The Communicating Home

- Definition, Evaluation and Business Opportunities for TeliaSonera in a 3-5 years perspective

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ABSTRACT

Title: The Communicating Home – Definition, Evaluation and Business Opportunities for TeliaSonera in a 3-5 years perspective.

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Problem discussion: The meaning of the communicating home concept is today vague and confusing. To be able to define the communicating home industry a thorough investigation concerning which communication technologies, buying behavior and user needs, products and actors that are present in this area must be established. Furthermore, the communicating home as a market place must be examined in order to evaluate the industry. The evaluation of the industry will point out business opportunities that can be used to develop a business model for a telecommunication operator like TeliaSonera.

Purpose: There are three main purposes of this master thesis:
1. To define the communicating home in a 3-5 years perspective.
2. To evaluate the communicating home as a market place in a 3-5 years perspective.
3. To develop a business model, explaining how TeliaSonera should act in the communicating home industry in order to generate profit.

Methodology: Given the prerequisites, where the authors have a form of consulting role for TeliaSonera, an action based research method have been chosen. This research method has lead to a continuous analysis, in parallel with phases of theoretical and empiric data collection. To facilitate the reader's comprehension of the report, empirics and theory have been intermixed. Because of the ever changing characteristics of the IT and telecommunication industry its of great importance to collect as much up-to-date information as possible. Therefore Internet has been a widely used information source complemented with scientific journals and interviews with industry experts.

Conclusions : The communicating home concept has been defined by identifying the dominating communication technologies to/from and in the homes, the most important customer behavior and user needs, the dominating products and the dominating actors of the industry.

The evaluation of the communicating home industry has been performed with a five forces framework analysis and theories regarding value migration and value structures of industries. It has been concluded that actors of communication technologies, goods and access services will compete fiercely. The barriers of entry will however be high. When it comes to content services the situation is completely different. These actors will, to the largest extent, meet lower competition and low barriers of entry. As a consequence a value migration from communication technologies, goods and access services to content services will occur.

TeliaSonera is suggested to develop a content service portal. It should, in its first version, contain IPTV, music on demand, video on demand, data security, online storing and online gaming in the first place. The TeliaSonera group has the right prerequisites to implement and capitalize on a content service portal. In addition to the content service portal some other business opportunities have also been addressed in the business model.

Key words :
Business model
Business development
Communicating home
Communication technology
Telecommunication
User needs
Value structure

PREFACE

The working process in producing this report has been both interesting and educational. By spending the spring semester at TeliaSonera we have had the opportunity to establish a thorough understanding for the company and its competent employees. The weekly evaluation meetings with our internal tutors, Per Gustafsson and Karna Norén, have been a great help in establishing an understanding of both TeliaSonera and the communicating home. The vast amount of time they spent supervising has also provided us with insights, and thereby great motivation, of the importance of our work. Thanks for your devotion Per and Karna!

Our academic tutors have also been a great resource during the work of our master thesis. With the extensive knowledge and useful contacts within the telecommunications industry, Ulf Körner has been of great help for us. Carl-Henric Nilsson with his interdisciplinary knowledge in business and technology, his great experience in the development of master thesises and his sharp eye for methodology has also been an invaluable resource in this thesis. In addition to this Thomas Häger and Mattias Larsson from Accenture have been very supportive in the creative development processes of the industry structure and the business model for TeliaSonera.

Of course the outcome of the master thesis would not have reached the same levels without the input gathered from our interviewees. The authors would therefore especially like to thank the involved employees at TeliaSonera, Jonas Birgersson, Anders Kälvemark, Ann-Charlotte Kornblad, Ewa Ställdal and Claes Wellton.

Thank you all!

Malmö, May 2005

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1. INTRODUCTION

The introduction chapter begins with a background built on Bill Gates first book published ten years ago. Together with the section describing TeliaSonera's point of departure, it is proved that the communicating home is a relevant and interesting subject to investigate in further detail. The problem discussion then leads to the three purposes that will be addressed by the master thesis. Focus and delimitations, target group, report disposition, some vital definitions and a short description of TeliaSonera concludes the chapter.

1.1. BACKGROUND

In his first book, "The road ahead" published in 1995, Bill Gates presented many visionary thoughts about the future home. He began his book by writing about the digital revolution: *"The personal-computer revolution happened and it has affected millions of lives. It had led us to places we had barely imagined. Now that computing is astoundingly inexpensive and computers inhabit every part of our lives, we stand at the brink of another revolution. This one will involve unprecedentedly inexpensive communication; all the computers will join together to communicate with us and for us. Interconnected globally, they will form a network, which is being called the information highway…The revolution in communication is just beginning. It will take place over several decades, and will be driven by new" applications"- new tools, often meeting currently unforeseen needs."*[1]

He goes on by explaining the capabilities of the information highway and how it can be used in the future homes*: "The highway will enable capabilities that seem magical when they are described, but represent technology at work to make our lives easier and better. Because consumers already understand the value of movies and are used to paying to watch them, video-on-demand will be an important application on the information highway. It won't be the first, however…The systems will be able to offer other applications such as games, electronic mail, and home banking…Television shows will continue to be broadcast as they are today for synchronous consumption- at the same time they are first broadcast. After they air, these shows- as well as thousands of movies and virtually all other kinds of video-will be available whenever you want to view them…Even if a show is being broadcast live, you'll be able to use your infrared remote control to start, stop, or go to any previous part of the program, at any time."* Other future services, according to Bill Gates ten years ago, were personalized news, simultaneous transfer of voice and data and he also wrote about the information highway as the ultimate market: *"Markets from trading floors to malls are fundamental to human society, and I believe this new one will eventually be the world's central department store. It will be where we social animals will sell, trade, invest, haggle, pick stuff up, argue, meet new people, and hang out."* The digital era would also have great implications on the way individuals consume entertainment content*: "The information highway will enable innovations in the way*

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[1] Gates (1995)

that intellectual property, such as music and software, is licensed. Record companies, or even individual recording artists, might choose to sell music a new way. You, the consumer, won't need compact discs, tapes, or any other kinds of physical apparatus. The music will be stored as bits of information on a server on the highway. 'Buying' a song or album will really mean buying the right to access the appropriate bits. You will be able to listen at home, at work, or on vacation, without carrying around a collection of titles. Anyplace you go where there are audio speakers connected to the highway, you'll be able to identify yourself and take advantage of your rights." Pure convenience services are also possible:*"Other applications will be strictly practical. For example, when you go on vacation a home-management application will be able to turn down the heat, notify the post office to hold your mail and the newspaper carrier not to deliver the printed paper, cycle your indoor lighting so that it appears you are home, and automatically pay routine bills".[2]*

But before people could enjoy the benefits of applications and appliances described above the information highway had to be in place. In 1995, Bill Gates thought it was unlikely that the information highway would be available in the homes for at least a decade: *"Nobody is going to spend this kind of money until it is dear that the technology really works and that consumers will pay enough for the new applications. The fees customers will pay for television service, including video-on-demand, won't pay for building the highway. To finance the construction, investors will have to believe new services will generate almost as much revenue again as cable television does today. I think investors will become confident of such a return as innovators bring new ideas to the trial…Once investors begin to understand the new applications and services and the potential financial payback for the highway infrastructure is proven, there will be little trouble raising the necessary capital. The outlay will be no greater than that for other infrastructures we take for granted – roads, water mains, sewers, and electrical connections."[3]*

Bill Gates concludes the first chapter of the book by stating: *"We are watching something historic happen, and it will affect the world seismically, the same way the scientific method, the invention of printing, and the arrival of the Industrial Age did. Big changes used to take generations or centuries. This one won't happen overnight, but it will move much faster. The first manifestations of the information highway will be apparent in the United States by the millennium. Within a decade there will be widespread effects. If I had to guess which applications of the network will be embraced quickly and which will take a long time, I'd certainly get some wrong. Within twenty years virtually everything I've talked about will be broadly available in developed countries."[4]*

Today, ten years later, the information highway is a fact in form of the Internet. Many of the above described services have or are about to break through. It will have major implications on how to use digital goods and services in the homes in the future.

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[2] Gates (1995)
[3] ibid
[4] ibid

1.2. TELIASONERA'S POINT OF DEPARTURE

TeliaSonera is a communication provider, supplying connectivity and services over a number of different accesses and technologies. These accesses and services were previously supplied relatively independently of each other, but over the last couple of years a convergence has begun and in the future users will be offered a seamless service experience. One implication of the convergence is a new position of the home as a hub for residential user's communication consumption. In addition to this the digitalization of media content will create a market place in the home for information and entertainment consumption based on IP-connectivity. TeliaSonera refers to the concept of the home as a market place for communication and entertainment consumption as the communicating home.

Communication providers experience decreasing average revenue per user (ARPU). This revenue decline is caused by a number of reasons. The main cause is ever toughening competition resulting in decreasing margins. In the case of TeliaSonera they are also about to lose parts of their former great revenue source from fixed telephony. At the same time minute tariffs for mobile telephony are decreasing at a fast pace. In order to sustain or improve profitability when the total amount of revenues are decreasing, costs need to be reduced and/or new revenue generating areas need to be addressed.

With users that are growing more advanced in their usage of communication services and new product areas enabled by a technology evolution, the home is coming to light as a potential area for new revenue streams. Combining user demands, technology evolution and the need for additional new revenue generating business areas, an extension of a communications provider's product portfolio to include the home as a market place is a possible solution. This is believed by TeliaSonera to be a vital part of the remedy of tomorrow's potential poor profitability in form of new revenue streams.

