to 43.5%. The government continued to hold a special share in KPN, entitling it to fundamental changes in the organization and strategic direction of the company.

KPN's core operations are explained briefly in the following paragraph:

Domestic fixed-line telephony

KPN is the single largest provider of fixed-line telephony services in the Netherlands, operating 3.694 million residential and 1.695 million business lines at the end of 2007. The number of lines in service has been falling progressively since the late-1990s, although the rate of decline is slowing. KPN attributes the decline to customer migration to other fixed-line service providers and the substitution of traditional fixed-line telephones with mobile phones and broadband connections among other media. The decline in traditional fixed-lines is being more than adequately offset by growth in the broadband sector, where KPN is competing aggressively with a host of long-term and new entrant service providers.

KPN has rolled out services and networks based on IP and broadband. KPN develops and upgrades its networks to enable the introduction of new IP and broadband services. With the introduction of VoIP and IPTV, KPN implemented two new IP-services networks: the IMS platform and TV Middleware. These service platforms are independent of the underlying transmission and access networks and would in the mid-term merge into one new services environment. This provides KPN with the opportunity to offer converged services: fixed-mobile, voice-TV-internet and new business applications, like security and a national victim tracking system.

International network and services

KPN's international infrastructure comprises two major voice and data transmission networks. To provide international wholesale voice services, KPN operates an international transmission network including land and submarine cables as well as satellite transmission systems, which directly connects approximately 400 telecom operators worldwide.

Mobile networks and services

In the Netherlands, KPN holds licenses to provide GSM 900, DCS 1800 and 3G UMTS services. KPN offers a range of standard and value-added mobile voice and data services under a multi-brand strategy to effectively appeal to different target markets. The 'KPN' brand targets both the consumer and business markets with a premium value brand. 'Telfort' provides a branded portfolio as well as a wholesale white label portfolio, offering mobile products in specific niche segments of the Dutch mobile market. The 'Hi' brand focuses on the young consumer and on heavy text message users. Furthermore, with the web-only 'Simyo' brand, KPN serves cost-conscious consumers who prefer basic mobile services (voice and text messages only) at low tariffs and with low distribution costs. KPN introduced NTT DoCoMo's i-mode mobile data services in 2002. KPN is licensed to use i-mode mobile data technology and trademarks within the Netherlands, Germany and Belgium. KPN also supplies data and fax transmission services, VPNs (Virtual Private Networks) for business customers as well as multimedia services and WiFi as part of its mobile data services portfolio.

Organization structure

In January 2007, KPN announced a new organizational structure in the Netherlands built around customer segments rather than products, creating a customer centric organization (shown in Figure 10). KPN's former Fixed division and KPN Mobile in the Netherlands (Mobile) were reorganized into the Consumer, Business and Wholesale & Operations segments. The new organizational structure in the Netherlands provides KPN with the opportunity for an integrated customer approach. The company can offer integrated services, both as a multimedia company in the consumer market (fixed, mobile, TV and internet) and as a managed ICT company in the business market.

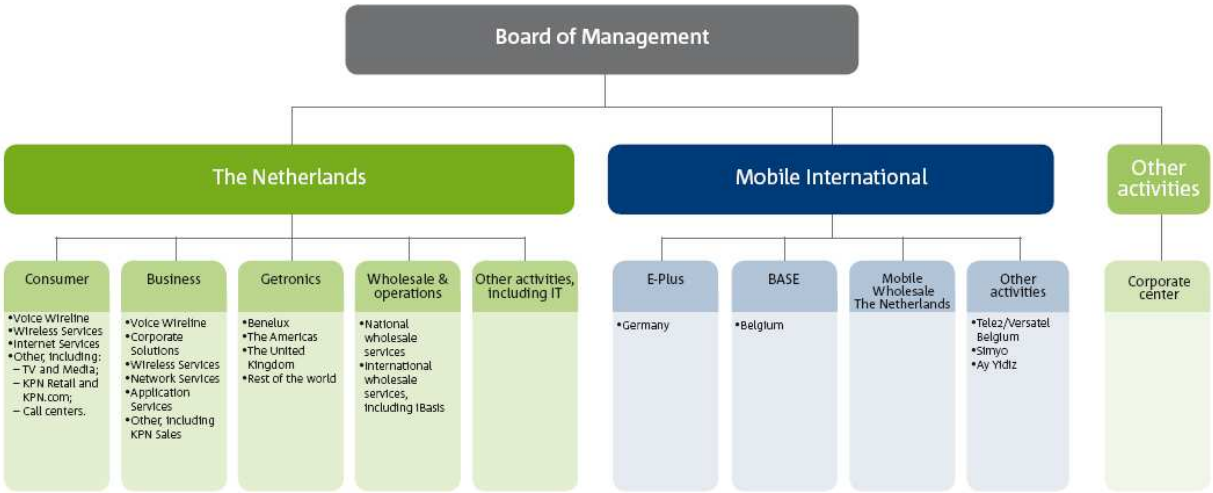


Figure 10: KPN's organization structure (from January 2007 onwords)

6.2.2 KPN's path towards the convergence of mobile Internet

KPN Research joined the WAP Forum[2] in 1997. Later, at the end of 1998 the WAP Forum approved the standard 1.0 and KPN Mobile started an internal test together with Alcatel and Phone.com to have experience with WAP. The WAP 1.1 standard was launched in June 1999 (Appendix B, event 2). This version of protocol was more suitable for commercial applications. KPN Mobile made a deal with Nokia to become a launching customer for their gateway and handsets. M-info was therefore the name of this first commercial service based on WAP 1.1 in the Netherlands on November 25, 1999 (Vos and Klein, 2002). To successfully launch M-info, KPN carefully chose several suppliers, which were:

- Nokia: the supplier of the gateway and handsets;
- Agency.com: the web design agency who designed and build the web and WAP site;
- PMS: the advertisement agency who prepared the marketing communication campaign;
- Lotus: the supplier of the agenda and address book applications;
- A lot of content providers like news agencies, financial institutions, etc.

Later on, M-info was extended in 2001with WAP on GPRS. The technology behind WAP on GSM was considered to be too limited for offering a service that meets the requirements of the market. M-info on GPRS had two main variations: 'Internet everywhere' and 'Mobile office.' M-info on GPRS was targeted at the business market.

In 2000, KPN agreed to sell a 15% stake in its mobile unit to Japan's NTT DoCoMo (Appendix B, event 4). By acquiring part of KPN Mobile's share, NTT DoCoMo hoped to transfer its technology and know-how to KPN, which would also manage the gateway, contents and other aspects of i-mode and 3G services (Appendix B, event 5). NTT DoCoMo aimed to cooperate with KPN for the early start of mobile packet-switching. Since then, a series of activities among these two companies were taken. For example, engineers worked closely together in order to build up an Internet portal on the basis of European mobile network systems and marketers were sent to Japan to learn i-mode's successful business model in Japan. Moreover, NTT DoCoMo, Italian mobile operator TIM and KPN signed a MoU (Memorandum of Understanding) in 2001 wherein they jointly focused on the development and deployment of new mobile Internet services in the European market (Appendix B, event 6).

In 2002, KPN Mobile launched i-mode in the Dutch market (Appendix B, event 7). All the communication in the mass media was focused on i-mode. Sooner afterwards, NTT DoCoMO installed a FOMA base station in the Netherlands and test on 3G system with KPN (Appendix B, event 8). However, some blamed the rather slow uptake of i-mode on the fact that none of the major handset makers participated. The first i-mode handsets launched in European markets were the N21i model. This model had been specially created for Europeans by NEC Company.

[2] The WAP Forum began with four founders in 1997 (Phone.com, Ericsson, Nokia and Motorola) and it has now grown to more than 500 members, many of whom are among the most powerful telecom, IT, and software companies from around the world. The WAP Forum is the industry association comprised of hundreds of members that have developed the de facto world standard for wireless information and telephony services on digital mobile phones and other wireless terminals.

Later, Toshiba launched the second handset for i-mode in the Dutch market. Both handset makers had never released a phone before in Europe. Market leader Nokia has consistently refused to release an i-mode phone, despite attempts from KPN to persuade them to join (Volkskrant, 2002). Not until the middle of 2003 did the European handset manufactures such as Nokia and Ericsson finally joined to offer i-mode supportive handsets (Appendix B, event 10).

KPN actively started to align with some large media and IT companies after the launch of i-mode in order to distribute value-added services. For example, in 2003, CNN became KPN's content provider and introduced a brand new i-mode service from CNN: CNNLive. CNN's i-mode site provided news and in-depth reports in various handy categories to customers in the Netherlands (Appendix B, event 12). Later in 2005, MSN and KPN launched the availability of Hotmail and MSN Messenger on i-mode devices, allowing customers to stay in touch with their friends and family even when they are on the move (Appendix B, event 17 and 18).

KPN chairman Ad Scheepbouwer presented KPN's goal to attract one million i-mode users in 2003. Though it did reach this goal eventually, KPN realized the usage was low when analyzing the usage of i-mode subscribers. One of the plausible reasons for the unattractiveness of i-mode in the Dutch market is that the environment for mobile Internet was not mature yet. Not only the users but also the manufacturers were doubting which will become dominant, WAP or i-mode?

Not until 2006, did this question get a clear answer. The WAP environment had become mature enough to be comparable with the i-mode portal. KPN therefore adapted these developments and improved its WAP offering on the basis of market needs. The first step was that KPN launched a new portal, Mobiel Startsite (Appendix B, event 22), which enabled i-mode content accessible for non i-mode customers. KPN subscribers or prepaid users with a WAP enable handset could access up to fifty i-mode sites, news and 538 ring tones.

The open mobile Internet portal brought KPN several advantages, including its attractiveness to large handset manufacturers. In 2007, Palm and KPN rolled out the Palm Treo 750 smartphone running on KPN's 3G/UMTS network in the Dutch market (Appendix B, event 26). The Treo 750 smartphone was a touch-screen device that runs Windows Mobile 5.0, with added High-Speed Downlink Packet Access (HSDPA) capability. HSDPA was the most recent innovation of KPN by that time. Though HSDPA was not developed by KPN itself, KPN provided the high speed mobile Internet with help of this network service. Palm Treo 750 offered users access to Outlook applications as well as the ability to view and edit Microsoft Word and Excel files and view PowerPoint and PDF files. The touch screen made surfing websites, gathering data and navigating forms and applications much easier -- all with KPN's next-generation 3G network.

Consequently in 2007, KPN announced to stop source new i-mode handsets given the developments and the high level possibilities of WAP handsets. KPN cannot abandon the i-mode license until early 2013 however (Appendix B, event 28). KPN also actively participated in the OMA (Open Mobile Alliance), helping to create interoperable services which work across countries, operators and mobile terminals. For instance, Artilium became a partner of

KPN in 2008 to further upgrade innovation for KPN's mobile networks. ARTA (Artilium's Real-Time Architecture) for connected mobile services was designed to facilitate rapid creation of new mobile applications, packaged as services. The partnership included a licensing agreement allowing KPN deployment of ARTA as a platform for next-generation converged services.

Moreover, KPN used its experience with i-mode to build internally a much more advanced content management and provisioning system for the WAP portal which made it easier for content providers to get material into the WAP portal. In 2008, MoMac, the mobile media publisher, completed a deal with KPN to facilitate the Dutch network operator's mobile Internet business (Appendix B, event 30). The GoPortal platform allowed KPN to dynamically manage all the content that it makes available to its customers including direct branded feeds on news, weather and traffic as well a diverse diet of third party content such as ringtones, video via MoMac's tier. Moreover, publishing partners, such as AutoWeek, Sport 1, Elsevier also joined to provide mobile content.

The above mentioned activities have shown KPN's main activities which influence the convergence of mobile Internet in the Netherlands. More events and the details about these activities can be found in Appendix B.

6.2.3 Analysis of KPN's capabilities

Figure 11 represents an overview of KPN's activities under the convergence of mobile Internet derived from the event listed in Appendix B; wherein the circles are the events representing KPN's relational capabilities and diamonds are the ones representing KPN's absorptive capacities. In this section, the analysis of KPN's capabilities development pattern would be taken from three different perspectives, namely (1) the overall time-period; (2) the launch of significant services; and (3) the main components of mobile Internet which have been discussed in chapter 5.4.

There are 29 events listed in Appendix B since the emergence of mobile Internet in 1999 to the present. On the one hand, some of the events are only listed as milestones for KPN's distribution of mobile Internet; on the other hand, some of them are involved in several components of mobile Internet. These events are tagged either as a relational capability or an absorptive capacity. In chapter 4.2.3, I have clearly defined that relational capabilities appear in the forms of alliances, collaborations, partnership and joint venture, and the absorptive capacities are shown in the forms of M&A, subsidiaries and buyer-supplier contracts. As a result, in total, only 28 tags are shown in Figure 11 as either a relational capability or an absorptive capacity. Among all, 17 events are tagged as absorptive capacities and 11 events are tagged as relational capabilities. KPN focuses more on its absorptive capabilities than relational capabilities over the convergence of mobile Internet in the past 10 years.