1.3. PROBLEM DISCUSSION

The communicating home is a relatively new concept and there exists a lot of confusion about what the term really means. To be able to establish a definition a lot of aspects must be considered. Questions that need to be answered are:

- Which communication technologies are possible parts of the communicating home?
- Which customer behavior and user needs have to be addressed in the communicating home?
- Which products (goods and services) are possible parts of the communicating home?
- Which actors are active in the communicating home industry?

By answering these questions the communicating home concept can be defined. When this has been accomplished the natural next step is to evaluate the

communicating home as a market place. To do this the competitive environment has to be studied. Examples of questions that need to be addressed are:

- What will the competitive situation for the communicating home industry look like?
- Which traditional industries have interests in the communicating home industry?
- How are actors of the communicating home industry connected to each other?
- Which positions in the communicating home industry are most attractive?
- Is it likely that the value offered from different positions in the industry will migrate over time?
- Is the success of the communicating home industry dependent on a technology push or a market pull strategy?

When all these questions have been answered, the communicating home as a market place has been evaluated. Since the master thesis is conducted at TeliaSonera it is of great importance to analyze and recommend an appropriate position for them within the communicating home industry. This is accomplished by developing a business model for TeliaSonera. To be able to do that the following questions need to be answered:

- What is a business model and which aspects must be considered?
- How should TeliaSonera act to reach an optimal position in the communicating home industry?
- What should TeliaSonera's offerings look like in terms of differentiation, pricing strategies, relevant partnerships, etc.?

1.4. PURPOSE

The problem discussion above has revealed that the purpose of this master thesis is threefold:

1. To define the communicating home in a 3-5 years perspective.
2. To evaluate the communicating home as a market place in a 3-5 years perspective.
3. To develop a business model, explaining how TeliaSonera should act in the communicating home industry in order to generate profit.

1.5. FOCUS AND DELIMITATIONS

In order to understand the prerequisites the master thesis has been founded on, it is important for the reader to be aware of the focus and the delimitations that have been made.

The time frame of the study has been a 3-5 years perspective. This is because of that a continuous stream of technology innovations within the chosen area makes it hard to predict the future in a longer perspective with trustable accuracy. However, the defined time frame also means that some goods and services will be considered as not being part of the communicating home although they have great potential in a longer perspective. A delimitation has also been made to not discuss actors concerning

communication technologies and products that have not been deemed as dominating in a 3-5 years perspective. This means a risk of missing important actors but had to be done in order to get an acceptable scope.

The study has been restricted to the Swedish market. However, many of the goods, services and actors in the report are found on the global market. This implicates that the conclusions drawn from this thesis, to a great extent, can be applied on other markets with similar user behavior and customer needs, e.g. the Finnish market.

Last but not least, focus has been set on the home. All communication technologies, goods, services and actors discussed will in some way have a connection to the home. Enterprise solutions will therefore not be regarded if a potential business development suited for the home is not visible.

1.6. TARGET GROUP

This is a final thesis for the Technology Management education at Lund Institute of Technology and Lund School of Economics and Management. Host company has been TeliaSonera and the authors have also been appointed to an Accenture scholarship program. Therefore, students and teachers within the Technology Management education and people with an interest in the subject at TeliaSonera and Accenture are the primarily target group for this report.

The content in this report encompasses a lot of complex technology, goods and services and also numerous actors and traditional industries. In order to treat all this while still not exceeding a reasonable length of the report it is presumed that the readers have basic understanding for telecommunications, business and strategy.

1.7. DISPOSITION

Chapter 1 is the introduction and chapter 2 describes the methodology used in the master thesis.

The master thesis consists of three major parts, where each part addresses one of the three purposes. A general feature in the chapters belonging to one of these three parts is that theory and empirical facts are integrated. Analysis sections discussing the theory and the empirical facts are intermixed in the chapters. Here, the authors present their own ideas and draw conclusions. Finally, every chapter belonging to one of the three major parts, are summarized under a headline called key conclusions.

The first purpose, to define the communicating home, is addressed in chapter 3-6. This is done by identifying the dominating communication technologies to/from and in the homes (chapter 3), identifying the most important customer behavior and user needs (chapter 4), identifying the most important products in form of goods and services (chapter 5) and finally by identifying the most important actors of the industry (chapter 6). The figure below will be complemented with content after every chapter in this part until it, after chapter 6, constitutes a comprehensive definition of the communicating home.

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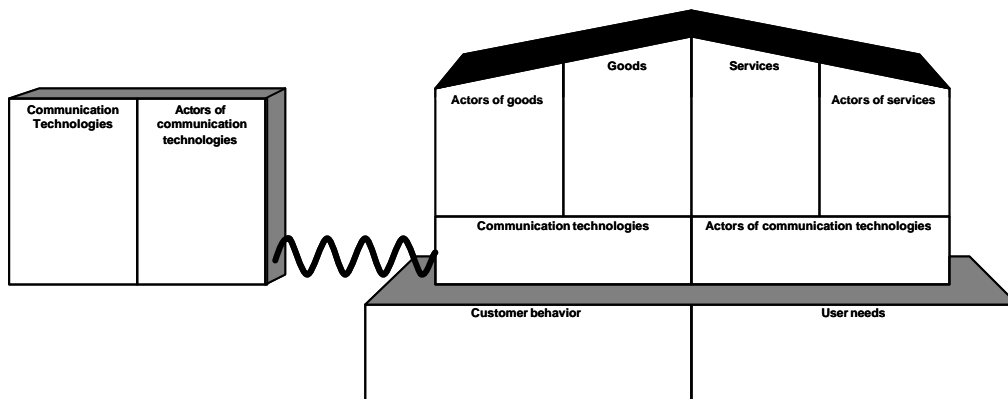
Figure.1.1 Scheme presenting the communicating home.

The figure represents a house with belonging communication technologies, goods, services and the most important actors concerning these communication technologies and products. The box at the left side is a curb which is used to illustrate the access network in form of dominating access technologies and the actors behind these technologies. The foundation of the house constitutes of the customer buying behavior and the user needs which also is the foundation that all communicating home offerings must be built on.

The second purpose, to evaluate the communicating home as a market place, is addressed in chapter 7. The chapter starts of with theories from Michael Porter and Adrian Slywotzky. These are used to analyze the competitive situation in the communicating home industry and how the value in the industry might migrate over time. Then, theories for value systems and value chains are used to develop a figure of how different actors of the industry are connected.

The third purpose, to develop a business model for TeliaSonera, is addressed in chapter 8. First, theories that tell what a business model is are put together. By combining these theories with theories concerning the resource based view of how a company should formulate its strategies and the conclusions from previous chapters a business model for TeliaSonera is developed.

Finally, in chapter 9, the most important conclusions concerning the three purposes are summarized in a concise manner.

To help the reader to navigate in the chapters the figure below is used to show which subject that is discussed. The discussed subject, in form of a chapter, will be marked grey in the introduction of the chapter.
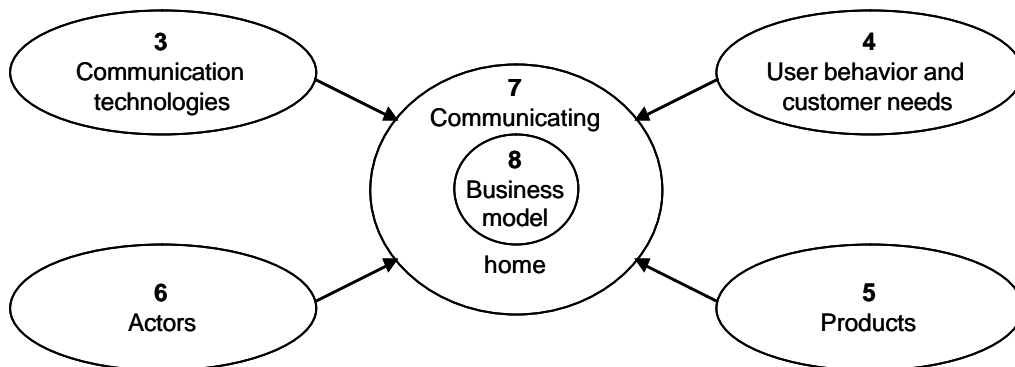
Figure 1.2. Figure showing the structure of the report which is used to help the reader navigate in the report.

The four periphery ellipses are the chapters that define the communicating home. These chapters constitute input to the large circle in the middle where the communicating home is evaluated. The small circle in the middle is a subset to the large circle and here the business model of TeliaSonera will be developed.

1.8. CLARIFICATIONS OF VITAL TERMS

Customer and user. The customer is the person that buys a product and the user is the person that uses the purchased product. The customer and the user do not have to be the same person.

Goods and services. A product is anything that can be offered to a market to satisfy a need. Products can be both physical and intangible. Physical products are called goods and intangible products are called services.

Digital home. A digital home consists of goods using digital technology and the content used by these devices is in a digital form. It is not necessary that the goods can communicate with each other to create a digital home.

Communicating home. The essence of the communicating home is communication. This includes all interoperable communication to/from the home and between goods in the home. The word communication is here used to illustrate any kind of digital data transfer. The communicating home enables new and enhanced products which implicates great improvements for users in their everyday life. When all goods uses digital technology, all content is in a digital form, all communication is carried through digital technologies and all goods are interoperable , a communicating home is a fact.

Remark: It should be noticed that the above description of the communication home does not constitutes a definition of the concept. Instead, this description was developed in the beginning of the master thesis and has been used as a point of departure. This description will be filled with content in form of communication

technologies, customer behavior, user needs, products and actors in the first part of the master thesis which will define the concept.