It is considered as an important step for KPN to launch i-mode in 2002. From 1999 to 2002 before KPN launched i-mode in the Netherlands, there are 8 activities tagged as absorptive capacities and 2 activities tagged as relational

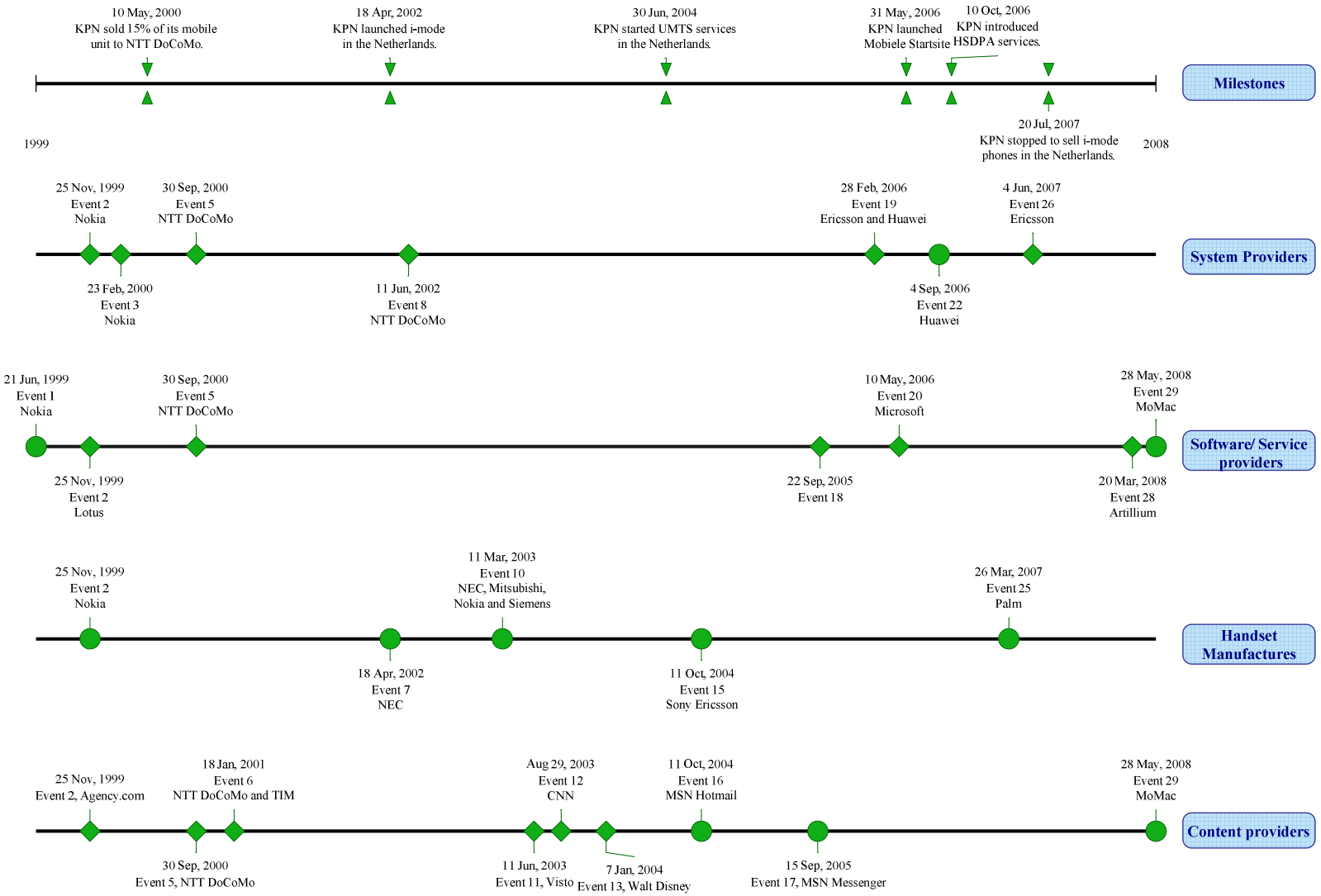
capabilities. From 2002 to 2008, though the percentage of activities tagged as absorptive capacities remains high (9 activities), KPN largely increased its relationship (9 activities) with other partners and developed its relational capabilities. This can be explained by that KPN, as the incumbent operator in the Netherlands, preferred to develop internally or pursued to have more control of new resources and technologies as the convergence of mobile Internet just emerged. Gradually, KPN learned that it is hardly possible to maintain the resources and develop the technologies all by itself in such a converging environment. The choice between internal developments versus external partnership was highly dependent on how KPN could further distribute the attractive products and services in a timely and cost effective way. KPN largely improved its relational capabilities and decided to become more active to collaborate with its partners.

Next, I would like to see if KPN has a different attitude towards the converging components of mobile Internet. Regarding system providers, 6 events are tagged as absorptive capacities while only 1 event is tagged as a relational capability. Secondly, with the software providers, 5 events are tagged as absorptive capacities while only 2 events are tagged as relational capabilities. KPN as the incumbent operator had a general tendency to neglect the disruptive potential to their core business, and rather declared itself as a clear winning stakeholder – as they owned the infrastructure, they also owned the business. However, this was a misconception since the environment was converging. As a common denominator for KPN aligning its resources into a convergent umbrella could not be successfully created internally, the innovation had to take place outside of the beast. What happened to KPN then was that after having identified key requirements for development of mobile Internet horizontally, it was able to search and acquire the platforms needed. The best example was that KPN fully absorbed the technology and platform from NTT DoCoMo and became the first operator launching i-mode outside Japan. Therefore, as shown in Figure 11, the frequency of KPN's activities with software and system providers was quite low during 2000 to 2006. It mainly focused on adopting the Japanese technology and service, then commercialized it to the Dutch market. Even though there were few activities tagged as KPN's relational capabilities, one can only conclude that KPN was trying to be more open by developing together with its software providers to provide more value-added services to the customers and by updating and testing the latest mobile network technologies with the system providers to ensure the quality of services.

Regarding the relation with handset manufacturers, it shows that 5 events are tagged as relational capabilities. KPN did not have the ability to manufacture handset, but it still actively evolved in the design and production to create handsets which could fill their requirements and deliver services smoothly. However, that KPN lacked close relations with European handset makers caused a shortage of handsets initially when KPN launched the first i-mode service. KPN was the only operator providing i-mode services in the Netherlands, but it could not provide a guarantee sales volume to the handset makers. Therefore, handset makers hesitated to invest money on the highly uncertain i-mode service and delayed handset production. Only the Japanese manufacturers such as NEC and Toshiba who already had the experience of i-mode service in Japan were willing to launch supportive handsets for i-mode in the Dutch market. It was a whole new relationship for both KPN and NEC when they together launch the N21i handsets. NEC collaborated with KPN to test their handsets operating under the European network systems. However, the brand

awareness worked very differently in Europe. Handset awareness certainly did exist in Japan, but the emphasis lied on the mobile operator, not on the handset brand. It was the opposite situation in Europe, with disproportionate weight placed on the handset brand. The phones had been the major consideration for most users in Europe. Therefore, KPN continued to seek for more opportunities with other handset manufacturers such as Nokia, Sony Ericsson and Palm.

Last, with the content providers, there are 6 events tagged as absorptive capacities and 3 events tagged as relational capabilities. Referring to Figure 11, KPN's ability to converge relevant content has been migrated from absorptive capacities to relational capabilities. Having learned from M-info and NTT DoCoMo, KPN Mobile introduced the 'content governance' model for its i-mode service. This means two things: KPN Mobile was cooperating with content providers in developing the service, together they sat around the table and discussed the look and feel of i-mode. Also, KPN Mobile formulated the quality standards for the content. By using an i-mode portal, KPN had direct links only for the "official" content. Even though users could access the "unofficial" websites by typing the URL, hitting the links of the portal menu was still easier and mobile convenient. The content providers who wanted to spread their content on i-mode had to make an application for being "official content providers" first. Then KPN would decide who are qualified to list on its portal. Besides, KPN offered its portal exclusively for its subscribers and block the access from non-subscribers since i-mode was part of KPN's products. However, the situation changed with KPN's strategy towards an open WAP platform. In the last three activities, it shows that KPN started to possess relational capabilities. For example, KPN Vandaag, KPN's latest mobile Internet portal in the Netherlands, provides integrated WWW address name and Google search bars, clickable tabs and dynamic promotion of third party content providers.



●are relational capabilities and □are absorptive capabilities

Figure 11: Overview of KPN's activities under the convergence of mobile Internet

6.3 Discussions

To compare the two cases mentioned in the previous sections, Table 9 summarizes the numbers of events representing absorptive capacities and relational capabilities for Vodafone and KPN within mobile Internet convergence in the Netherlands. It is quite clear that the events representing KPN's relational capabilities are much less than Vodafone's.

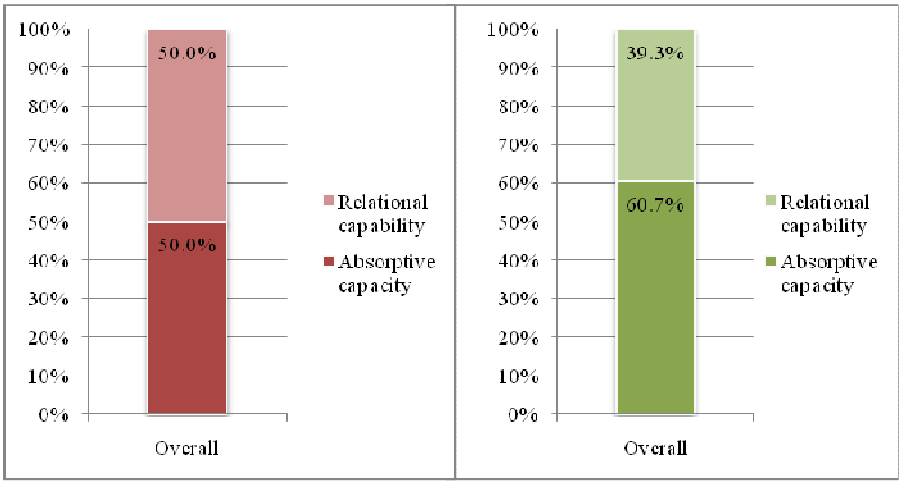
	Vodafone		KPN	
	Absorptive capacity	**Relational capability**	**Absorptive capacity**	**Relational capability**
Overall				
1999 to 2008	17	17	17	11
Divided by the launch of Vodafone Live!/ i-mode (2002)				
Before launch	8	6	8	2
After launch	9	11	9	9
Divided by components of mobile Internet				
System providers	3	2	6	1
Software/ service providers	12	5	5	2
Handset manufacturers	0	6	0	5
Content providers	2	4	6	3

Table 9: Overview of Vodafone and KPN's capabilities

As stated before, this thesis is a qualitative research; however, a few simple calculation formulas are used to help the comparisons between firms' capabilities. These comparisons are shown in three ways, namely (1) overall; (2) the launch of significant services; and (3) the main components of mobile Internet which have been discussed in chapter 5.4. Below, an explanation of the calculation methods is given and results are shown.

(1) Calculation method for overall events:

- Percentage of overall events representing firms' absorptive capacities (%)
  = number of events representing firms' absorptive capacities ÷ total number of events
- Percentage of overall events representing firms' relational capabilities (%)
  = number of events representing firms' relational capabilities ÷ total number of events
- For example, the percentage of Vodafone's absorptive capacities is 17 ÷ 34= 50%
- The results are visualized in Figure 12



*Red column represents Vodafone; green column represents KPN.

Figure 12: Comparison of Vodafone and KPN's capabilities from overall events

Result

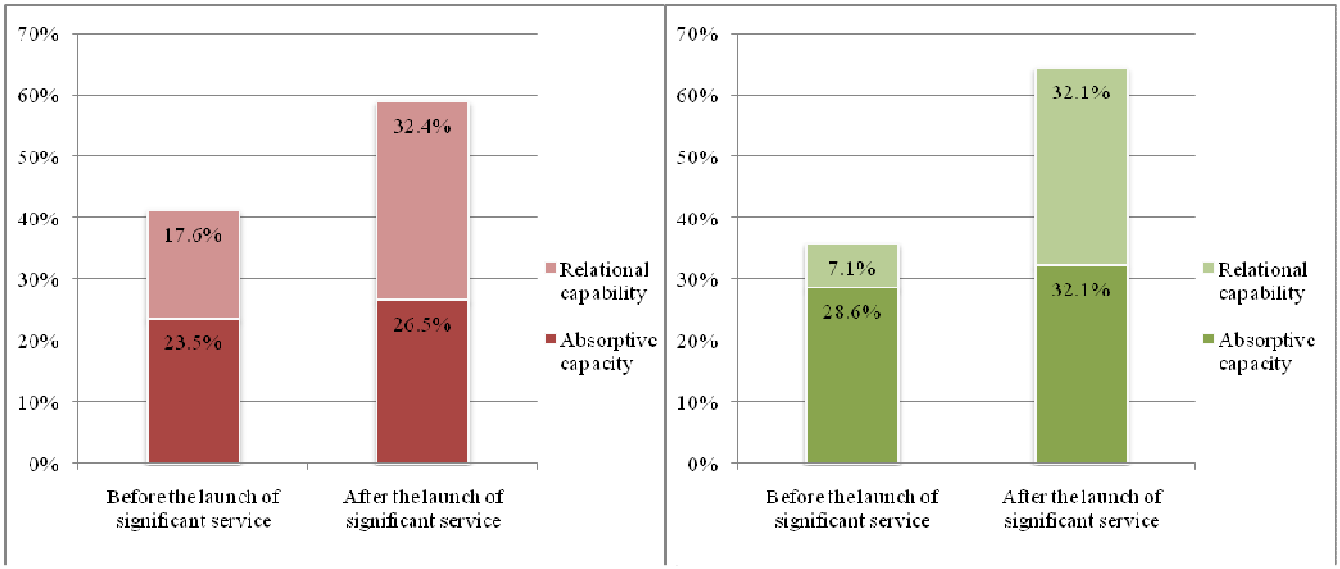
- Overall speaking, both capabilities are equally important in Vodafone's case. As for KPN's case, absorptive capacities play a relatively more important role than relational capabilities.

The result might be interpreted by the very different cultures of these two companies which led to their different starting point in the convergence process. Research has also shown that it is often difficult to get support for radical projects in large firms (Dougherty and Hardy, 1996), where internal cultures and pressures often push efforts towards more low risk, immediate reward, incremental projects. Besides, the incumbent operator KPN tends to exploit complementary assets via interfirm cooperation (Rothaermel, 2001). Since there are many radical projects during the convergence process, one might therefore conclude that absorptive capacities are the key capability for KPN to acquire new resources externally and to adopt them internally while developing mobile Internet services. On the other hand, Vodafone is an international mobile operator who runs its business in many continents. It is already embedded in its culture to build relationships and search new opportunities while collaborating with its partners. That is why Vodafone seems to adapt its relational capabilities and absorptive capacity in a more balanced way during the convergence process of mobile Internet.

(2) Calculation method for events divided by the launch of significant services:

- Percentage of events representing firms' absorptive capacities before the launch of significant services (%) = number of events representing firms' absorptive capacities before the launch of significant services ÷ total number of events
- Percentage of overall events representing firms' absorptive capacities after the launch of significant services (%) = number of events representing firms' absorptive capacities after the launch of significant services ÷ total number of events

- Percentage of events representing firms' relational capabilities before the launch of significant services (%) = number of events representing firms' relational capabilities before the launch of significant services ÷ total number of events
- Percentage of events representing firms' relational capabilities after the launch of significant services (%) = number of events representing firms' relational capabilities after the launch of significant services ÷ total number of events
- The significant services are inferred to Vodafone Live! for the Vodafone case and i-mode for the KPN case
- The results are visualized in Figure 13



*Red columns represent Vodafone; green columns represent KPN.