1.9. TELIASONERA – COMPANY INTRODUCTION

With an extensive service portfolio, including voice and data communications, and a strong market position TeliaSonera is the leading communications provider in Scandinavia and the Baltic states. During 2004 net sales totaled about SEK 82 000 million, and the group presented an operating income close to SEK 13 000 million. At present the Swedish and the Finnish government are the dominating owners, and the group employs about 27 000 people. In their vision, TeliaSonera states that with simplicity as their guiding star they aim at building an even stronger market position as the leading service provider supplying users with the most optimal technical solutions perfectly tailored for their needs.[5]

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[5] www.teliasonera.com, 2005-04-20

2. METHODOLOGY

This chapter describes the course of action of producing this paper. First the practical approach is presented. Thereafter areas regarding data collection are addressed. Given the somewhat special approach in this master thesis of integrating theory and empirics the reasons for this is presented. Insight to how this master thesis was developed is given through the working process. In the end of the chapter follows source of criticism and a presentation of the pre-conception of the authors.

The main purpose of virtually any research based study is to create knowledge.[6] The methodology is a systematic way of examining the reality. Methodology is the doctrine of how to collect, organize, process, analyze and interpret social facts in a way that enables others to logically derive achieved conclusions.[7]

2.1. PRACTICAL APPROACH

Given the prerequisites including three major stakeholders; Accenture, TeliaSonera and the University and furthermore that the deliverable needed to satisfy expectations from all these three, an action research approach was chosen. Action research is often identified by its dual goals of both improving the organization participating in the research project, while at the same time generating academic knowledge.[8] Since the master thesis project was a subset of a greater project called, "Seamless Service Experience for Home and Family", the master thesis was expected to generate new concepts and ideas for the comprehensive project. Between the projects a two way flow of knowledge existed, that is, the authors' were able to access some of the knowledge output from the comprehensive project while performing their work. In a way the authors could be seen as consultants enhancing the knowledge within the main project. Knowledge for the academy was generated when Michael Porter's five forces model was combined with Adrian Slywotzky's Value Migration concept in chapter 7.

When using an action research approach it is important to understand the difficulties and problems it might convey. The threats can be divided into three categories;[9]

- Uncontrollability; refers to the threat that the studied environment might change appearance into one that is not forecasted by the researchers. This might lead to project delays as the researcher has to revisit the empirical data or theoretical model. Worse case scenario is project termination due to the new prerequisites.
- Contingency; is about the generalization of the research results. Action research usually becomes influenced by the environment it was performed in.

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[6] Lundahl and Skärvad (1992) p.10
[7] Halvorsen (1992) p.13
[8] Kock (2004)
[9] Ibid.

- Subjectivity; this refers to the risk of the personal involvement by the researchers. The involvement might cause misinterpretation of data and loss of objectivity which furthermore implies faulty conclusions.

To ease up the difficulties with the problems a number of actions can be taken. The contingency problem can be addressed through studying more instances and therefore making the results more independent. A working process characterized by iterative manner also counteracts the above stated threats. By collecting data about included areas at multiple times, the threat from all the problem areas, but especially the possible negative influence from uncontrollability and contingency is decreased.[10]

2.1.1. Primary and secondary data collection

Primary data has been gathered through interviews with industry experts mapped out in discussion with the supervisors from TeliaSonera and the University. Interviews can be categorized based on their degree of standardization. In a highly standardized interview the questions, as well as their ordering, are static. Unstandardized interviews mean less static questioning and question sequence. Unstandardized interviews can also be structured or unstructured. Unstructured interviews are used when the purpose of the interview is not totally defined and when the interview aims directly to catch the interviewees own opinion. [11] Given that the interviews will be about a business area 3-5 years ahead an unstandardized approach was best suited for the situation as questioning and question sequence needed to be adjusted depending on the interviewee's area of specialization. The interviews performed have furthermore been structured as their purpose was defined in advance.

Secondary data, being data that is collected by others[12], have been gathered from a number of sources. When the communicating home is an area that is swiftly evolving, Internet has been a very useful source to access up-to-date information. Furthermore, other written sources from e.g. industry magazines, articles in Lund University's database ELIN, telecommunications literature, surveys from different research institutes, articles from the TeliaSonera's internal business portal BizKit, etc. have been helpful in fulfilling the purposes of this master thesis.

2.1.2. Qualitative, quantitative and generalization aspects

A quantitative research approach is classified by having data that is possible to quantify. Usually surveys or questionnaires are examples of quantitative research methods. Qualitative research is based on data that cannot be quantified e.g. interviews considering opinions, values or other "soft" data.[13]

This master thesis is constituted of a mix of the two above described approaches. The quantitative approach can be found in the wide variety of independent Internet

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[10] Kock (2004)
[11] Lundahl and Skärvad (1992) p.78, 91-93
[12] Lundahl and Skärvad (1992) p.78
[13] Lundahl and Skärvad (1992) p.82

sources, facts and figures from different research institutes. The qualitative approach is reflected by the interview procedure and other non objective sources.

A qualitative research project can never be as generalizing as a quantitative one. However, the target group of the report must be considered.[14] The report has primarily been directed to suit TeliaSonera and therefore it is believed that the generalization aspect is valid for their purposes. The first two purposes, the definition and the evaluation of the communicating home, can be applied for a wider audience with reason of the extended objectiveness in these areas. The definition and the evaluation of the communicating home ought to be interesting and valid for any traditional industry being part of the emerging communicating home industry.

2.1.3. Reliability and validity

If an investigation is reliable it implicates that there are a low presence of random faults. Validity however, refers to the amount of systematic faults.[15] A favorable validity is dependent on a good reliability but the degree of reliability is independent of the validity.[16] To ensure a comfortable degree of validity a number of actions have been taken. The interviewees have been chosen from different backgrounds and sets of references. The iterative working process, gathering data at a number of different times from different sources have also increased the validity. The reliability aspect is ensured by the use of a structured interview procedure.

2.1.4. Objectivity

The fundamentals of science are often claimed to be objectivity together with generalization and explanation.[17] Objectivity is a multi facetted word with implications such as differentiation of facts and values, impartiality, completeness and versatility.[18] To achieve a satisfying objectivity parts of the master thesis have been differentiated where facts differ from opinions. An example of this is the theoretical and empirical parts which aim at illustrating an objective picture of a phenomenon in contrary to the analysis which contains objective facts, integrated facts and opinions from e.g. interviews and the authors' own thoughts. Another conscious choice of method is the decision to divide the different parts of the master thesis in two. Chapters 3-7 have been written from an industry perspective with not any other consideration to TeliaSonera than that they are part of the industry. However chapter 8 has been written from a TeliaSonera perspective, taking their resources and capabilities into account when developing a business model.

2.2. INTEGRATED APPROACH

The methodological outline of this master thesis is chosen to facilitate the readers' ability to couple the different parts of the report. Thus theoretical and empirical

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[14] Holme and Solvang (1997) p.81
[15] Lundahl and Skärvad (1992) p.87-88
[16] Lundahl and Skärvad (1992) p.88
[17] May (2001) p.19
[18] Lundahl and Skärvad (1992) p.71

material has been integrated and is followed by an analysis referring back on the findings. This procedure is valid for the chapters 3-8. The method was chosen because of the obvious benefits it offers when it comes to enhancing the reader value and linking collected data with analysis. In addition to enhancing the readers' experience the approach was also chosen though it is aids the work of ensuring the quality of the master thesis. Merging theory and empiric aids the authors in the work of discovering non value adding information.

2.3. WORKING PROCESS

To ensure that all stakeholders, being TeliaSonera, the University and Accenture, had the same thorough understanding for the work to be conducted an extensive project plan was developed and presented to all involved before the actual work with the masters thesis was begun.

To accomplish the first two purposes, to define and evaluate the communicating home, future communication technologies both to/from home and in-house and was investigated. Information was gathered from a number of sources. With reason of the 3-5 year perspective Internet was a regularly used source to access information about frontline research. To guide the work of establishing a forecast of future communication technologies, help was also taken from the supervisors at TeliaSonera and the university. The author's personal network of decision makers and industry experts was furthermore at times a very helpful source of information.

After a forecast of what communication technologies that will be used in a 3-5 year perspective was established, a parallel working process was implemented. Concurrently the products part of the future communicating home and customer behavior and user needs was analyzed. Working in an iterative way proved very useful, as it allowed the allocation of the appropriate amount of resources at all times. During the development of these chapters' interviews with industry experts and other decision makers was very valuable.

In the work to map out the actors and develop a value network for the communicating home the concurrent working process was aborted and all resources was gathered and focused on this area. In the early work of this chapter help was also taken from Accenture.

As the first two purposes was fulfilled work addressing the third and last, to develop a business model for TeliaSonera in the communicating home was begun. Since a business model's foundation consists of much of the work presented in the five previous chapters, a lot of the preparatory was already carried out. Therefore all resources could at a very early stage be allocated for the formulation of TeliaSonera's position and offering in the communicating home.

It should be noted that writing has been a continuous process during the development of this master thesis.

2.4. SOURCE CRITICISM

The fact that this report was written for TeliaSonera and that some empirical material was supplied by the comprehensive project this master thesis was part of, might have disturb the objectiveness in the work. The possible influence of TeliaSonera has been addressed through a number of ways. First of all a wide range of information sources have been addressed. Information has been gathered from published, electronic and oral sources. The electronic sources have been chosen taking aspects of quality and correctness into account, and mostly originate from regulatory organizations, large company sites and industry forums.

2.5. THE PRE-CONCEPTION OF THE AUTHORS

To be able to provide the reader with insights in which context the new created knowledge is shaped, it is of greatest importance to reveal the history and existing reference frames of the authors'. A thorough understanding of the frames of reference will also assist the authors in presenting an unbiased report as possible.[19]

All three authors are majoring in Technology Management at the University of Lund. Johan Claesson and Hampus Janzon derive from Lund Institute of Technology where they both have studied Computer Science while Daniel Clemensson has studied business at Lund School of Economics and Management. In addition to this Johan has also complemented his educational background by studying business. Technology Management embraces subjects such as strategy and management in hi-tech industries, project leadership, group dynamics, teamwork and leadership. Except from the educational past the authors have a great interest in the telecommunications and consumer electronics industry. The portrayed background of the authors' will provide a broad and interdisciplinary foundation from which a wider spectrum of conclusions, compared to non interdisciplinary master theses, can be drawn.

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[19] Gummesson (1986) p.41

3. COMMUNICATION TECHNOLOGIES

This chapter begins with an introduction explaining the terms core and access network. After that different technologies that have potential of being part of the communication to/from the home and/or in-house in a 3-5

years perspective are investigated. The communication technologies to/from the home and in-house are divided into wired and wireless technologies.
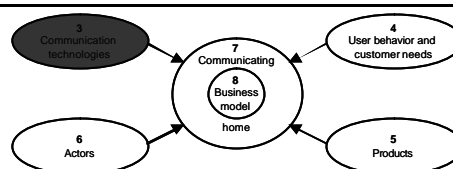
3.1. CORE AND ACCESS NETWORKS

The purpose of a telecommunication system is to transfer some kind of information from one place to another. To establish this kind of information transfer switching is used. Switching means to on demand establish a connection from an inlet to an outlet via a set of nodes for as long as the information transfer requires.[20]

The amount of information transferred through telecommunication systems is growing and is also expected to continue to increase in the future. This fact demands increased functionality on the switching equipment to support the more extensive traffic. Historically circuit switched networks has been the most widespread technology used which basically means that a dedicated connection is set up which lasts as long as the information exchange is performed.[21] This results in a low utilization of the network and due to that a packet switched technology has emerged. The information sent is thereby divided into packets that can chose different paths through the net to the receiver where the packets are put together again. By using packet switching the network is only used when information actually are sent which results in a much better utilization of the transmission capacity.[22] In addition, packet switching offers multiplexing possibilities which means that different sources are put together into a shared traffic flow with a higher bit rate[23]. IP, which is an acronym for Internet Protocol, is a way of accomplishing packet switching. IP is widely used with reason of the robustness of the protocol and the functionality to carry almost all data services over all nets[24].

A telecommunication network consists of two major parts; core network and access network. The core network connects switching nodes with each other and the access network links the switching nodes to user terminals.[25] The core network can be subdivided into three levels; national, regional and local. Optical fiber is the first choice at all levels of the core network.[26] The core net is not considered further in this

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[20] www.itu.int/ITU-T, 2005-02-17
[21] Ericsson and Telia (1997)
[22] Forouzan (2001) p.431-446
[23] Ericsson and Telia (1997)
[24] Ericsson and Telia (1998) p.585
[25] Ericsson and Telia (1997)
[26] Ericsson and Telia (1997)

report, instead focus are on the access network and the communication in-house. Because of the increasing load in the telecommunication network operators are exploring different access technologies to be able to deliver the traffic to the subscribers. These access technologies will be described in the coming sections.

3.2. WIRED ACCESS TECHNOLOGIES TO/FROM THE HOME

3.2.1. Optical fiber

As mentioned above most of the core network consists of optical fibers which can provide bit rates of several Tbps (10^{12}). This extremely high bit rate is accomplished by grouping together many optical fibers into a cable.[27]

As of today an optical fiber offers a maximum bit rate of about 3.2 Tbps [28]. In reality it is more likely with a bit rate somewhere between 10 and 20 Gbps. This is more than enough to satisfy all imaginable user needs in the homes for a foreseeable future. The problem with fiber is however that the cost of implementing this infrastructure are extremely high compared with using existing infrastructure like the copper net and the coaxial cable net (se coming sections).[29] The question for communication providers is therefore how far the fiber connection should be implemented for meeting future bandwidth demands while still being economically feasible. There exist a number of different solutions where the shortest fiber implementation is first:[30] [31]

- Fiber To The Curb (FTTC)
- Fiber To The Building (FTTB)
- Fiber To The Home (FTTH)

FTTC and FTTB must be combined with other communication technologies (e.g. DSL technologies, Ethernet or coaxial cable net infrastructure) to reach end users. The possible bit rate depends on the length of the fiber implementation. Therefore FTTC have lower possible bit rate considered to FTTB. The last and most expensive alternative where the highest bit rates can be reached is FTTH. PricewaterhouseCoopers calculated the cost of a FTTH implementation. Their conclusion was that this was too expensive for any implementation in the near future.[32] The Swedish recommendation (by the not more existing IT-commission) is to implement an optical fiber net reaching to about 100 meters from all buildings which corresponds to at least a FTTC implementation[33].

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[27] Interview, Ulf Körner, 2005-02-03

[28] www.itkommissionen.se, 2005-03-08

[29] Interview, Göran Lindell, 2005-03-07

[30] PriceWaterhouseCoopers (2004)

[31] Broadband Access Evolution Pathways Beyond ADSL, 2005-02-16

[32] PriceWaterhouseCoopers (2004)

[33] www.itkommissionen.se, 2005-03-08

3.2.2. xDSL

DSL is an acronym for Digital Subscriber Line. The DSL technology uses the existing copper net infrastructure for telephone systems. These cables support frequencies between 1 Hz to above 1 MHz. The lower frequencies are used by voice transmissions. This opens up opportunities for data transmission in the remaining frequencies which can be either symmetric or asymmetric. The latter means that up- and downlink capacity is unequal and the former means that up- and downlink bandwidth are equal. There exist xDSL-solutions for both symmetric and asymmetric communication. The asymmetric ones are referred to as the ADSL-family and the symmetric ones as the SDSL-family.[34]

The amount of usable bandwidth available in the access network is dependent of a number of factors, including loop length, impedance, signal power, frequency and line coding techniques. The higher the frequency, the greater the attenuation, and the smaller the signal becomes when it is received at the far end. The most significant dependence is the one between the loop length and the bandwidth.[35]

The international standards for DSL technologies are developed by the International Telecommunications Union – Telecommunications sector (ITU-T). The first DSL standard was ADSL which was launched in 1999. ADSL supports a peak bit rate of 8 Mbps downstream and 0.8 Mbps upstream.[36] At 3000 meters range from the telecom operator's central office a peak bit rate of 5.5 Mbps is possible[37].

The next step in the development came in 2002 with the introduction of ADSL2. It works at longer distances than regular ADSL and the peak bit rate in the downlink was also extended to 12 Mbps.[38]

The latest standard is ADSL2+ which offers a peak bit rate of 24 Mbps at a distance closer than 1.5 km from the central office. At longer distances the capacity of ADSL2+ is equal to ADSL2.[39]

READSL2 (Reach Extended ADSL2) is a special form of ADSL with focus on extending the range of the technology. This has resulted in that a bit rate of 768 kbps can be offered at a distance of about 7 km from the central office.[40]

SHDSL (Single-pair High-speed DSL) differs from the previous explained technologies while it is symmetric. SHDSL offers a possible bit rate of about 2 Mbps in both directions.[41]

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[34] Forouzan (2001) p.254-256
[35] Symmetric DSL, 2005-02-17
[36] DSL Anywhere issue 2, 2005-02-18
[37] Broadband Access Evolution Pathways Beyond ADSL, 2005-02-16
[38] O'Shea (2005)
[39] DSL Anywhere issue 2, 2005-02-18
[40] O'Shea (2005)
[41] Symmetric DSL, 2005-02-17

VDSL (Very high-speed DSL) can be used both in symmetrical and in asymmetrical mode[42]. The technology offers in its asymmetrical implementation a peak bit rate of 54 Mbps in the downlink and 13 Mbps in the uplink[43]. To be able to offer these bit rates optical fiber has to be implemented all the way to the curbs (FTTC) which typically are situated in basements or in the nearby terrain[44]. VDSL2 is expected to be developed during 2005 and is a further development of the VDSL technology. Bit rates approaching 100 Mbps are supposed to be reached in short loops[45].[46]

Last but not least is UDSL (Universal DSL) an emerging technology. The term universal is used because of the advantage and compliance taken from other DSL technologies such as ADSL2+ and VDSL2. This technology will provide a symmetric bit rate of 100 Mbps.[47]

3.2.3. Coaxial cable

Broadband delivered via the existing cable-TV network (through a coaxial cable) is another technique for residents to establish a high-speed data connection to the Internet[48]. The bit rate provided through cable modems depends on the preferences of the cable modem, the cable network architecture and the current traffic load. The network architecture affects the possible bit rate for end user in the same way as in the xDSL case (the longer from the central office the slower the bit rate).[49]

Cable modem access technology is often an asymmetric data transmission technology[50]. Given the cable modems of today it is possible to offer a bit rate of 38 Mbps in the downlink and 30 Mbps in the uplink. When this is not economically viable the actual peak bit rates offered to end users are 8 Mbps in the downlink and 1 Mbps in the uplink. In a 3-5 years perspective the possible bit rates described above will probably be 10 to 20 times as fast as today due to the rapid technological development.[51]