Figure 13: Comparison of Vodafone and KPN's capabilities divided by the launch of significant services

Result

- Before the launch of significant services, absorptive capacities are relatively more important than relational capabilities for both Vodafone and KPN cases. After the launch of their significant services, both mobile operators have largely increased their relational capabilities. There is a trend in this two case studies that a capability focus shift from absorptive capacities towards relational capabilities.
- Both companies had fewer activities before the launch of their significant mobile Internet services. After the launch of Vodafone Live! and i-mode, both mobile operators' activities related to mobile Internet have been largely increased.

Both Vodafone and KPN have been migrating toward a more open attitude and building on their relational capabilities in order to stay competitive in the converging environment. It can be explained by the high technological uncertainty when the mobile Internet just emerged; therefore, the operators preferred to acquire new resources externally in order to deliver the innovative services in time. In the rapidly changing mobile telecommunication

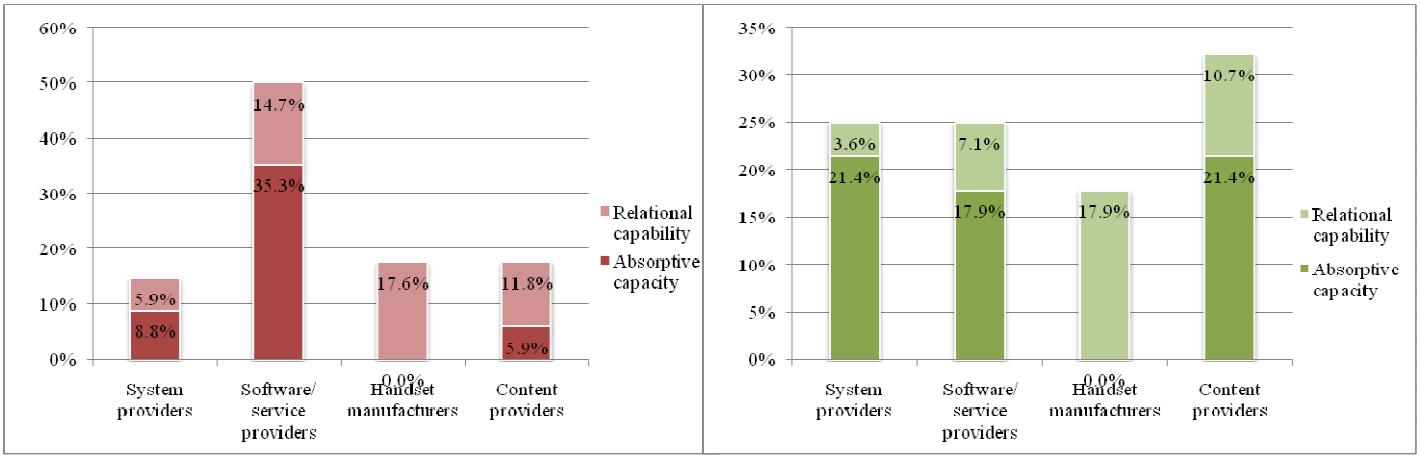
sector where time is an important factor, companies are inclined to improve innovative capabilities and to enlarge their user base through the acquisitions in related industries. Until recently, when the technologies supporting mobile Internet become more mature, both mobile operators preferred the more flexible and less expensive external mode of cooperative alliances.

It is concluded that KPN and Vodafone have migrated their capabilities from absorptive capacities towards relational capabilities along with the mobile Internet convergence in the Netherlands. In the following paragraphs, I want to look into the different components involved in the convergence of mobile Internet and see if similar patterns can also be drawn.

(3) Calculation method for overall events regarding to individual components of mobile Internet:

- Percentage of events representing firms' absorptive capacities regarding individual components of mobile Internet (%)
  = number of events representing firms' absorptive capacities regarding individual components of mobile Internet ÷ total number of events
- Percentage of events representing firms' relational capabilities regarding to individual components of mobile Internet (%)
  = number of events representing firms' relational capabilities regarding individual components of mobile Internet ÷ total number of events
- Components of mobile Internet are referring to system providers, software/ service providers, handset manufacturers, content providers.
- The results are visualized in Figure 14

Results:



*Red columns represent Vodafone; green columns represent KPN.

Figure 14: Comparison of Vodafone and KPN's capabilities divided by components of mobile Internet

- For system providers, the importance of absorptive capacities for both mobile operators in the convergence process is shown. Besides, KPN seems to be more active in acquire new systems than Vodafone.
- With software/ service providers, both companies have a relatively high percentage of events showing their absorptive capabilities. Also, Vodafone has more events located in this category than KPN does.
- Regarding the relationship with handset manufacturers, only relational capabilities can be found from both companies' activities.
- With content providers, these two mobile operators show their very different preferences. KPN prefers to acquire and possess the content from smaller firms while Vodafone has a more open attitude towards content providers during the convergence process of mobile Internet.
- Overall, all KPN's activities seems to be equally allocated different component categories in its mobile Internet convergence process; on the contrary, Vodafone focuses more on improving its software and services while it shows less activities with other actors during the process.

Network systems

Mobile network systems are the foundations which makes mobile communications and mobile Internet possible. However, the design of the protocols and the development of the infrastructure are not the core business for mobile operators. Therefore, as shown in Figure 9 and Figure 11, most of Vodafone and KPN's network systems were acquired from the system providers in order to catch up with the rapid-changing technologies in the mobile telecommunication sector. Although there are few activities showing KPN and Vodafone's collaboration with their system suppliers, absorptive capabilities are still seen as the key for the operators to recognize the new technologies and the market trends, further assimilate them, and finally apply them to meet the commercial needs in the converging environment.

Software and services

The same situation happens to the software and services enabling mobile Internet. In the first few years when the mobile Internet just emerged, it was chaotic and fragmented in standards as well as incompatible networks. Vodafone and KPN were enthusiastic about the emergence of WAP, a content, software and networking standard for mobile Internet browsing, and therefore devoted on the development of an unified portal with other software companies. However, WAP was not as promising as expected in the first few years. KPN then decided to switch to the Japanese portal i-mode when NTT DoCoMo offered the opportunities to license its technology and service to KPN. After a few years of dissatisfied results from the market, KPN decided to drop i-mode and started to cooperate with MOMAC for its new WAP portal. As can be seen in Figure 11, KPN focused more on its absorptive capacities during the i-mode period. On the other hand, as shown in Figure 9, Vodafone has already developed both absorptive capacities and relational capabilities over the convergence process and used these two capabilities strategically to get supportive services and to stay competitive in the converging environment. For example, the absorptive capacity was used when Vodafone acquired VIZZAVI in order to posses the ability to launch its unified WAP portal, Vodafone Live! in 2002. Meanwhile, Vodafone also made several partnerships with prestige IT companies such as Microsoft

and Oracle to co-create innovative services for its portal. The manipulation of these two capabilities enables Vodafone to converge new technologies and services into their current resources as well as exploring new ones from their partners.

Handset manufacturers

Regarding the handsets supporting mobile Internet, KPN and Vodafone did not have the knowledge to manufacture handsets themselves. But, both operators seemed to have close relationship with handset makers as the mobile Internet just emerged in the late 90s. They tended to actively participate in the development and production processes of handsets. To ensure handsets could conform to their requests for the function and performance, they usually specified clearly what qualities they needed for the handsets and provide support enthusiastically on product research, design and test. In the later phase of the convergence process, KPN and Vodafone did not work with handset makers so intensively. They tended to be more open to leave the development and design to handset manufacturers.

The close relations with the operators and handset makers have several advantages. First, operators can ask for special design function keys on the handset, such as their company's respective logos and hot keys that directly dial their service. Second, handset makers tend to highly cooperate with delivering a sufficient quantity of handsets in time when operators want to launch new services. However, it is not easy to maintain such close relations with numerous handset makers. Nowadays, KPN and Vodafone have looser relations and partner with more handset manufacturers; therefore, customers can have a wider choice of handsets when they subscribe for their mobile Internet services. Moreover, the more manufactures supporting the operators' services, the more mature the technology behind the services will become.

Content providers

Regarding the relationship with content providers, KPN acted like a 'manager' in the higher position to govern its official content providers which indicates its absorptive capacity played an essential role in the launch of i-mode in the Netherlands. KPN controlled the power to establish a cooperation model as well as the content selection and portal management in such a way that KPN acquired the content from providers. Content providers had to follow KPN's rules to apply for being official content providers. Then KPN filtered the content according the selection criteria. By adopting the "manager" model, the absorptive capacity that KPN built had the advantage that the content registration was open to everyone. Content providers could have easy access to the evaluation process that is helpful for KPN to have abundant content. Besides quantity, the quality of content was guaranteed since KPN carefully evaluated the content. However, the biggest disadvantage was that KPN usually restrained their official content providers from providing the same content to other operators which limited content's provision.

On the other hand, Vodafone did not put their content providers through a strict selection process and acted more like a partner in the parallel position to establish the business connection. The advantage is that Vodafone usually did not bind the content providers to provide content only for them. Content provider could provide their content through every mobile operator. By doing so, Vodafone benefited from the knowledge generated from its content provider and

competitors. The innovative services and contents created by the content providers and other mobile operators could be applied to Vodafone as well. The relationship with content providers has been seen as increasingly important; KPN therefore also adopted such a 'partner model' as it launched the new open WAP services, allowing third parties such as MOMAC to steer the content.

Summary

In sum, acquisitions and partnerships are a fact of daily life in the European telecommunications industry. On the one hand, mobile operators particularly prefer the acquisition approach for entering new markets. In the rapidly changing mobile telecommunications sector where time is an important factor, mobile operators are inclined to improve their resources and to enlarge their user base through the acquisition of external technology or companies. On the other hand, mobile operators cannot survive without good relationships to other who are actors under this converging environment as well. The level of cooperation should be increased. The relationships that are being formed are not necessary buyer-seller types of relationships. Rather they are based on reaching a mutual goal, such as technology development or business area/market creation. The relationships may also be more short-termed than long-termed, since they are created for a purpose. When that purpose is reached, there might not be a reason to carry on the relationship anymore. The relationship then dissolves or becomes dormant only to be activated later, when a need to do so arises. An exterior, supporting network has however been present during the whole process, where supporting actors have found their roles, i.e. funding, technology development, user tests, equipment supply etc.

In the section, I have compared and analyzed the empirical data regarding Vodafone and KPN's capabilities within the convergence process of mobile Internet in the Netherlands since 1999 to 2008. The discussions have been done from three perspectives. Though these two mobile operators seem to have different preferences between relational capabilities and absorptive capacities in the emerging phase of convergence process due to the cultures and historic background of organizations, a shift from absorptive capacities towards relational capabilities in recent years has been discovered in this study. To avoid the result to be manipulated by the calculation method mentioned in this section as well as to increase the accuracy of the result, the empirical data has been examined by three other alternative calculation methods. The details and the results are presented in Appendix C. Though there is some variation in the results from one method to the other, it does not conflict the results presented in this section. One can still reckon the general pattern of mobile operators' capability migration.

6.4 Chapter conclusions

In this chapter, I have conducted case studies on the two largest mobile operators in the Netherlands: KPN and Vodafone. I have looked into their activities along with the convergence of mobile Internet during the period 1999 to 2008. These main activities were used to analyze Vodafone and KPN's capabilities on the basis of the theoretical framework mentioned in chapter 3. Besides, I have also examined their capabilities development pattern on the basis of (1) the overall time-period; (2) the launch of significant services; and (3) the main components of mobile Internet.

In short, both absorptive capacity and relational capability were seen as the crucial capabilities for mobile operators to possess in order to stay competitive in the converging environment from this study.

The important finding is that different preferences between relational capabilities and absorptive capacities in the emerging phase of convergence process due to the very different cultures and history possessed by Vodafone and KPN, a shift from absorptive capacities towards relational capabilities in recent years has been discovered in this study.

7 CONCLUSIONS

In this final chapter the prime conclusions are drawn and the results answering the study's central issue are presented. Suggestions concerning further studies are also put forward.

7.1 Summary of the key findings and conclusions

The aim of the study is to explore mobile operators' capabilities within convergence processes in the Dutch mobile telecommunications sector. This has been done by firstly looking at the convergence of mobile Internet which has occurred in the Netherlands during 1999 to 2008, in order to understand how convergence and firms' capabilities fit into the picture. The theoretical framework consisted of two parts, namely (1) theories concerning firms' capabilities, with specific focus on absorptive capacities and relational capabilities, and (2) a review of literature explaining and describing convergence processes. After the theoretical framework was set, the case topic and sub-cases were chosen in order to gather the empirical data, which was mainly gathered through secondary sources. The mobile telecommunication sector in the Netherlands was chosen as the main case, and the case topic was the convergence of mobile Internet, in which two sub-cases were embedded namely, Vodafone and KPN. Both manifest and latent content analysis were treated as methods in analyzing the data, reporting the results and thus creating understanding of the phenomena studied. This content analysis was also conducted as a step in revealing perceptions of convergence and its influence on the Dutch mobile telecommunication sector. The following section summarizes the answers to each research question theme stated in chapter 1.

Sub Research Question 1
How has the convergence phenomena emerged in the mobile telecommunication sector in the Netherlands?

Answer:

Understanding the nature of convergence processes is a crucial first step in managing the dynamics associated with convergence. The convergence of the mobile telecommunication, IT and media sectors has been a widely discussed topic since the 1990s, but so far the process reaching converging industry areas remains a hypothetical issue. The use of convergence as a concept rarely distinguishes between convergence on an understanding the phenomenon. The Dutch mobile telecommunication sector offers a suitable setting for studying convergence, its meaning and how it is understood as well as its implications on an industry, actor and firm level.

There are several drivers that led to the convergence of mobile Internet in the Netherlands, such as technological development and innovations, deregulation and liberalization and so on. When Internet services became available through the mobile network and the mobile devices, the convergence process starts. Therefore, mobile Internet drives the convergence process. On the other hand, the convergence process has influenced the mobile Internet development and deployment. Along with the convergence process, several innovative technologies have been introduced in order to create value-added services to fulfill customers' needs.