3.2.4. Power Line Communications

Power Line Communications is usually abbreviated as PLC. The PLC technology uses the existing electrical network.[52] The technology, as of today, supports bit rates

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[42] VDSL, 2005-02-18
[43] DSL Anywhere issue 2, 2005-02-18
[44] Interview, Per Ödling, 2005-02-07
[45] Short loop: Short distance copper wire between CO and end-user
[46] DSL Anywhere issue 2, 2005-02-18
[47] Uni-DSL™: One DSL for Universal Service, 2005-02-17
[48] www.etsi.com, 2005-02-18
[49] www.intel.com, 2005-02-18
[50] Ibid.
[51] Interview, Jonas Abrahamsson, 2005-03-08
[52] www.fcc.gov, 2005-02-10

of about 1 Mbps. There are however intense research with expected proceedings considering bit rate to reach a level of about 12 Mbps.[53]

There are some major drawbacks of this technology. The most extensive one is unpredictable disturbances in this communication as well as the lack of a global standard.[54] Another downside is that the fiber infrastructure to the power stations isn't as well developed as in the DSL case. The pros of the technology are, like in the DSL scenario, that end user doesn't have to implement any further wiring.[55]

3.2.5. Swedish penetration of wired access technologies to/from the home

The table below presents forecasts of the number of broadband users in Sweden 2005 and 2008. These forecasts have been developed by Forrester, Yankee Group and Strategy Analytics.

Broadband subscribers by access platform	2005	2008	Average yearly growth
Forrester			
xDSL	971 450	1 466 056	15%
Cable	288 399	399 833	12%
Other	258 041	355 408	11%
Total number broadband subscribers	1 517 890	2 221 297	14%
Yankee Group			
xDSL	745 000	1 115 000	14%
Cable	329 000	500 000	15%
Other	403 000	1 009 000	36%
Total number broadband subscribers	1 477 000	2 624 000	21%
Strategy Analytics			
xDSL	1 030 000	1 490 000	13%
Cable	380 000	860 000	31%
Other	260 000	450 000	20%
Total number broadband subscribers	1 670 000	2 800 000	19%

Table 3.1 Forecast of broadband users[56][57][58]

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[53] www.cordis.lu, 2005-02-18

[54] www.fcc.gov, 2005-02-10

[55] www.plca.net, 2005-02-10

[56] Godell (2004)

[57] Doran (2004)

[58] Strategy Analytics (2004) a

3.3. WIRELESS ACCESS TECHNOLOGIES TO/FROM THE HOME

3.3.1. 2G

GSM is an abbreviation of Global System for Mobile communications. In addition to voice, SMS and MMS the GSM system enables a very low speed "dial up" Internet access.[59] GPRS which is an acronym for General Packet Radio Service is an evolution of the GSM systems. [60]GPRS offers bit rates up to 115 kbps. EDGE which stands for Enhanced Data rates for Global Evolution is an add on feature for the GPRS systems. Through an enhanced signaling interface bit rates up to 384 kbps[61] are made possible.[62]

3.3.2. 3G

WCDMA, an acronym for Wideband Code Division Multiple Access, is the existing 3G standard in Sweden.[63] By offering higher peak bit rates compared with GPRS, WCDMA enables an enhanced user experience for data services. This includes support for data services in real time, e.g. video and location based services.[64] WCDMA offers peak data rates up to 2 Mbps.[65]

High Speed Downlink Packet Access (HSDPA) is an upcoming evolution of WCDMA. During 2005 these systems will be launched by the major hardware suppliers. An enhanced downlink makes considerably higher bit rates available [66]. The theoretical peak bit rate in the downlink differs between different actors but in one version 14 Mbps is the theoretical maximum, although the true bit rate with regular system load will probably decrease to 2 Mbps.[67]

Time Division Duplex (TDD) refers to a technology that is a part of the European 3G standard. TDD is, compared with WCDMA, more efficient when it comes to data transmission and therefore offers lower costs per data unit sent/received.[68] By being part of the European 3G-standard, frequency space was reserved for TDD but when WCDMA became the dominant standard it remained unused. Recently a number of new entrant operators have been given permission to use this frequency spectrum to offer broadband connections. With its area of application in mind the TDD technique

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[59] www.ericsson.com, 2005-02-01
[60] Wisely and Mitjana, (2003)
[61] EDGE - high-speed data in GSM/GPRS networks, 2005-02-03
[62] www.ericsson.com, 2005-02-01
[63] Basic Concepts of WCDMA Radio Access Network, 2005-02-03
[64] Wisely and Mitjana, (2003)
[65] www.ericsson.com, 2005-03-07
[66] WCMA Evolved, 2005-02-03
[67] Interview, Andrei Dulski, 2005-02-03
[68] www.nyteknik.se, IP-Wireless satsar på tekniken som Ericsson ratat, 2005-02-18

competes with the WiMAX technology (see next section). The TDD technique offers a 4 Mbps data peak rate and coverage up to 20 km from the radio base station.[69]

3.3.3. WiMAX

The standard IEEE 802.16 is referred to as WiMAX which is an abbreviation of Worldwide Interoperability Microwave Access. The standard can be seen as an evolution of the 802.11 standard (see IEEE 802.11 standards in a later section) which has been driven by the increasing need for coverage and capacity.[70] WiMAX intends to compete with wired broadband access alternatives.[71] The 802.16-family consists of three different standards which differ on a number of parameters summarized in the table below:

Standard	802.16	802.16a	802.16e
Spectrum	10-66 GHz	<11 GHz	<6 GHz
Channel conditions	Line of sight (LOS)	No LOS	No LOS
Bit rate	32-134 Mbps	75 Mbps (max)	15 Mbps (max)
Cell radius, ca	1.4-4.2 km	4.2-7.1 km	1.4-4.2 km
Mobility	Fixed	Fixed	Semi mobile

Table 3.2 Summary of WiMAX standards.[72]

WiMAX has not reached a wider market penetration in Sweden yet. But concerning the involvement of major industry players the rate of adoption is expected to increase. In order to drive mass market adoption industry giants have stated their intention to make it possible to build in the technology into PCs and laptops.[73]

3.3.4. Satellite

Broadband access can be accomplished through the use of satellite. Current available solutions offer bit rates up to 1.5 Mbps. Satellite broadband access is lacking standardization, and because of missing scale advantages, additional equipment besides the costly satellite is very expensive. Satellite offers extreme coverage, and infrastructure needed in order to establish a connection can be in place in a couple of hours, therefore it is well suited for extreme situations like war zones etc.[74] As of today only 200 Swedish households are connected via satellite access.[75]

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[69] www.nyteknik.se, 3G variant skall ge bredband i glesbygd, 2005-02-18
[70] Wade (2004)
[71] Reinhardt (2004)
[72] Fitchard (2005)
[73] Reinhardt (2004)
[74] Poe (2005)
[75] Williamson (2004)

3.3.5. Analysis of dominating communication technologies to/from the home in 3-5 years

Optical fiber is the absolutely dominating communication technology in the core network. There is no doubt concerning the fact that optical fiber also is the preferred solution in the access network when technical parameters are compared. However, in most houses and apartments the fiber does not reach all the way into the homes. Supplying all users with fiber access would therefore require massive reconstruction of buildings, excavations, etc. This would of course result in very high investments which, according to PricewaterhouseCoopers, can't be motivated due to the prerequisites of today. Instead, it is a question of how close to the house the fiber should be drawn. A solution like FTTC is likely to be implemented in a 3-5 years perspective in densely populated areas. This means that fiber will not reach all the way to the buildings but to the closest station (curb) before the buildings which will result in a bit rate sufficient for all thinkable applications in the homes.

With this in mind – how should the last part of the access network be implemented? In this area a couple of both wired and wireless communication technologies are competing. In the cities four different technologies, using an existing infrastructure, are already in place; xDSL, Ethernet (see Ethernet section), coaxial cable net and power supply network. When it comes to the last of these four it is doubtful if it will have any larger uptake in a 3-5 years perspective. This is due to the fact that the power supply network introduces a lot of unpredictable interference, that a global standard is missing and that the cost of implementing fiber to the power supply stations is extensive. Two other reasons are that the development of xDSL and coaxial cable access networks are far ahead which will make it difficult to reach a high market penetration and that the provided bit rate seems to be moderate. These drawbacks of PLC implicates that the access network in most cases will consist of xDSL, coaxial cable technology or Ethernet (where it exists). The cost of implementing an Ethernet access compared to FTTH is slightly lower but compared to solutions using existing infrastructure it is still much more costly. Therefore Ethernet access will in the future exist only to a quite limited extent. It is only in cases of new establishment of housing where Ethernet will compete with xDSL and coaxial cable in terms of cost efficiency. Regarding the competition between the other access technologies, none will be so superior that it can force the others to leave the market. Instead these technologies will live in parallel. xDSL will be the dominating one but the coaxial cable net will have a fair share of the market. This is in line with the analyses made by Gartner, Yankee Group and Strategy Analytics which although they believe in different growth rate for access technologies all have xDSL as the dominating technology with coaxial cable as a competitive alternative. That xDSL probably will be the dominating access technology is not due to a technological advantage. For example when it comes to the important bit rate parameter it seems like both technologies will offer a speed that is more than enough in a 3-5 years perspective. Instead the explanation is that it is possible for more Swedish citizens to get an xDSL access than a coaxial cable access. Where both accesses are possible it will be a comparison between bit rate and price that will make the customers make their decision.

At more sparsely populated areas where an xDSL or coaxial cable access not is possible, wireless technologies may come to play an import role. From a Swedish perspective it will probably be a battle between TDD and WiMAX which are more suitable than WCDMA technologies concerning transmission of data. TDD is already offered to the Swedish customers which will be the key factor making this to the dominating technology the coming years. However the bit rate from TDD, and the 3G-technologies, is not sufficient for more demanding services like streaming video. With WiMAX these drawbacks can be overcome which together with the powerful players that advocates the technology makes it an interesting future alternative. 3G-technologies, foremost HSDPA, will probably also, to a lower degree, be used for less capacity demanding purposes.

The window of opportunity for satellite communications is closing. Considering the missing standardization work, lacking scale advantages and the very poor penetration figures for the Swedish market satellite access is very unlikely to be able to succeed in the future. It will only exist in cases where a broadband access is absolutely necessary and not any other access technologies are available.

3.4. WIRED COMMUNICATION TECHNOLOGIES IN THE HOME

3.4.1. Ethernet

Ethernet, IEEE 802.3, refers to a LAN standard. The 802.3 category can be further divided into five standards. The most widely used is the 10BASE-T standard. It supports bit rates up to 10 Mbps and has a maximum hub to station length of 100 m. The 10Base-T standard offers excellent user interface when it comes to exchanging a unit in the network since it's plug-and-play. With ever more advanced services Fast Ethernet, 100Base-TX, which offers 100 Mbps and Gigabit Ethernet, 1000Base-T, offering 1 Gbps are becoming more widely adopted.[76]

3.4.2. USB

Universal Serial Bus, often abbreviated as USB, was developed back in 1995. Its main objective was to make a serial bus that with the same ease of use as connecting a telephone to a wall jack connected peripheral equipment to a PC. USB has been a great success, and practically every new PC is equipped with one or more USB ports.[77] The USB interface is today a part of more than one billion products.[78] In the USB structure the PC is master and the peripherals are slaves. The new generation USB 2.0 which is also backward compatible with USB 1.1, offers peak data rates up to 480 Mbps.[79] The maximum cable length from host to a peripheral is 5 m but can be extended with a repeater solution.[80]

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[76] Forouzan (2001) p.379, 380-384
[77] A Technical Introduction to USB 2.0, 2005-02-16
[78] Piven (2003)
[79] A Technical Introduction to USB 2.0, 2005-02-16
[80] www.intel.com, 2005-03-29

3.4.3. Firewire

Firewire, IEEE 1394, is used for connecting different consumer electronics devices and computers.[81] The first version, 1394a, offers peak data rates at approximately 400 Mbps and supported distances up to 4 m. The new standard 1394b offers peak data rates up to 800 Mbps and supports distances around 100 m.[82] Firewire supports plug-and-play.[83] The technology is often used in more expensive multimedia appliances with needs for a fast and reliable data connection.[84]

3.5. WIRELESS COMMUNICATION TECHNOLOGIES IN THE HOME

WLAN is an acronym that stands for Wireless Local Area Network. This is a generic term for different technologies used for short range data packet communication. Hence, WLAN is suitable as a no-wires communication alternative between networking computers and other connected appliances in the home.[85]

WLAN networks can be set up using infrared light or through the use of radio transmission. But due to line of sight requirement, poor bit rates compared with radio solutions and other technical drawbacks infrared light solutions will not be further regarded here. When used in this report the term WLAN therefore refers to radio transmission technologies.[86]

3.5.1. Pros and cons with WLAN

Two great advantages of WLAN are that no wires are needed and that the equipment is relatively cheap. The communication between two WLAN compatible devices is accomplished through radio waves which can penetrate walls. This offers the users in the home a high degree of flexibility because within radio coverage nodes are allowed to communicate without further restriction. Furthermore, when the access point is in place, additional devices can easily be added to the network at a low cost since no additional wiring is needed.[87]

However, there are also some disadvantages of WLAN compared to its wired counterparts. The quality of the transmissions is for example lower due to limitations in the radio transmission and the delay variation is higher because of extensive error detection and correction mechanisms. The slow standardization process has resulted in that many actors have developed their own enhanced features in addition to the standards that have been set so far. The negative effect of this is that these devices only are interoperable with devices from the same vendor. Last but not least the use of radio waves might cause interference with other high-tech equipment and also make the transmission of data more vulnerable for eavesdropping. Because of the

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[81] www.1394ta.org, 2005-02-16
[82] Wolf (2003)
[83] www.1394ta.org, 2005-02-16
[84] www.apple.com 2005-03-29
[85] www.wlana.org, 2005-01-18
[86] Schiller (2003) p.204-205
[87] Schiller (2003) p.201-202

eavesdropping risk extensive work on automatic encryption, privacy mechanisms, support for anonymity, etc has been and still is made.[88]

In the development of the WLAN standards low power consumption of the devices has been an important objective. Another challenge has been, and still is, to make the WLAN networks easy to manage. New devices should preferably be installed on a plug-and-play basis.[89]

3.5.2. Network structure [90]

WLAN networks of today are typically set up in one of two existing network structures. These are infrastructure network and ad-hoc network. Hybrids between these two forms of networks are also possible.

In an infrastructure based wireless network communication usually takes place only between the wireless nodes and an access point. In this kind of network the access point usually both control the medium access and contain functionality to bridge the traffic to other wireless or wired networks. This means that several access points, together with wired network in between, can form a more extensive network beyond actual radio coverage. The advantage of using an infrastructure based network structure is that most of the network functionality lies within the coverage of the access point. Collisions are also avoided when the access point controls medium access.

Ad-hoc wireless networks works through decentralization of the medium access mechanisms to each node. This enables two wireless nodes to communicate directly with each other. A disadvantage is that two nodes can communicate only if they are within each others radio range or if another node can forward the message. Another disadvantage is that every node possibly must contain priority mechanisms to offer a certain quality of service. However this kind of network structure offers the greatest possible flexibility.

There exist many standards concerning WLAN networks. In the coming sections the IEEE 802.11 standards, HiperLAN, Bluetooth, Zigbee and UWB are described.

3.5.3. IEEE 802.11 standards

Wi-Fi is an abbreviation for Wireless Fidelity and is a set of standards for WLAN based on the IEEE 802.11 standards[91]. This is the most famous family of WLANs and there are many products which supports these standards. The 802.11 standards specify the physical and data link layer to the special requirements of wireless local area networks. The higher layers in the OSI model offer the same interface as other 802 standards to maintain interoperability with for example 802.3 Ethernet. The network

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[88] Schiller (2003) p.202
[89] Schiller (2003) p.203
[90] Schiller (2003) p.205-207
[91] www.wi-fi.org, 2005-01-18

structure is typically infrastructure based but in addition to this it supports ad-hoc networking. Five standards in the IEEE 802.11 family are described in the following sections; 802.11b, 802.11a, 802.11g, 802.11h and 802.11e.[92]

802.11b. The IEEE 802.11b works in the ISM-band (2.4 MHz), supports bit rates up to 11 Mbps and has an operating range up to 100 m[93]. This is the most widely used standard of today and it is used in many commercial products on the market[94].

802.11a. The IEEE 802.11a works in the 5 GHz spectrum, supports bit rates as high as 54 Mbps and has an operating range of up to 50 m[95]. Due to the use of a spectrum that is less occupied than the ISM-band, functionally is ensured through the lack of interference from cordless phones, Bluetooth appliances, etc.[96]

802.11g. The IEEE 802.11g is often considered as an evolution of the 802.11b. It works in the ISM-band, supports bit rates as high as 54 Mbps and has an operating range of up to 100 m[97]. Because of the above mentioned heritage 802.11g is backward compatible with 802.11b.

802.11h. The IEEE 802.11h was developed in order to be able to offer an 802.11a like solution in Europe. 802.11h is needed to utilize the full 5 GHz spectrum in Europe and USA.[98]

802.11e. 802.11e offers different data traffic to be assigned different priority depending on how important that traffic is for the user. While applications using the 802.11 technology are becoming more sensitive for quality of service (QoS) aspects, e.g. IP telephony and video on demand, the need for an extensive QoS support increases. The standard is not yet completed by the IEEE, but major progress was made during fall 2004, and a full draft approval is likely to be gained at the upcoming 802.11e working group meeting in spring 2005. The standard is expected to have reached mass market in a three to five years perspective.[99]

3.5.4. HiperLAN

HiperLAN is an abbreviation that stands for HIgh PERformance Radio Local Area Network. It has been turned into a standard by the European Telecommunications Standards Institute (ETSI). In the same way as the IEEE 802.11 standards the network structure is typically infrastructure based but also supports ad-hoc networking.[100]

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[92] Schiller (2003) p.207
[93] Broadband Wireless: The new era in communications, 2005-01-18
[94] www.ericsson.com, 2005-01-18
[95] Electronic design (2004)
[96] 802.11a, 2005-02-11
[97] Electronic design (2004)
[98] Interview, Roger Bengtsson 2005-05-25
[99] Interview, Ulf Körner 2005-03-31
[100] Schiller (2003) p.207, 239

The HiperLAN family consists of four standards. These are HiperLAN1, HiperLAN2, HiperAccess and HiperLink. The key feature of all these networks is their integration of time sensitive data transfer services. HiperLAN1 was standardized in 1996 but was not a commercial success. Instead, the only of the above mentioned standards that have a slight potential of becoming a mass market WLAN standard is HiperLAN2. HiperLAN2 works at 5 GHz, supports bit rates as high as 54 Mbps and has an operating range of up to 50 m with support of slow mobility. This standard includes QoS support and enhanced security features compared to basic IEEE 802.11 LANs.[101] One should note that these additional features have been implemented or are planned to be implemented in later versions of the 802.11 standards[102].