Sub Research Question 2
What have mobile operators done in order to cope with the convergence phenomena in the Netherlands?

Answer:

From the case study, it is seen that mobile Internet has enabled Internet services to become accessible via mobile devices as well as has derived the convergence between stationary Internet and mobile networks. During the emerging phase, the Internet and mobile telecommunication market has multi networks (e.g. GSM, CDMA, WiFi, and WiMax) with multiple access protocols (e.g. WAP and i-mode). Therefore, mobile operators were busy acquiring new resources and technologies in order to develop exclusive services to their customers in time. For the Vodafone case, it is seen that its focus was solely on WAP and its relevant applications through the convergence processes. Though WAP was not successfully accepted in the first few years, Vodafone dedicated to acquire as well as align the necessary components for its mobile Internet services. As a result, Vodafone Live! was a big success when it was launched in 2002. KPN, on the other hand, wandered between WAP and i-mode for its distribution of mobile Internet services. It started with joining the WAP forum in 1999; however, it soon took another approach by acquiring i-mode technology, platform and business model from NTT DoCoMo and launched the first i-mode service in Europe in 2002. However, it turned out a disappointment for both companies. KPN thus switched to WAP again and opened up the opportunities with other partners.

Besides, Vodafone and KPN have been busy dealing with other parties who also contribute to the convergence process of mobile Internet via different forms of business activities such as M&A and alliances. Four main important parties are: (1) system providers, (2) software/ service providers, (3) handset manufacturers and (4) content providers. It is shown that KPN seems to have a better balance to these parties within the convergence process; on the contrary, Vodafone focuses more on its activities with software and services providers while the activities with other parties are relatively less during this process.

Sub Research Question 3
What are the different capabilities that mobile operators have developed along within convergence processes?

Answer:

Convergence processes require a firms' search ability for new information outside the existing knowledge base, generally in areas unrelated to current operations (Nelson and Winter, 1982). Likewise, dynamic capabilities rely on quickly created, situation-specific knowledge (Eisenhardt and Martin, 2000). Therefore, one can derive a close association between the requirements for convergence processes and the nature of dynamic capabilities.

While answering the previous sub-questions, I have found out many activities include alliances, joint ventures, R&D partnerships and mergers and acquisitions have taken place within the convergence process in the mobile telecommunication sector. Therefore, two important dimensions for dynamic capabilities have in this research: one is relational capability which is defined as a firm's ability to interact with and manage other firms in interfirm relationships (Lorenzoni and Lipparini, 1999), while the other one is absorptive capacity which is described as a

firm's ability to discover and to learn from any other firm. In many respects, relational capability and absorptive capacity are different capabilities which result in different strategic activities such as alliances and acquisitions involving different organizational routines.

The analyses and comparisons between Vodafone and KPN's capabilities have been divided into three parts, namely: (1) overall; (2) the launch of significant services; and (3) the main components of mobile Internet. And the findings are:

(1) Overall speaking, both capabilities are equally important in Vodafone's case. As for KPN's case, absorptive capacities play a relatively more important role than relational capabilities.
(2) Before the launch of significant services, absorptive capacities are relatively more important than relational capabilities for both Vodafone and KPN cases. After the launch of their significant services, both mobile operators have largely increased their relational capabilities. There is a trend that a capability focus shifts from absorptive capacities towards relational capabilities.
(3) With system providers and software/ service providers, it is shown that the importance of absorptive capacities for both mobile operators in the convergence process. Regarding the relationship with handset manufacturers, only relational capabilities can be found from both companies' activities. Last, these two mobile operators show their very different preferences with content providers. KPN prefers to acquire and possess the content from smaller firms while Vodafone has a more open attitude towards content providers during the convergence process of mobile Internet.

Main Research Question
What are the key capabilities for operators to utilize through the process of convergence in the Netherlands?

Answer:

Convergence processes starts on a technological or technical level and possibly leads to industry convergence and a series of consequences. In the mobile Internet case, one can in a concrete way see the convergence on a technical level, i.e. the mobile handset has been equipped with the ability to access the Internet. The convergence process as such after the technical level is in its beginning, but a number of important implications can be derived from this case. The fact that the Internet and the mobile phone have converged on a technical level has led to the establishment of a new business area or market. Furthermore, new markets lead to the entrance of new actors, possible leading to increased competition. However, this cannot be achieved by one actor alone – the convergence process requires cooperation between participating actors.

Looking at the mobile telecommunication sector in the Netherlands, one can find that acquisitions and alliances were a fact of daily life. On the one hand, mobile operators particularly preferred the acquisition mode for entering new markets. In the rapidly changing mobile telecommunications sector where time is an important factor, mobile operators were inclined to improve their resources and to enlarge their user base through the acquisition of external technology or companies. On the other hand, mobile operators cannot survive without good relationships to other

actors under this converging environment as well. The level of cooperation should be increased. The relationships that are being formed are not necessary buyer-seller types of relationships. Rather they are based on reaching a mutual goal, such as technology development or business area/market creation. The relationships may also be more short-termed than long-termed, since they are created for a purpose and when that purpose is reached, there might not be a reason to carry on the relationship. The relationship then dissolves or becomes dormant only to be activated later, when a need to do so arises. An exterior, supporting network has however been present during the whole process, where supporting actors have found their roles, i.e. funding, technology development, user tests, equipment supply etc.

These activities were then transformed into firms' capabilities which are stated here as relational capabilities and absorptive capacities. These two capabilities allow mobile operators to obtain resources, to develop new products and to obtain the market presences they needed to compete effectively. From the empirical data, I conclude that though these two mobile operators seem to have different preferences between relational capabilities and absorptive capacities in the emerging phase of convergence process due to the cultures and historic background of organizations, a shift from absorptive capacities towards relational capabilities in recent years has been discovered in this study.

7.2 Contributions of the study

7.2.1 Theoretical contributions

This thesis contributes to theory in several different forms. First, I contribute to the concept of convergence processes. The implications of convergence processes include an increased engagement by actors from the telecommunications, IT and media sectors. Firms cannot alone and single-handedly create new and innovative products, services and solutions, which also the mobile Internet case stresses. Instead, a focus on firms' capabilities is evident and executed through many activities, such as acquisitions and collaborations. For instance, mobile operators acquire new systems and let equipment manufacturers take over the maintenance and operation of mobile networks, allowing mobile operators to focus on their core functions. A longitudinal study showed the phases that the mobile telecommunication sector has gone through and how technological development and the actors have driven the convergence.

In addition, I contribute to the concept of dynamic capabilities. Although accepted as important, the framework has been subject to various points of critique. Different scholars (e.g., Henderson and Cockburn, 1994; Priem and Butler, 2001) argue that the framework is tautological, non-operational, theoretically vague, and lacks empirical grounding (Eisenhardt and Martin 2000; Barney 2001). Since dynamic capabilities are context-specific (Hannan and Corroll, 2002), relational capabilities and absorptive capacities were identified as essential capabilities that firms possess during convergence processes. Relational capabilities are defined as the way that companies foster collaboration, while absorptive capacities are described as structures that facilitated the discovery of new knowledge. Although these two capabilities have been separately discussed by previous researchers, the intertwinements between relational

capabilities and absorptive capacity are hardly discussed. Therefore, the other contribution in this thesis is that these two capabilities had been applied together to the convergence processes.

Finally, this thesis contributes to derive a close relationship between the requirements for convergence processes and the nature of dynamic capabilities. Technology leads to new opportunities and convergence processes. The competitive landscape puts pressure on actors to act and react in relation to competitors as well as find suitable partners. Convergence processes thus bring pressure to act and react. Developing relevant capabilities thus become a means of coping with convergence processes.

7.2.2 Managerial contributions

The findings of this study are especially interesting for mobile operators, but also to other actors in the mobile telecommunication sector in general. There has been a lack of understanding concerning the emerging converged market for telecommunications and mobile communications services. The convergence process is regarded as taking place on a technical/technological level. Industry convergence is a part of future ideas of convergence, but is not seen as a reality in today's market. Convergence on a technological/technical level implies that telecom actors must access required resources and develop capabilities in order to create value-added services as well as focus on core competence in order to be cost-efficient. The development of absorptive capacity and relational capability is a prerequisite in current mobile telecommunications. It is almost impossible for mobile operators to develop e.g. mobile Internet services from scratch.

It is important for managers of mobile operators to understand how the convergence process has been perceived as well as the drivers and implications. The framework of firms' absorptive capacity and relational capability is a useful tool for defining activities needed during the convergence process.

7.2.3 Methodological contributions

In the current literature, convergence is a popular topic that many researchers are interested in; however, appropriate approaches or methodologies are seldom stressed. This thesis contributes to research methodology in the field of studying firms' managerial issues under the convergence phenomena. As shown in Figure 15, this thesis contributes to a replicate research protocol for other researchers while conducting similar researches. In order to increase the scrutiny of this research, a careful review on convergence literature and firms' capabilities has been conducted, which enables to understand the nature of convergence processes and thus to select relevant capabilities within this processes. The collection of the data is divided into two parts: the information related to the convergence of mobile Internet and the companies' activities in such convergence process. The activities represent the capabilities companies possess, for example, M&A represents an absorptive capacity.

Moreover, this thesis also contributes to conduct multiple methods of sorting empirical data, namely (1) by time chart, (2) by components of mobile Internet, (3) by types of activities. These companies' events are coded either as relational capabilities or absorptive capacities. That to analyze the empirical data from multiple from both time and system perspectives contribute also contributes to depict firms' capabilities within convergence processes. Last, to increase the accuracy of comparing results, four different methods are provided in this protocol.

Though this study has not attempted at generalization, it provides an explicit research protocol for other researchers to generalize the results. This protocol leads to formulate the hypothesis that "the capabilities shift over the convergence process."

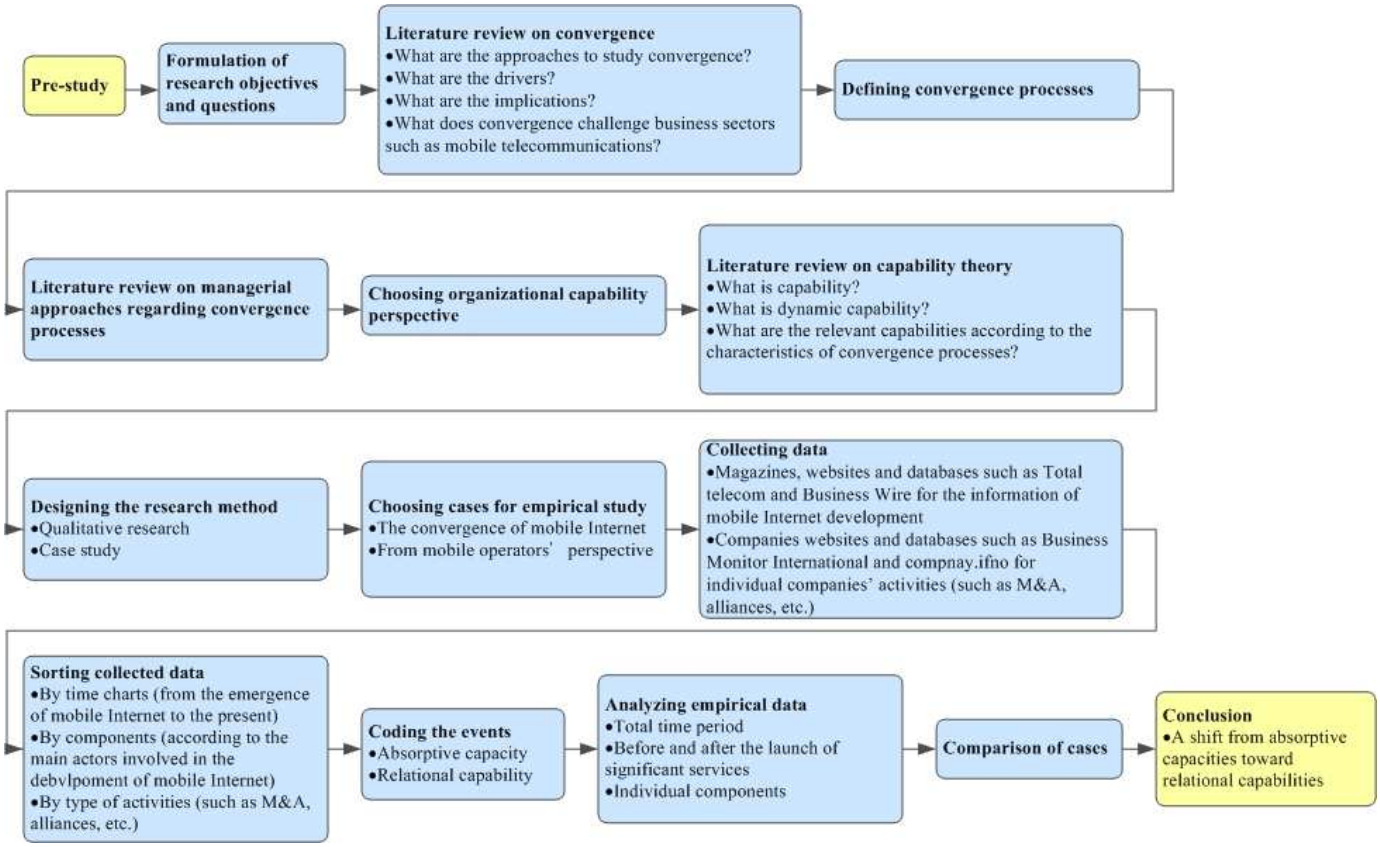


Figure 15: Overview of research protocol

7.3 Critical remarks

Although this study incorporates various implications for researchers and practitioners, it has some limitations as well. First, the possibility of generalizing the results for all the mobile operators or even actors in the mobile telecommunications is limited. The study has not attempted at generalization. Rather, the aim has been to understand

the change taking place within a specific actor based on the prevailing context, and further, to investigate firms' capabilities.

The findings of this study may very well be transferred to similar settings, but is not generalizable as such. The concepts used in the study could very well be used in order to understand other empirical contexts, e.g. other industries where convergence plays a role or mobile telecommunications markets in other countries.

Besides, the study has been carried out actively between March to September in 2008 and the industry has changed so dramatically in the past ten years that the collection of my empirical data might not be complete enough in such a short period. In addition, the study is focus on the Dutch market that is logical to collect the data from Dutch resources. However, it is not an easy task for me to interpret the data recorded in Dutch in such a short time; therefore, I could only collect and analyze the data written in English.

In short, this study only offers a snapshot of the state of the mobile telecommunications sector, the convergence process of mobile Internet and mobile operators' dynamics capabilities during 1999 to 2008 in the Netherlands.

7.4 Suggestion for future research

The convergence process poses interesting settings to study in various industries where communication is an important part. It is important to distinguish between convergence processes and to identify their drivers and outcomes in order to understand a certain event or sequence of events. In terms of technological convergence one must remember that it may give rise to, for instance, functional convergence and regulatory convergence, affecting industry actors in different ways. The convergence processes taking place within telecommunications are currently slowly becoming understandable for actors. Research on possible business strategies and business models in a converged environment is therefore justified.

A number of limitations exist in this study and they create a need for further research. First of all, the study was performed as a single main case study in the Dutch market by examining the largest two mobile operators' capabilities within mobile Internet convergence process. The framework of convergence processes and firms' absorptive capacity and relational capability can be generalized only with care to other mobile services and geographic markets. Two directions are suggested for further research. One is to conduct the same research on the same mobile operators in the Netherland providing another converged mobile service such as mobile Internet. Another suggested direction of further research could incorporate an international comparison of mobile operators' with respect to mobile Internet convergence. Therefore, mobile operators in different regional clusters who are active involved in the convergence of mobile Internet must be sampled in the same way.

Last, the research performed is not aiming at finding absolute or best solutions. Rather it is descriptive in character. Outcomes are to be seen as an incentive for the management team of mobile operators and should ideally be the starting point for further developing their monitory devices, checking which capability fit into their organizations. For further research, this has to be proved in a more statistic and quantitative way with a larger number of cases.

Appendix A: Vodafone's path towards the convergence of mobile Internet

No.	Date	Content	Source
1	28-Apr-1999	Vodafone and Ericsson announce agreements for extensive collaboration between the two companies to develop and evaluate 3G wireless technologies that will introduce to users the benefit of mobile multimedia communications. This collaboration encompasses early extensive technical experiments and follows separate announcements by the two companies on 3G/UMTS trials.	Business Wire
2	11-Jan-2000	Vodafone Group partnership with InfoSpace.com and selects its platform to deliver wireless Internet services to mobile customers worldwide. InfoSpace.com's wireless Internet services are the first global end-to-end private-label solution that enables wireless carriers, device manufacturers and software application providers to develop a comprehensive wireless portal optimized for their customers. The integrated platform of services provide mobile users with one place to conduct transactions including buying products and checking bank balances, getting personalized and localized information, etc.	PR Newswire
3	24-Jan-2000	Vodafone AirTouch Plc announces the launch of its single global platform and branded portal for mobile data and internet. A number of major global partners which confirm the world-class position of the platform and they will be joined by other leading technology and content companies prior to launch. (The partners are Sun Microsystems: hardware and software provider; IBM: systems integrator; Infospace.com: content and commerce services; Travelcity.com: travel information, flight status and bookings; Palm computing: handheld computers; Ericsson and Nokia: handset manufacturers)	Wireless Week
4	3-Feb-2000	Vodafone has signed an agreement with CMG Telecommunications for the supply of their WAP Service Broker solution.WAP gives mobile phone users direct access to Internet content. The protocol combines the simplicity of Internet browsing with the convenience of making a telephone call.	Financial Times
5	7-May-2000	CMG Telecommunications has announced that Libertel will be the first non-UK subsidiary of the Vodafone AirTouch Group to benefit from the WSB umbrella agreement signed in February. The agreement covered the supply of WAP Service Broker solutions for	Business Wire

		its mobile operator member companies around the world. The CMG WAP Service Broker is already operational for testing purposes in the Libertel network and will be capable of handling high throughput. CMG's WAP Service Broker offers operators the opportunity to make available only those Internet services that are tuned to the mobile environment and to develop secure, well-manageable services.	
6	17-May-2000	Vodafone and Vivendi (a joint venture between Vivendi and Canal+) announce that an agreement has been signed for the creation of a new joint venture company, VIZZAVI, to establish a multi-access Internet portal for Europe. Vodafone and Vivendi will both have a 50% shareholding in VIZZAVI. The new venture, operating under the VIZZAVI global brand name, will become the default home page for Vodafone's, Vivendi's and Canal+'s national operating companies throughout Europe. The multi-access Internet portal will provide services to customers in a consistent format across different platforms, including mobile handsets, personal computers, televisions and personal digital assistants. VIZZAVI will have its own technology team to develop the multi-access interfaces, working in close co-operation with the Vodafone's global mobile platform technology team to ensure a seamless global service.	Vodafone Group Releases
7	5-Sep-2000	Vodafone and Microsoft have signed an agreement to develop mobile Internet services. The deal will bring the familiarity of Microsoft's Outlook e-mail software to wireless mobile devices.	Telecomworldwide
8	15-Nov-2000	Vodafone Libertel uses SignalSoft Technology to bring WAP-based location services. SignalSoft's software products help to enhance the variety of services that mobile customers are currently using with their WAP-enabled phones. Incorporating location into these WAP services makes them more relevant, practical and convenient. SignalSoft is also supporting the ability to allow users to reach localized content through Vodafone's Vizzavi portal.	Business Wire
9	27-Feb-2001	Vizzavi, the joint Net venture of mobile communications company Vodafone and European media company Vivendi Universal, has chosen Google as its default search provider.	Business Wire
10	18-Apr-2001	Vodafone Libertel launches the Corporate GPRS LAN Access, a GPRS service for the business market in the Netherlands through which customers can, irrespective of their location, access their company network using their mobile handset.	Libertel annual report
11	24-Apr-2001	Vodafone Libertel has chosen Ericsson to supply its UMTS/ GPRS mobile telephony network in the Netherlands.	Ericsson Press Releases

12	Mar-2002	Vodafone becomes the first Dutch mobile operator to launch GPRS roaming enabling customers to make use of GPRS services while travelling outside the Netherlands.	BMI Vodafone Group Plc Report 2007
13	29-Aug-2002	Vodafone acquires Vivendi's 50% stake in the Vizzavi joint venture, which operates a mobile content business. As a result of this transaction, Vodafone owns 100% of Vizzavi. Vodafone plans to continue focusing Vizzavi's operations on providing multi-media entertainment-led consumer content aimed at increasing customer usage and to further integrate these operations into Vodafone. The acquired assets also form an integral part of Vodafone's strategy in providing differentiated services to its customers and form part of the consumer service offering, Vodafone live!. Vizzavi has since been renamed Vodafone Content Services and services are provided under the Vodafone brand.	Vodafone Group Releases
14	24-Oct-2002	Vodafone launches Vodafone Live! in seven EU countries. Subscribers will get a custom-designed Sharp GX10 camera phone and access to an exclusive bundle of picture messaging, chat, email, gaming, and content services delivered over GPRS. Vodafone Live!'s integrated devices, services, and always-on GPRS data transport form the killer cocktail needed to ignite mobile Internet usage in Europe. To win the Vodafone Live contract, Sharp gave up all control of the handset it delivered: The GX10 supports Vodafone's content standards to the letter, sports a dedicated "Vodafone Live" button, and comes emblazoned with a Vodafone logo.	Vodafone Local Releases/ Netherlands
15	18-Dec-2002	Vodafone has signed an agreement that will pre-install its "Connected by Vodafone" service in IBM and Dell Computer mobile devices sold in Europe. The partnership will let Vodafone's customers buy PDAs and portable computers from the two computer giants with pre-installed mobile connection SIM cards that will then automatically connect to Vodafone GPRS network. For Dell and IBM, they will be responsible for testing, configuration and support for all "Connected by Vodafone"-enabled PCs. The partnership is part of Vodafone's corporate concept "Mobile Office," which offers customers with PC suppliers' computers that are ready to connect to the mobile data network so they can access e-mail, calendars and intranet information.	www.internetnews.com
16	22-Oct-2003	Vodafone and Oracle announces a joint initiative to offer enterprise customers integrated mobility solutions based on Oracle *10g* and Vodafone Network Services. The initiative covers joint	Vodafone Group Releases

		development work, marketing efforts and an intention to launch further products. As well as providing the mobile-enabling middleware, Oracle has also provided mobile access to Oracle Collaboration Suite, with tools such as e-mail, calendar, voicemail, faxes and files; as well as key aspects of the Oracle E-Business Suite and its integrated set of business applications.	
17	30-Dec-2003	Vodafone selects FAST for worldwide mobile search services. The new search facility on Vodafone live! enables customers to use their mobile handsets to search across an extensive portfolio of content and an index of worldwide WAP content using a hosted installation of FAST Data Search. This enables Vodafone to quickly connect its customers to relevant services within the Vodafone live! offering as well as to the mobile Internet.	Vodafone Group Releases
18	16-Feb-2004	Vodafone is the first Dutch mobile operator to launch UMTS services. The first service is Vodafone UMTS Mobile Connect Card.	Tarifica Alert
19	10-Mar-2004	Vodafone announces that it has signed a memorandum of understanding with other leading companies (Microsoft Corp., Nokia, 3, GSM Association, HP, Orange, Samsung Electronics Co. Ltd. and Sun Microsystems) from the mobile industry to apply for a mobile Top Level Domain (TLD) from the Internet Corp. for Assigned Names and Numbers. A mobile TLD would be a key step in bridging the world of mobility and the Internet.	Microsoft Press Releases
20	16-Jun-2004	Vodafone is the first Dutch mobile operator to introduce consumer to UMTS.	Tarifica Alert
21	23-Sep-2004	Vodafone has agreements with six handset manufacturers for the supply of UMTS-enabled devices. Motorola provides three UMTS handsets, the E1000, V980 and C980. Samsung provides the Z110V and Z107V. Market leader Nokia delivers only a device, the 6630. Sharp will deliver the 802 and 902, Sony Ericsson V800 and the NEC 802N.	www.telecomwereld.nl
22	13-Feb-2006	Vodafone launches new Windows Mobile Direct Push e-mail solution for business customers. Windows Mobile Email from Vodafone enables customers to enjoy a Direct Push e-mail service on the move in a format that anyone familiar with Microsoft Office will recognize. Moreover, Windows Mobile Email from Vodafone easily integrates with customers' Microsoft Exchange Server 2003 software, making Windows Mobile Email a highly cost-effective, scalable and security-enhanced way to deliver the benefits of e-mail on the move without the need for investment in additional servers or hardware.	Microsoft Press Releases

23	14-Feb-2006	Vodafone announces that it is collaborating with Google to develop innovative mobile search services for its customers. Google's search results will be delivered through Vodafone's high speed data networks. Combining Vodafone's mobile expertise with Google's search capability will ensure that customers can quickly and easily find what's relevant to them. The new service will offer simultaneous search both on Vodafone live! and the wider Web.	PR Newswire
24	28-Feb-2006	Vodafone has signed a contract with Infront Sports & Media and gains the right to broadcast the World Cup in the Netherlands. Vodafone will further offer exclusive images via Vodafone Live!.	www.telecomwereld.nl
25	29-Mar-2006	Vodafone Libertel and Ericsson enter into an exclusive managed services partnership. Under the five-year contract, Ericsson will be responsible for engineering, implementation and operation of the access part of Vodafone Libertel's GSM, GPRS and UMTS radio networks in the Netherlands. Vodafone Libertel will retain ownership of the network and IT assets, as well as responsibility for the strategic direction of the network and IT infrastructure. About 160 Vodafone Libertel employees would be transferred to Ericsson under the scope of the managed services agreement.	Ericsson Press Releases
26	12-Sep-2006	Palm introduces Window mobile-based Treo 750c smartphone for Vodafone customers. The Treo smartphone result from the collaboration will represent an industry first by operating on Vodafone's 3G/UMTS network and delivering the hallmark Palm experience on top of the Microsoft Windows Mobile operating system. The new Treo smartphone will be available first to Vodafone customers in multiple European countries, including the Netherlands.	Business Wire
27	26-Sep-2006	dotMobi is backed by Vodafone. To make creating Web sites for mobile Internet functional and reliable, the dotMobi Switch On!(TM) Guide for Web Development contains rules and best practices based on open standards. The dotMobi Switch On! Guide ensures that Web sites can be viewed and navigated by any mobile phone.	PR Newswire
28	2-Oct-2006	Vodafone launches HSDPA in the Netherlands.	www.telecomwereld.nl
29	6-Nov-2006	Vodafone and Microsoft work in close cooperation aiming to ensure that Vodafone applications and services are tightly integrated with a Windows Mobile experience, resulting in improved mobile phone functionality as well as an enhanced mobile experience for customers. The partnership also enables Vodafone to access Microsoft's expertise to help speed up convergence between mobile devices and computers. Additionally,	BMI Vodafone Group Plc Report 2007

		it is expected to reduce time to market for new products and encourage customers to new services.	
30	9-Nov-2006	Vodafone Libertel acquires The Network Factory (TNF) and will join forces to offer integrated broadband services for voice and data communication on mobile and fixed networks to the Enterprise market. The strategic acquisition of TNF is a logical next step for Vodafone Netherlands in its strategy to fulfill customers' total communication needs.	Vodafone Local Releases/ Netherlands
31	19-Jan-2007	Vodafone Libertel has deployed network-based Alcatel-Lucent enterprise solution to enable Vodafone Libertel to expand the capabilities of its Wireless Office Service. Vodafone's enhanced Wireless Office Service is a network-based IP Centrex solution that enables business customers to use mobile phones to access communications features that previously were available only via fixed telephones, including extension dialing, hunt groups to route a call to an available line, placing calls in a queue, conferencing, and call transfer.	Telecomworldwide
32	13-Feb-2007	Vodafone and Yahoo! have agreed to extend their partnership to bring their instant messaging services to both the mobile phone and PC, providing customers with a seamless mobile Internet communications experience. Vodafone and Yahoo! intend to further develop their partnership by exploring the creation of next generation communication services. The companies first established their partnership in November 2006 when Vodafone named Yahoo! their exclusive display advertising partner in the UK. Together the companies are creating an innovative mobile advertising business to enhance the customer experience on mobile phones while providing both companies with a new revenue stream.	Vodafone Group Releases
33	7-Nov-2007	Vodafone and Nokia agree to launch integrated Vodafone services on Nokia handsets. These services will offer customers a greater choice of communications, Internet services, content and browsing through a range of premium handsets on high speed 3G and broadband networks. Vodafone and Nokia also have agreed that a number of these handsets will be exclusive to Vodafone. Customers will get faster and easier access to all of Vodafone's Internet and entertainment services from Nokia services on a wide range of handsets. Vodafone and Nokia will make it easier to access the Internet quickly at the click of a button.	Vodafone Group Releases
34	15-Feb-2008	Vodafone together with Ericsson, Qualcomm and Huawei test HSPA+ standard, an evolution of today's radio access HSPA	www.telecomwereld.nl