3.5.5. Bluetooth

In 1994 Ericsson initiated a project to develop a so called multi communicator link which later was named Bluetooth. Four years later the Special Interest Group (SIG) was formed around Bluetooth with the goal to develop a single-chip radio based wireless network technology at low cost. Today SIG consists of more than 1000 members and their goal has been reached.[103]

Bluetooth compatible devices like mobile phones, PDAs, laptops, notebooks, video cameras, headsets, etc., use an ad-hoc network structure to communicate with each other.[104] This network is called a Piconet and today the standard supports connection of up to eight devices[105]. The original Bluetooth works in the 2.4 GHz ISM-band, supports bit rates lower than 1 Mbps and has an operating range of up to about 10 m.[106]

There is continuous work going on to develop the Bluetooth standard. In the Bluetooth SIG's roadmap for the coming years the focus is on enhancing bit rates, minimizing power consumption, evolving security aspects as well as enhancing the QoS. The work will result in a release of the Bluetooth Version 2.0 + EDR (Enhanced Data Rates) later this year which will triple the bit rate as well as lowering the power consumption. In 2006 SIG predicts the technology to support a range of 100 m with decreased power consumption.[107]

The physical and medium access layer in the IEEE 802.15.1 standard is the same as in the Bluetooth standard. The Bluetooth standard is then further specified concerning the higher layers.[108]

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[101] Schiller (2003) p.256-257
[102] Interview, Peter Karlsson, 2005-02-14
[103] www.ericsson.com, 2005-02-14
[104] www.bluetooth.com, 2005-03-08
[105] Gunasekeran, (2002)
[106] www.bluetooth.org, 2005-02-14
[107] www.bluetooth.com, 2005-03-29
[108] Schiller (2003) p.269-270, 292

3.5.6. ZigBee

Another of the IEEE 802.15 standards is IEEE 802.15.4. This standard is specialized for low bit rates Wireless Personal Area Networks (WPANs)[109]. The ZigBee Alliance is a rapidly growing industry consortium that tries to standardize the higher layers of IEEE 802.15.4 in a similar way as SIG has done with Bluetooth considering the IEEE 802.15.1 standard. The members of the consortium consist of leading semiconductor manufacturers, technology providers, OEMs and end users worldwide.[110]

The reason for developing a low rate WPAN standard is that many products do not need the higher bandwidth offered by for example the IEEE 802.11 standards and UWB (se next section). Instead, this higher bit rate is accomplished at the expense of higher power consumption which is a great disadvantage when it comes to battery operated devices. Therefore, the goal of the Zigbee standard is to bring a reliable, secure, low powered and cheap solution to the market.[111] This is similar specifications as the ones Bluetooth has been developed from but Zigbee offers lower power consumption, lower bit rate and a less complex architecture[112].

In Europe Zigbee can be used in two different ISM-bands. These are the 2.4 GHZ and 868 MHz bands and offers bit rates at 250 kbps and 20 kbps respectively[113]. The advantage of using the lower frequency band is better propagation conditions but the drawback is that this band suffers from interference from many analogue transmission systems[114]. It should be possible to accomplish reliable data transmission of modest amount of data up to at least 100 m. The Zigbee technology is appropriate for applications like home automation, wireless sensors, interactive toys, smart badges, interconnection of peripherals and remote controls.[115]

3.5.7. UWB

UWB is an abbreviation of Ultra Wide Band. The corresponding working group at IEEE is called 802.15.3 and is thereby together with Bluetooth and Zigbee part of the 802.15 WPAN-family.

UWB refers to a new upcoming short-range broadband communication technique for connecting consumer electronics. It supports a connectivity range of up to 20 m and offers data rates above 480 Mbps. Most UWB compatible products will use a frequency band between 3.1 and 10.6 GHz. Through enabling very high data rates, while still consuming low amounts of power, UWB is expected to experience fast market penetration with an uptake starting during 2006 given no interference with licensed frequency bands.[116] UWB chips are planned to be placed in a number of

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[109] Schiller (2003) p.292
[110] www.zigbee.org, 2005-02-14
[111] Zigbee Alliance "Wireless Control that simply works", 2005-02-14
[112] Schiller (2003) p.292
[113] Zigbee Alliance "Wireless Control that simply works", 2005-02-14
[114] Schiller (2003) p.292
[115] Zigbee Alliance "Wireless control that simply works", 2005-02-14
[116] Ultrawideband: High-speed, short range technology with far-reaching effects, 2005-02-15

different devices where benefits can be generated from connecting them, e.g. streaming video from the set top box to the TV etc. UWB has also the potential to replace wires in some cases, e.g. where a USB or Firewire cable is used today. Before the standard is set there are some issues to solve regarding the architecture which might delay it's time to market.[117] Most frequency spectrum UWB uses is licensed, therefore it is quite unlikely that it will reach the Scandinavian markets in three to five years.[118]

3.5.8. Analysis of dominating communication technologies in the home in 3-5 years

The communication in-house in 3-5 years is first of all a question of whether wired or wireless technologies will dominate. The answer is that the future is wireless and already in this short time perspective we will see a major migration to the wireless alternatives. In households with existing Ethernet cabling this infrastructure will serve as a connection to distribute signals between wireless nodes. Our arguments supporting the wireless future are:

- *Cost* – The cost of implementing a network infrastructure is minimized with a wireless architecture. The declining prices of wireless routers are further reinforcing the choice of a wireless network structure.
- *Mobility* – The ability to consume or create content wherever you are within the borders of the home is another issue that supports the wireless alternative.
- *Supply* – Because of the major players' belief in a wireless communicating home, customer will be influenced of the heavy marketing activities performed by these companies.
- *Aesthetics* – Hence no new wires are needed the aesthetics of the home will be enhanced.

But which of the wireless technologies will dominate? This will be decided by the usage areas of different devices which put different requirements on parameters like bit rate, QoS and power consumption. However Wi-Fi is the most cost efficient solution when it comes to accomplish connectivity throughout the households and will therefore make up the backbone in the in-house communication. With its fast market penetration, interoperability issues as well as limited ease of use will be solved in the upcoming years.

The poor QoS support in available Wi-Fi solutions will be addressed by the future 802.11e standard which will be the dominating wireless standard in the communicating home. Because of the future maturity for the 802.11b/g standards the cost for these products will decrease which will create an opportunity for these products to coexist with the 802.11e standard. The market for the 802.11b/g standards is constituted by less QoS demanding applications e.g. Internet access sharing. HiperLAN2 is another competitor to the 802.11-standards. However the technological advantages of HiperLAN2 will also be implemented in the Wi-Fi standards. This will

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[117] O'Shea (2005)
[118] Interview, Peter Karlsson 2005-02-10

probably end up in that HiperLAN2 compatible products, as in the case of HiperLAN1, never reaches the market.

When accomplishing ad hoc connectivity and in situations when connecting peripherals with limited amount of networking logic to computers both USB and Firewire will complement Wi-Fi. If UWB reaches the Swedish market it will be used in situations where USB and Firewire are used today. Bluetooth is a wireless alternative that can be used for the same, and other, purposes. When Bluetooth has a limited bit rate the most natural area of application will be content sharing and synchronization between cellular terminals and other devices connected to the home network. In the future communicating home there will be situations where the greatest restrictions will be on power consumption and not bandwidth. Such usage areas could for example be remote controls, home automation and wireless sensors an in this case Zigbee will be the technology of choice.

3.6. KEY CONCLUSIONS

In a 3-5 years perspective optical fiber will on average reach to the closest station before the buildings (FTTC), at least in urban environments. The access network near the end user will be dominated of xDSL and coaxial cable connections. In more sparsely populated areas the wireless access methods, above all TDD and WiMAX, constitutes an alternative to its wired counterparts.

In the connected home 3-5 years ahead different, mostly wireless, in-house communication technologies will exist in symbiosis. Considering the scale advantages Wi-Fi possesses today and the fourth going technology lock-in trend, it is quite unlikely that any other technology can disrupt its dominating position. The information transfer between PCs and other consumer electronics is just one example of this. When it comes to ad hoc connectivity, it looks like many technologies will exist in parallel. In these areas end users might favor a wired solution e.g. USB due to the higher bit rates they offer. If UWB is introduced, it will be used in situations where Firewire and USB are used today.

This chapter can be summarized in the following picture of the communicating home:

29
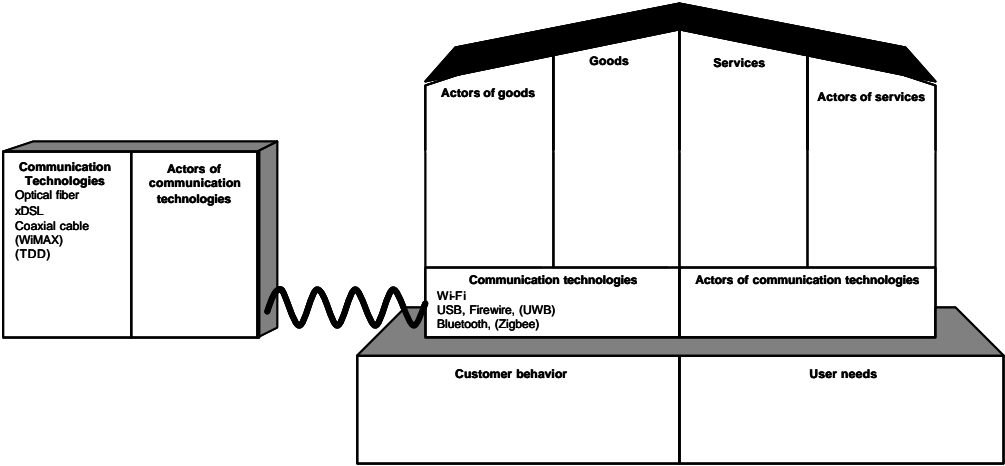
Figure 3.1 Scheme presenting the communicating home.