		technology, to assess its potential to deliver even higher data rates through the upgrade of existing network equipment.	
35	31-Mar-2008	Vodafone Libertel today announces that it will be sponsoring Mobile Monday Amsterdam until September 2009. As founding partner, Vodafone Libertel helps enable eight Mobile Monday network events where innovative people in the field of mobile Internet can meet and share knowledge and experience.	Vodafone Local Releases/ Netherlands
36	16-May-2008	Vodafone announces that it has agreed to acquire 100% of ZYB, a privately-owned company based in Denmark which operates a social networking and online management tool enabling mobile phone users to back-up and share their handsets' contact and calendar information online. The acquisition of ZYB is a further advance in the implementation of Vodafone's Total Communications strategy which is delivering new revenue growth around fixed broadband, mobile advertising and a rich set of Internet services that integrate the mobile and PC customer experience. ZYB fits into this strategy by enhancing the range of communications services Vodafone can provide to its customers.	Vodafone Group Releases
37	3-Jun-2008	Vodafone Libertel launches Vodafone Mobile Clicks 2008, a competition for mobile Internet start-ups in the Mobile Monday community. Mobilizing the internet is one of Vodafone's strategic goals. Relevant mobile sites, products and services are keys to the success of mobile Internet. Via the Mobile Monday community, Vodafone Libertel challenges the Dutch entrepreneurs to participate in thinking about how to make the mobile Internet even more attractive.	Vodafone Local Releases/ Netherlands

Appendix B: KPN's path towards to the convergence of mobile Internet

No.	Date	Content	Source
1	21-Jun-1999	Nokia and KPN Telecom have signed an agreement for the supply of an end to end solution, bringing Wireless Application Protocol (WAP) services to the Netherlands. The deal will see KPN and Nokia working together in marketing mobile messaging services throughout the Netherlands.	Business Wire
2	25-Nov-1999	KPN's M-info was the first commercial service based on WAP 1.1 in the Netherlands. To successfully launch M-info, KPN cooperated with other partners. Nokia: the supplier of the gateway and handsets; Agency.com: the web design agency who designed and build the web and WAP site; Lotus: the supplier of the agenda and address book applications; A lot of content providers like news agencies, financial institutions, and etceteras.	The introduction of M-info – A teaching case (van de Kar, 2002)
3	23-Feb-2000	KPN and Nokia demonstrate the use of WAP 1.2 and WAP Identity Module (WIM) in mobile e-commerce. Wireless Identity Module is a tamper-resistant device, for example a smartcard providing certificate-based authentication and digital signature applications for WAP services. WIM is included in WAP 1.2 specifications and can be implemented on a GSM SIM card, thus making the operator card a multi-application platform which can be co-branded for various mobile e-commerce schemes.	Nokia Press Releases
4	10-May-2000	KPN NV agrees to sell a 15% stake in its mobile-phone unit to Japan's NTT DoCoMo Inc. NTT DoCoMo, the wireless unit of Japan's Nippon Telegraph & Telephone Corp., is among the most technologically savvy mobile-phone companies in the world, and KPN hopes to apply that expertise in Europe.	The Wall Street Journal
5	30-Sep-2000	NTT DoCoMo, which owns 15 percent of KPN Mobile, hopes to transfer its technology and know-how to the joint venture, which would also manage the gateway, contents and other aspects of i-mode and 3G services. DoCoMo aims to cooperate with KPN for the early start of mobile packet-switching.	Financial Times
6	18-Jan-2001	KPN Mobile, its Japanese partner NTT DoCoMo and Italian mobile operator TIM will jointly focus on the development and deployment of new mobile Internet services in the European market. The three parties have reach agreement with the signing of a Memorandum of Understanding (MoU). The joint venture is the	KPN Press Releases

		extensive technical knowledge and experience of the three parties combined. NTT DoCoMo also provides for the transfer of experience in the development of i-mode services, application of advanced technology and the marketing of such products based services. KPN Mobile provides for the transfer of knowledge regarding value added services and introducing innovative products and services in the Netherlands, Germany and Belgium. TIM has experience in the implementation and operation of complex and flexible platforms for the consumer-oriented services, such as prepaid services and real-time payment. KPN and TIM have shared a thorough knowledge of the demands and wishes of European customers.	
7	18-Apr-2002	KPN Mobile launches i-mode services in the Netherlands. The N21i from NEC is the first mobile handset in the Netherlands compatible with i-mode.	Europemedia
8	11-Jun-2002	NTT DoCoMo and KPN Mobile test 3G. Under the terms of agreement, DoCoMo installs a FOMA base station in the Netherlands.	Europemedia
9	Dec-2002	NTT DoCoMo decides not to exercise its right to subscribe to new shares of KPN Mobile. As a result, NTT DoCoMo's voting interest in the company falls from 15% to approximately 2.2% when KPN Mobile issue new shares to its parent company, Royal KPN, in early-2003.	BMI Royal KPN NV Report
10	11-Mar-2003	New handsets are specifically designed for i-mode from current manufacturer NEC, as well as the first from new supplier Mitsubishi, and Nokia and Siemens will supply i-mode browser compatible handsets as well.	Europemedia
11	13-Jun-2003	KPN introduces the first business i-mode service. Developed in cooperation with content provider Visto, OfficeMode works with existing e- mail systems, such as Lotus Notes and Microsoft Exchange, offering i-mode users access to e-mail, diary and other office functions.	Europemedia
12	29-Aug-2003	KPN introduces a brand new i-mode service from CNN: CNNLive. Currently, i-mode in the Netherlands offers the choice of over 150 services from more 120 than nationally and internationally renowned content partners such as CNN, as well as access to thousands of other i-mode sites. CNN's i-mode site provides news and in-depth reports in various handy categories to customers in the Netherlands.	KPN corporate press
13	7-Jan-2004	KPN and the Walt Disney Internet Group have introduced Disney Mobile content on KPN's i-mode service in the Netherlands. The	Wireless news

		service enables i-mode customers to personalize their phones with Disney-themed wallpapers and ringtones based on classic and contemporary Disney characters and popular Disney animated films.	
14	30-Jun-2004	KPN starts UMTS services in the Netherlands. Laptop users will be the first to benefit with the introduction of the KPN Mobile Connect Card on July 15. KPN will begin marketing the first UMTS handsets and services for consumers in September.	KPN corporate press
15	11-Oct-2004	KPN starts to offer its UMTS for consumers with Sony Ericsson Z1010.	www.telecomwereld.nl
16	19-Jul-2005	KPN announces the introduction of MSN Hotmail on i-mode in the Netherlands, which will allow i-mode customers from KPN and its youth-brand Hi to access their MSN Hotmail account anytime, everywhere.	KPN Press Releases
17	15-Sep-2005	MSN and KPN launch the availability of MSN Messenger on i-mode devices, allowing customers to stay in touch with their friends and family even when they are on the move. Building on and complementing the messaging success of SMS, instant messaging between PCs and mobile phones enables service benefits to customers such as immediacy, the ability to tell whether a contact is available to receive a message and the ability to see the text of whole conversations. By adding the service functionality of IM and by connecting MSN and i-mode customers, both companies expect more frequent interaction between PC and mobile customers, resulting in increased traffic.	KPN Press Releases
18	22-Sep-2005	OZ has teamed with KPN to offer instant messaging (IM) via Microsoft's MSN service, to KPN's customers. The OZ Mobile IM Solution meets the dynamic needs of mobile operators and handset manufacturers with a proven, standards-based and customizable client application that is designed to meet customers' specific requirements. Working with the leading instant messaging service providers, the OZ Mobile IM Client enables mobile operators to offer a mobile IM experience that looks familiar to users' existing desktop IM services, and allows end-users to easily select which IM service they would like to use.	Business Wire
19	28-Feb-2006	KPN is accelerating the rollout of the HSDPA technology upgrade for its 3G UMTS network.KPN has signed Memoranda of Understanding (MoUs) with Ericsson and Huawei. Ericsson will provide the 3G radio network. Huawei will provide the unified circuit switched/packet switched core network. With HSDPA, customers will be able to surf the Internet or access business	KPN Press Releases

		information and applications just as quickly on the move as at home or in the office. KPN expects this to further stimulate the uptake and adoption of mobile data services, starting initially in the business market.	
20	10-May-2006	KPN introduces professional e-mail service for small businesses. The service, called Exchange Online, is based on Microsoft Solution for Hosted Messaging and Collaboration. Managed entirely by KPN, Exchange Online will allow businesses to communicate more efficiently, reducing their administrative overhead and connecting their employees with business-critical information whenever and wherever they need it. Exchange Online follows the success of Exact Online, KPN's accounting package, as the next in a series of online solutions. KPN is working in close cooperation with Microsoft to provide enterprise-class communication tools for small businesses that do not have a dedicated internal IT resource. These companies will now be able to benefit from the same experience as large business customers using Exchange Server 2003.	KPN corporate press
21	31-May-2006	KPN has launched a new portal, Mobiele Startsite, which will make i-mode content accessible for non i-mode customers. KPN subscribers or prepaid users with a WAP enable handset, can access up to fifty i-mode sites, news and 538 ring tunes.	www.moconews.net
22	4-Sep-2006	KPN extends relationships with Huawei with first HSDPA datacard. KPN is already working with Huawei to build a complete nationwide 3G/2G Circuit Switch/Packet Switch core network. Offering the HSDPA datacard service will enable KPN subscribers to tap into an enhanced 3G experience, with HSDPA radio technology boosting the data bandwidth of the core 3G network.	European communications
23	Oct-2006	NTT DoCoMo transfers its interest in KPN Mobile to KPN, while continuing the licensing of its i-mode technology to KPN Mobile. Under the agreement, in connection with DoCoMo's transfer of its KPN Mobile shares (approximately 2.16% of KPN Mobile's outstanding shares), KPN agree to cooperate with DoCoMo in the operation of the global i-mode alliance, through the use of KPN's i-mode-related patents and know-how, and paid DoCoMo 5 million euro.	BMI Royal KPN NV Report
24	10-Oct-2006	HSDPA services have been introduced in the Netherlands by KPN.HSDPA service provides users with download speeds of up to 1.8Mb/s and up to 384kb/s upload speeds.	Telecomworldwire

25	26-Mar-2007	Palm and KPN are rolling out the Palm Treo 750 smartphone running on KPN's 3G/UMTS network in the Dutch market. The Treo 750 smartphone is a touch-screen device that runs Windows Mobile 5.0, with added High-Speed Downlink Packet Access (HSDPA) capability. It offers users access to Outlook applications as well as the ability to view and edit Microsoft Word and Excel files and view PowerPoint and PDF files. The touch screen makes surfing websites, gathering data and navigating forms and applications much easier -- all with KPN's next-generation 3G network.	Wireless news
26	4-Jun-2007	Ericsson signs a five-year managed services contract with KPN for access network field maintenance. The contract allows KPN to focus more strongly on the evolving telecoms market. Under the contract, Ericsson manages KPN's access network activities, including its GSM/DCS access, UMTS access, Traxys and Semafonie networks. More than 40 KPN employees transferred to Ericsson.	Ericsson Press Releases
27	20-Jul-2007	KPN stops to sell i-mode phones in the Netherlands. KPN has the i-mode license until early 2013. The company, however, chooses to open WAP standard in the future. KPN's mobile portals can be found in shops at the same time with i-mode since March 2007.	www.telecomwereld.nl
28	20-Mar-2008	KPN Mobile International and Artilium partner to further upgrade innovation for KPN's mobile networks. The software enabling this transformation is Artilium's Real-Time Architecture (ARTA) for Connected Mobile Services, designed to facilitate rapid creation of new mobile applications, packaged as services. The partnership includes a licensing agreement allowing KPN deployment of ARTA as a platform for next-generation converged service.	Artilium News
29	28-May-2008	MoMac, the mobile media publisher, has today announced that it has completed a deal with KPN to facilitate the Dutch network operator's mobile internet business across all three of its portal properties including KPN, Hi and Telfort. The GoPortal platform will allow KPN to dynamically manage all the content that it makes available to its customers including direct branded feeds on news, weather and traffic as well a diverse diet of third party content such as ringtones, video and via MoMac's tier one publishing partners, made for mobile content such as AutoWeek, Sport 1, Elsevier and price comparison services for consumer goods.	Mobile Europe

Appendix C: Alternative calculation methods for empirical data analysis

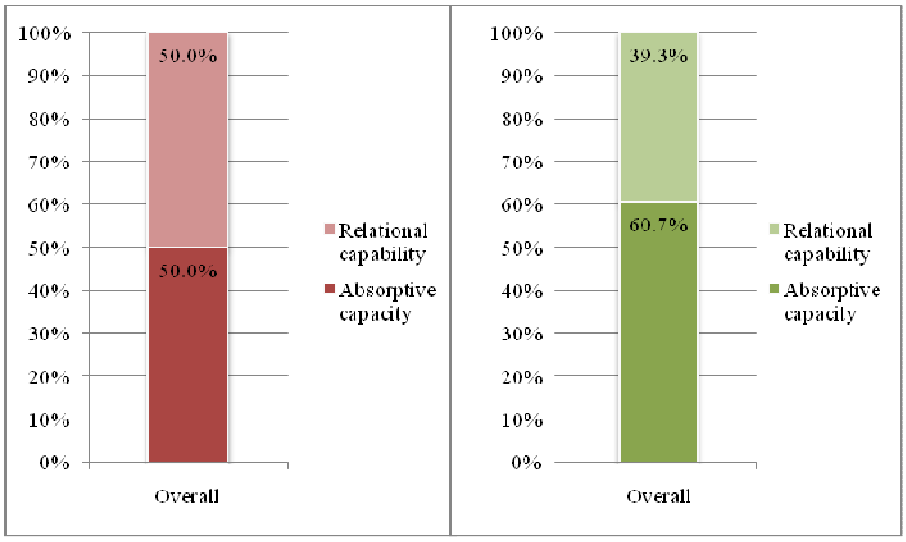
Alternative method 1

The total data is divided into several parts, and each division is used as a total data set (the details are provided in the following formulas).

(1) Calculation method for overall events:

- Percentage of overall events representing firms' absorptive capacities (%)
  = number of events representing firms' absorptive capacities ÷ total number of events
- Percentage of overall events representing firms' relational capabilities (%)
  = number of events representing firms' relational capabilities ÷ total number of events

Results:



*Red column represents Vodafone; green column represents KPN.

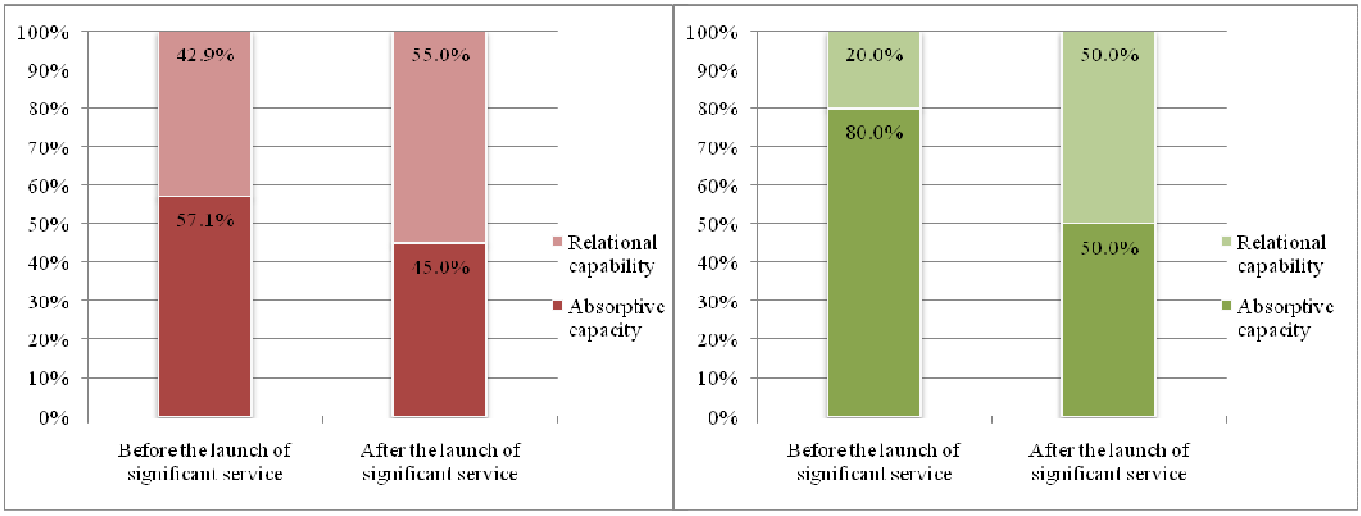
- Overall speaking, both capabilities are equally important in Vodafone's case. As for KPN's case, absorptive capacities play a relatively more important role than relational capabilities.
- The result is the same with the one presented in chapter 6.

(2) Calculation method for events divided by the launch of significant services:

- Percentage of events representing firms' absorptive capacities before the launch of significant services (%)
  = number of events representing firms' absorptive capacities before the launch of significant services ÷ total number of events before the launch of significant services

- Percentage of overall events representing firms' absorptive capacities after the launch of significant services (%) = number of events representing firms' absorptive capacities after the launch of significant services ÷ total number of events after the launch of significant services
- Percentage of events representing firms' relational capabilities before the launch of significant services (%) = number of events representing firms' relational capabilities before the launch of significant services ÷ total number of events before the launch of significant services
- Percentage of events representing firms' relational capabilities after the launch of significant services (%) = number of events representing firms' relational capabilities after the launch of significant services ÷ total number of events after the launch of significant services
- The significant services are inferred to Vodafone Live! for the Vodafone case and i-mode for the KPN case

Results:



*Red columns represent Vodafone; green columns represent KPN.

- Before the launch of significant services, absorptive capacities are relatively more important than relational capabilities for both Vodafone and KPN cases. After the launch of significant services, both companies shift their capability focus towards relational capabilities.
- Compared with the analysis in chapter 6, the same conclusion can be drawn out. With this new calculation method, one can tell the percentage differences between relational capabilities and absorptive capacity are getting bigger.
- The downside is that one cannot tell the increasing numbers of events after the launch of significant services in both cases from this calculation method.

(3) Calculation method for overall events regarding to individual components of mobile Internet:

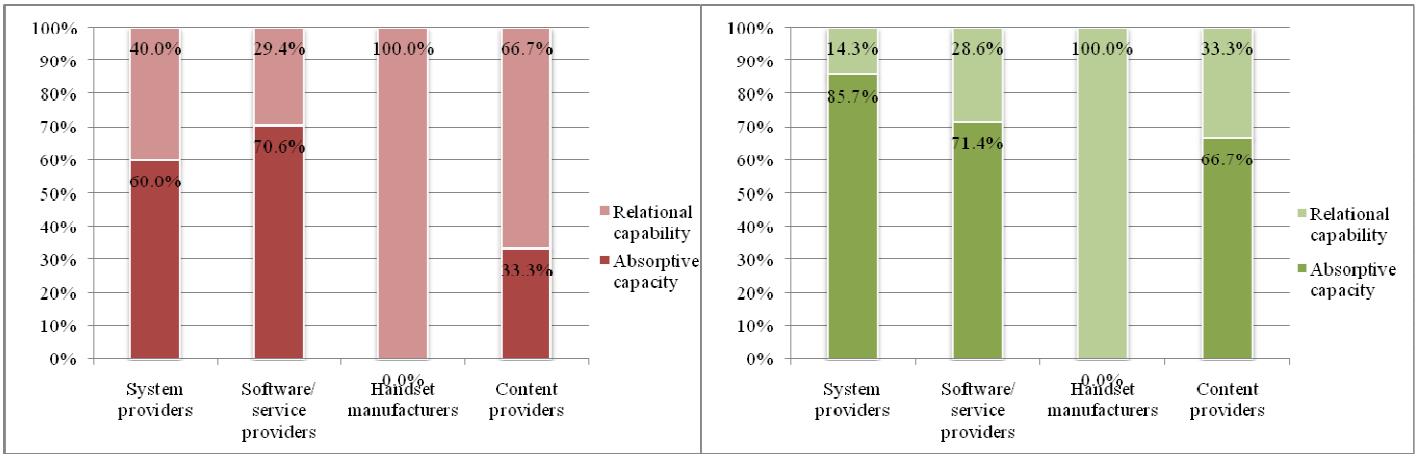
- Percentage of events representing firms' absorptive capacities regarding to individual components of mobile Internet (%)

= number of events representing firms' absorptive capacities regarding individual components of mobile Internet ÷ total number of events regarding to individual components of mobile Internet

- Percentage of events representing firms' relational capabilities regarding individual components of mobile Internet (%)

  = number of events representing firms' relational capabilities regarding individual components of mobile Internet ÷ total number of events regarding to individual components of mobile Internet
- Components of mobile Internet are referring to system providers, software/ service providers, handset manufacturers, content providers.

Results:



*Red columns represent Vodafone; green columns represent KPN.

- With system providers and software/ service providers, absorptive capacities are the preferable capabilities for both mobile operators. On the other hand, both Vodafone and KPN show their relational capabilities to handle with handset makers. Last, Vodafone possess relational capabilities to maintain its relationships with content providers, while KPN tends to acquire contents with their absorptive capacities.
- Compared with the analysis in chapter 6, the same conclusion can be drawn out. With this new calculation method, one can tell the percentage differences between relational capabilities and absorptive capacity are getting bigger.
- However, with this new calculation method it is hard to distinguish the event distribution regarding to different components of mobile Internet.

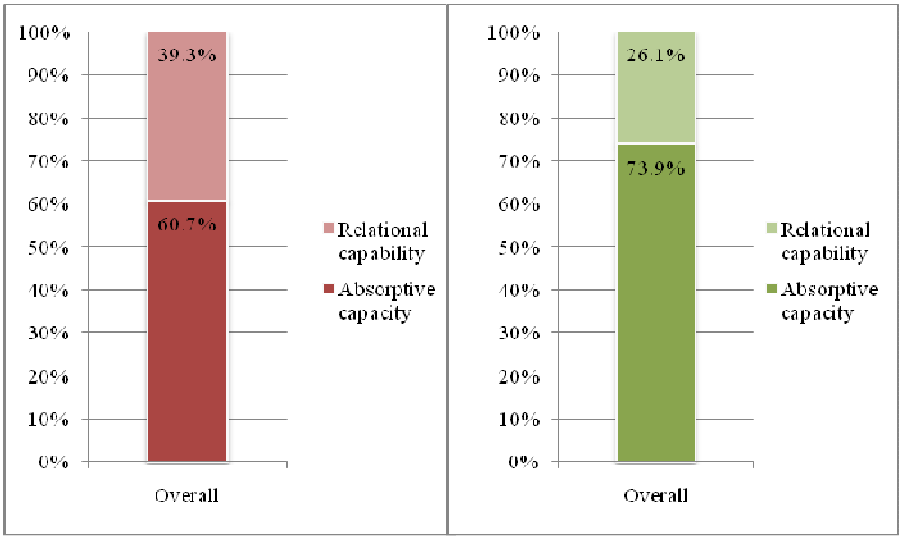
Alternative method 2

Since manufacturing handsets were not and will not be the core business for mobile operators, only events representing relational capabilities could been found in this research. Also, the main interests of this research are in the activities which are manipulated by both relational capabilities and absorptive capacities. Therefore, in this new calculation method, events related to handset manufacturers are deducted from the total events. For example, total numbers of events* = total numbers of events – numbers of events regarding to handset manufacturers.

(1) Calculation method for overall events:

- Percentage of overall events representing firms' absorptive capacities* (%)
  = number of events representing firms' absorptive capacities* ÷ total number of events*
- Percentage of overall events representing firms' relational capabilities* (%)
  = number of events representing firms' relational capabilities* ÷ total number of events*

Results:



*Red column represents Vodafone; green column represents KPN.

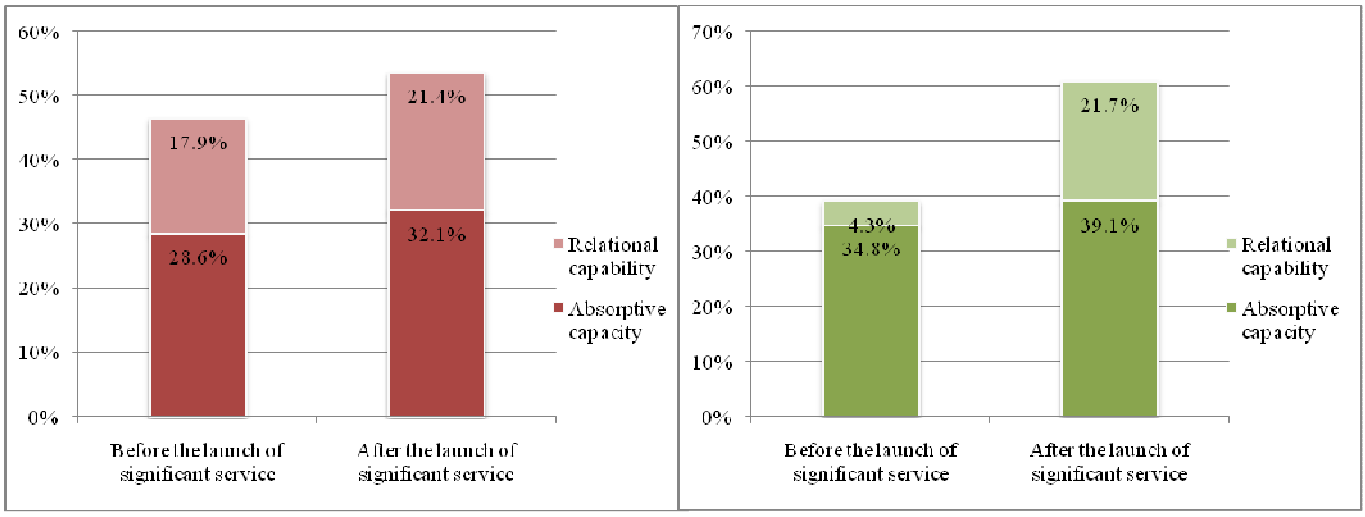
- Overall speaking, absorptive capacities are more important for relational capabilities for both companies. It seems that KPN stresses more on their absorptive capacities than Vodafone does, and Vodafone shows more relational capabilities via cooperation with other partners.
- Compared to the conclusion presented in chapter 6, the same conclusion can be drawn out for the KPN case but not for Vodafone. The percentage of events representing absorptive capabilities is much larger for both cases.

(2) Calculation method for events divided by the launch of significant services:

- Percentage of events representing firms' absorptive capacities before the launch of significant services* (%)
  = number of events representing firms' absorptive capacities before the launch of significant services* ÷ total number of events*
- Percentage of events representing firms' absorptive capacities after the launch of significant services* (%)
  = number of events representing firms' absorptive capacities after the launch of significant services* ÷ total number of events*
- Percentage of events representing firms' relational capabilities before the launch of significant services* (%)
  = number of events representing firms' relational capabilities before the launch of significant services* ÷ total number of events*

- Percentage of events representing firms' relational capabilities after the launch of significant services* (%)
  = number of events representing firms' relational capabilities after the launch of significant services* ÷ total number of events*
- The significant services are inferred to Vodafone Live! for the Vodafone case and i-mode for the KPN case

Results:



*Red columns represent Vodafone; green columns represent KPN.

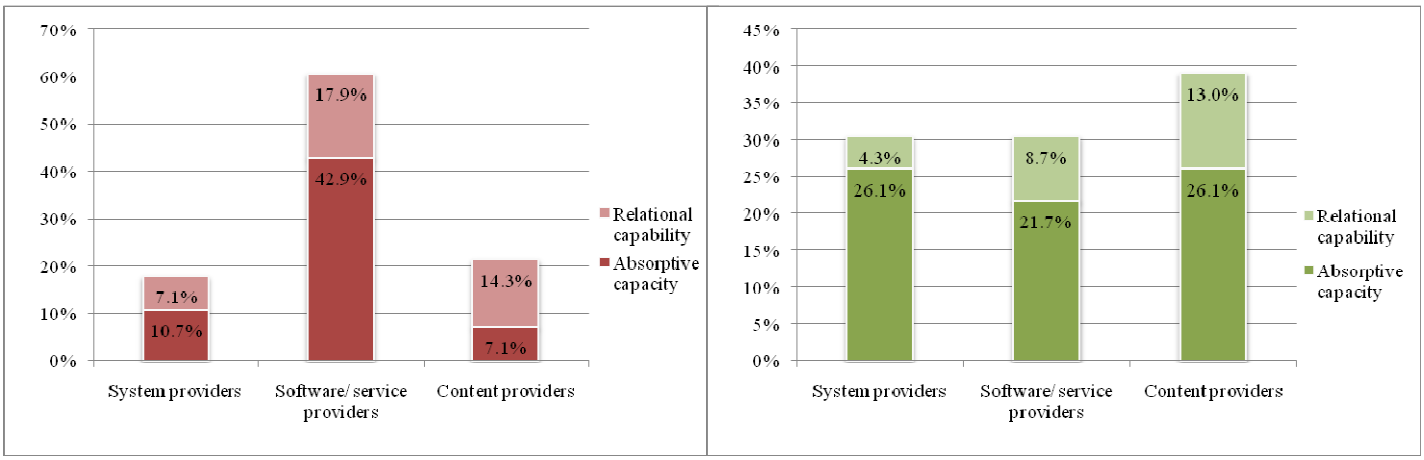
- Before and after the launch of significant services, both Vodafone and KPN shows their highly dependency on absorptive capacities within convergence processes. However, KPN largely increases its relational capabilities after the launch of i-mode in 2002 while the relational capabilities are only increased slightly for Vodafone case.
- By conducting this calculation method, it is shown that absorptive capabilities are still the preferable capabilities for mobile operators over the years. Though this conclusion is different from the one shown in chapter 6, one can still tell that relational capabilities are getting more important in the later phase of convergence processes.

(3) Calculation method for overall events regarding to individual components of mobile Internet:

- Percentage of events representing firms' absorptive capacities regarding individual components of mobile Internet* (%)
  = number of events representing firms' absorptive capacities regarding individual components of mobile Internet* ÷ total number of events*
- Percentage of events representing firms' relational capabilities regarding individual components of mobile Internet* (%)
  = number of events representing firms' relational capabilities regarding individual components of mobile Internet* ÷ total number of events*

- Components of mobile Internet are referred to system providers, software/ service providers, handset manufacturers, content providers

Results:



*Red columns represent Vodafone; green columns represent KPN.

- With system providers and software/ service providers, absorptive capacities are the preferable capabilities for both mobile operators. Vodafone possesses relational capabilities to maintain its relationships with content providers, while KPN tends to acquire contents with their absorptive capacities.
- Compared with the analysis in chapter 6, the same conclusion can be drawn out.

Alternative method 3

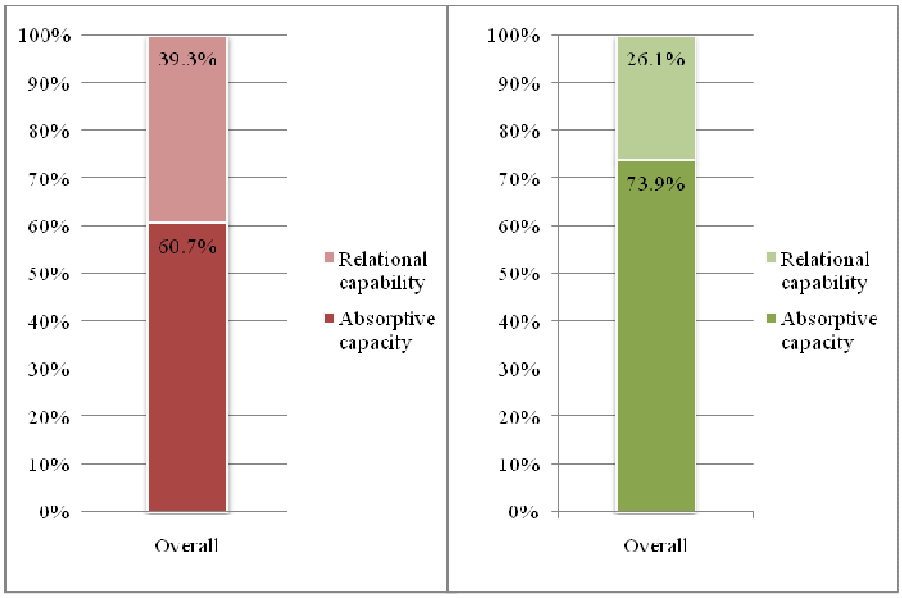
Since manufacturing handsets were not and will not be the core business for mobile operators, only events representing relational capabilities could been found in this research. Also, the main interests of this research are in the activities which are manipulated by both relational capabilities and absorptive capacities. Therefore, in this new calculation method, events related to handset manufacturers are deducted from the total events. For example, total numbers of events* = total numbers of events – numbers of events regarding to handset manufacturers.

Besides, the total data is divided into several parts, and each division is used as a total data set (the details are provided in the following formulas).

(1) Calculation method for overall events:

- Percentage of overall events representing firms' absorptive capacities* (%)
  = number of events representing firms' absorptive capacities* ÷ total number of events*
- Percentage of overall events representing firms' relational capabilities* (%)
  = number of events representing firms' relational capabilities* ÷ total number of events*

Results:



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- Overall speaking, absorptive capacities are more important for relational capabilities for both companies. It seems that KPN stresses more on their absorptive capacities than Vodafone does, and Vodafone shows more relational capabilities via cooperation with other partners.
- Compared to the conclusion presented in chapter 6, the same conclusion can be drawn out for the KPN case but not for Vodafone. The percentage of events representing absorptive capabilities is much larger for both cases.

(2) Calculation method for events divided by the launch of significant services:

- Percentage of events representing firms' absorptive capacities before the launch of significant services* (%) = number of events representing firms' absorptive capacities before the launch of significant services* ÷ total number of events during before the launch of significant services*
- Percentage of events representing firms' absorptive capacities after the launch of significant services* (%) = number of events representing firms' absorptive capacities after the launch of significant services* ÷ total number of events after the launch of significant services*
- Percentage of events representing firms' relational capabilities before the launch of significant services* (%) = number of events representing firms' relational capabilities before the launch of significant services* ÷ total number of events before the launch of significant services*
- Percentage of events representing firms' relational capabilities after the launch of significant services* (%) = number of events representing firms' relational capabilities after the launch of significant services* ÷ total number of events after the launch of significant services*
- The significant services are inferred to Vodafone Live! for the Vodafone case and i-mode for the KPN case

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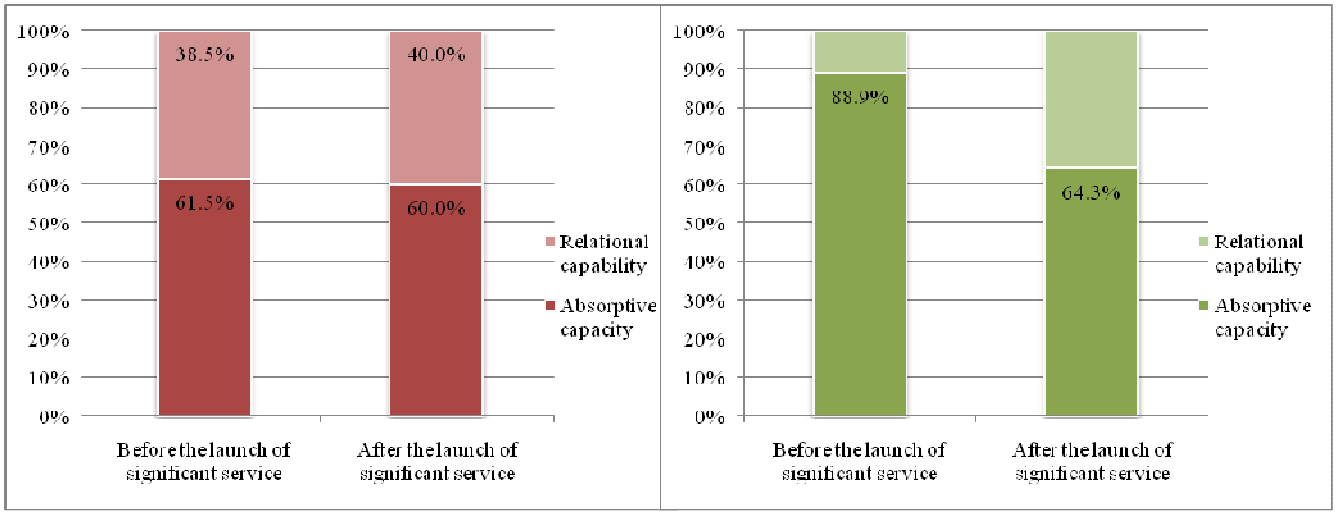

*Red columns represent Vodafone; green columns represent KPN.

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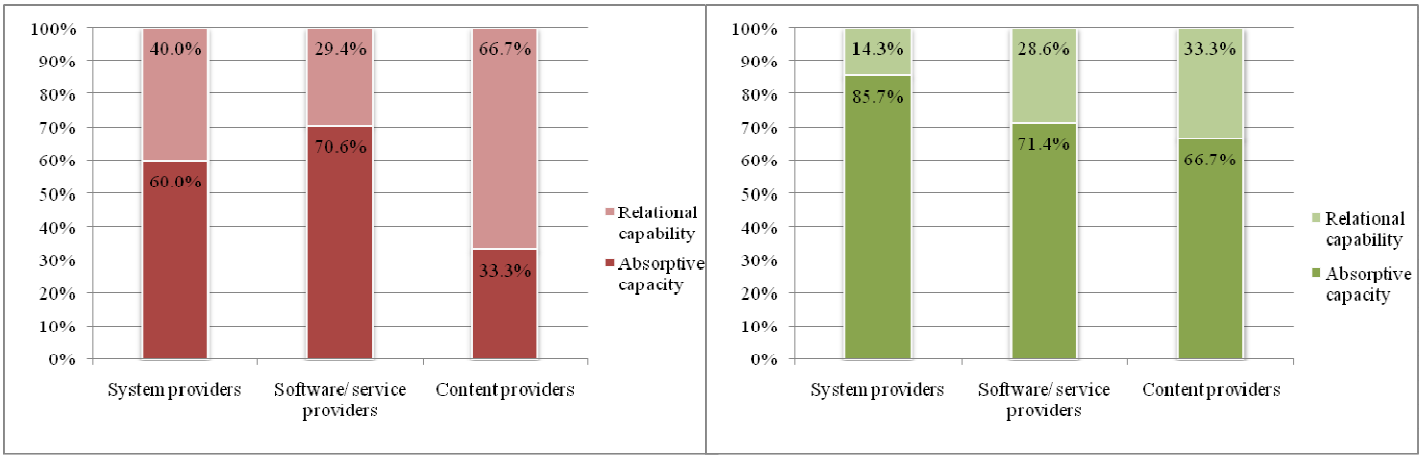
- By conducting this calculation method, it is shown that absorptive capabilities are still the preferable capabilities for mobile operators over the years. Though this conclusion is different from the one shown in chapter 6, one can still tell that relational capabilities are getting more important in the later phase of convergence processes in KPN case.
- However, with this new calculation method it is hard to distinguish the event distribution regarding to different components of mobile Internet.

(3) Calculation method for overall events regarding to individual components of mobile Internet:

- Percentage of events representing firms' absorptive capacities regarding individual components of mobile Internet* (%)
  = number of events representing firms' absorptive capacities regarding individual components of mobile Internet*÷ total number of events regarding to individual components of mobile Internet*
- Percentage of events representing firms' relational capabilities regarding individual components of mobile Internet* (%)
  = number of events representing firms' relational capabilities regarding individual components of mobile Internet*÷ total number of events regarding to individual components of mobile Internet*
- Components of mobile Internet are system providers, software/ service providers, handset manufacturers, content providers

Results:



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- Compared with the analysis in chapter 6, the same conclusion can be drawn out.
- However, with this new calculation method it is hard to distinguish the event distribution regarding to different components of mobile Internet.

GLOSSARY

2G Second generation mobile telephony systems which are characterized by the use of digital transmission enabling much higher capacity than first generation analog systems. Main 2G systems are GSM, CDMA, DAMPS, and PDC.

2.5G The generation between 2G and 3G, with speeds enhanced by, for example, GPRS.

3G Third generation mobile telephone systems that will combine voice and high-speed data services and offer a wide range of multimedia services when fully developed. W-CDMA as part of generic UMTS making this possible.

cHTML Compact Hypertext Markup Language. The language in which NTT DoCoMo developed its i-mode services.

Content Provider An enterprise whose products are information based, that is content, owned or managed for third parties. Content providers often include services to access and manage content.

GPRS General Package Radio Service. An extension for adding faster data transmission speed to GSM networks. GPRS is a package-based technology. Not to be confused with GPS.

GSM Global System for Mobile Communication. The European Telecommunications Standardization Institute (ETSI) and various EU research programs, such as RACE, played an important role in establishing this standard.

HTML Hypertext Markup Language, the language in which web pages are presently created.

i-mode NTT DoCoMo's Japanese Mobile Internet service.

NTT DoCoMo The largest mobile operator in Japan, still member of the NTT Group that maintains a majority equity stake in NTT DoCoMo.

SMS Short Message Service.Method within the GSM-telephony for sending short messages from and to mobile phones.

UMTS Universal Mobile Communications System. The 3D mobile phone system.

W-LAN Wireless Local Area Network, based on the 802.11b IEEE protocol. Regarded as an infrastructure that has the potential to compete with 3G networks by offering local access users of mobile devices.

WAP Wireless Application Protocol is a standard created to access mobile content.

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