4. CUSTOMER BEHAVIOR AND USER NEEDS

This chapter begins with explanations of the digital home and the communicating home. Then the digital lifestyle trend, described in terms of digitalization of media content, a growing broadband market and the Swedish consumer electronics landscape, is used to prove that the digital home is in place but that the communicating home still has a long way to go. However, trends driving the transition towards a communicating home are visible and it is proved that the first wave of implementation will be focused on entertainment content and take place in the living room. After that marketing theory about customer behavior and the buyer decision process for new products are used to identify which market segments that will lead the transition toward the communicating home. Last, but not least, user needs in form of important product characteristics is identified.
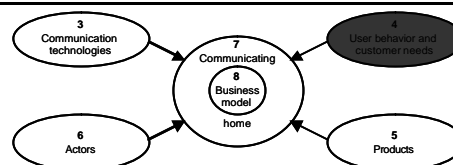
4.1. THE DIGITAL LIFESTYLE TREND

Before reading this chapter it is important to understand the difference between a digital home and a communicating home. Both these terms are explained in the section called clarification of vital terms in chapter 1. In a digital home goods use digital technology and the content used by these devices is in digital format. It is not necessary that all different goods can work together to accomplish a digital home. The communicating home takes the digital home one step further when different devices are interoperable so that content can be shared between them. Many of these goods also enable communication with the surrounding world.

4.1.1. Digitalization of media content

The digitalization of media content has occurred in two waves. First media content stored in analogue forms like LP-records, cassette tapes and video tapes were replaced by CDs and DVDs. The second wave is ongoing and means that CDs and DVDs are replaced or complemented with their counterparts appropriate for storage in computers and other devices. Many users are still struggling with understanding how to understand DVD-region encoding and similar problems.[119] A survey conducted by TeliaSonera in 2004 investigated whether Swedish consumers think Internet content will replace music on CD and radio in the future. 9 % thought it will happen within two years, 17 % within five years, 13 % within ten years and 61 % that it not will happen at all.[120] The second wave is although visible especially in the following areas:

- Music: Sales of MP3 players in Sweden grew with 350 % during 2003[121] and with 117 % during 2004[122].

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[119] Jackson (2004)

[120] www.teliasonera.se, 2005-03-16

[121] www.dn.se, Försäljningssuccé för mp3-spelare, 2005-03-16

[122] www.dn.se, Försäljningen av digitala musikspelare ökar, 2005-03-16

- Photography: Sales of digital cameras in Sweden experienced a 58 % growth during 2004. [123]
- TV: The Swedish parliament has made a decision to abolish analog terrestrial broadcasting in favor of its digital counterpart before February 2008. 75 % of the Swedish population will not be affected by the transition as they already got cable-TV, a digital satellite dish or a digital box. The remaining 25 % will have to invest in new equipment which facilitates access to digital TV. [124] One solution could be IPTV which is a growing form of digital TV. Strategy Analytics predicts a Swedish IPTV penetration of 9.8 % in 2008 and 11.8 % in 2010. [125]
- Video on demand: During the last six months a Swedish video on demand-provider have increased sales with over 100 % and now have approximately 100 000 customers. [126]
- Telephony: The number of Swedish subscriptions of IP telephony grew with 183 % between July 2003 and July 2004. [127]

Major parts of people's lives are becoming digitalized. They e-mail, search the Internet, and use digital video, TV, photos and music. But these areas are to the largest extent discrete islands of data which still has to be integrated. [128] Only 2 % of the households in Western Europe possess a broadband access, a home network and a will to extend this equipment to create a communicating home [129].

Users can get the new form of digital content, appropriate for storage in for example computers, into their devices in different ways. It can be self sourced or downloaded. Digital photographs are an example of self source content. To rip content from other sources is another way to self source content. It means that for example a record in the private CD-collection is converted into MP3 format. Most customers are expected to be less interested in the time consuming action of converting existing media libraries into their binary counterparts. [130] There are two main ways to download content; either to pay for it or to get it for free through some kind of file sharing community. This is a much debated question with many legal aspects. A TeliaSonera survey build on interviews with 1 600 Swedish customers with broadband access suggests that 75 % of the Swedish population are willing to pay for music downloaded via the Internet. The corresponding number when it comes to rent and download movies is 63 %. The same survey states that people younger than 35 years are more eager than average to pay for downloaded movies while customers between 35 and 50 years are more likely to pay for music received via the Internet. [131] Today it

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[123] www.idg.se, Digitalkameror säljer som aldrig förr, 2005-03-17
[124] www.di.se, 2005-02-02, Staten bäddar för köpfest hos digital-TV bolagen.
[125] Olausson (2005)
[126] Interview, Henrik Nilsson, 2005-03-22
[127] Williamsson and Öst (2004)
[128] Hewett (2005)
[129] Jackson (2004)
[130] Ibid.
[131] www.teliasonera.se, 2005-03-16

is hard for users to find new compelling content and applications. Most of the content and applications are just a development of existing servic es with increased speed and increased convenience.[132]

4.1.2. A growing broadband market

The Swedish market for Internet accesses has become saturated during the last two years. In total there were 2 848 000 private customers with Internet access in the end of June 2004. 36 % of these were broadband connections and the remaining 64 % consist of dial-up connections. The corresponding figures for the total amount of Swedish households with Internet access are, 64 % have a dial up connection and 23 % have broadband Internet access.[133]
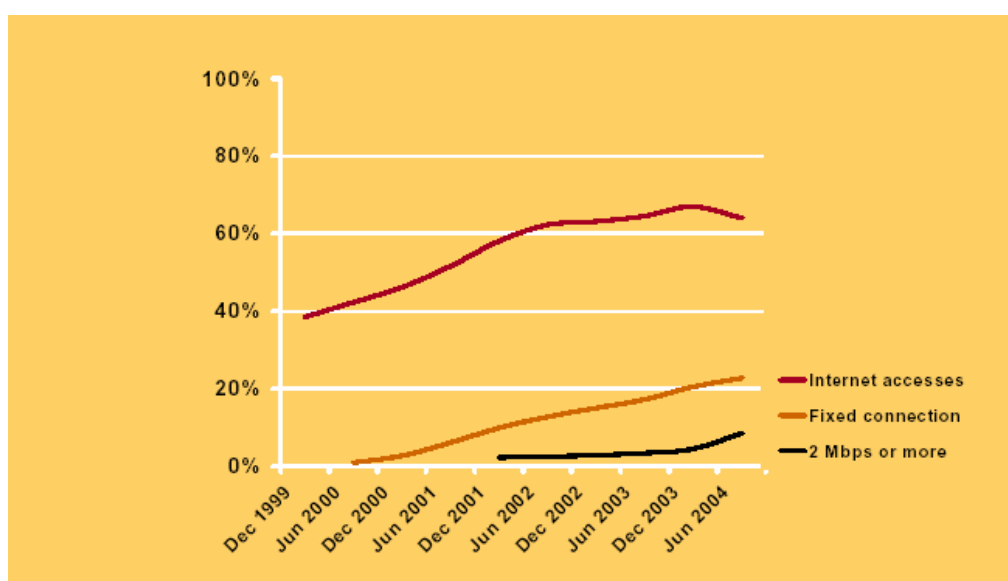
Figure 4.1. The percentage of Swedish households with different kinds of Internet accesses.[134]

According to figure 4.1, a substitution from dial-up to broadband connections is visible[135]. Between June and December 2003 the share of dial-up connections decreased from 70 % to 64 %. This decrease of 6 % corresponds to an increase in the number of broadband connections of similar size.[136] Different research institutes have identified a change of incentive for adopting a broadband access. The primary will to obtain broadband has shifted from being productivity driven, e.g. to conduct bank errands at a faster pace, to be driven by entertainment experiences, e.g. music and video downloads.[137]

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[132] Jackson (2004)
[133] Williamsson and Öst (2004)
[134] Ibid.
[135] Jönsson (2004)
[136] Williamsson and Öst (2004)
[137] Jackson (2004)

Broadband subscribers are more likely to have additional PCs connected to the Internet. Long term broadband users and households with income above average are also more eager to interconnect other goods to the home network.[138] Users with broadband connectivity use more advanced services and multimedia applications like streamed audio and video[139].

4.1.3. The Swedish consumer electronics landscape

To achieve a fully communicating home where all goods are interoperable and can communicate with each other and the surrounding world, a number of products groups must exist. These are:[140]

- Broadband connectivity: delivers sufficient bit rate and value to the homes.
- Wireless home network: offers reliable broadband connectivity throughout the home that is easy to install and manage.
- Goods for digital media consumption: displays, controls, audio systems and other components that let the users enjoy digital entertainment.
- Goods for digital media creation: digital cameras and other components that let the users create and share photographs, video and music.
- Goods for home office purposes: technology and components that enables work from home.
- Goods for home control and automation: sensors and other components that can be used to manage and secure the home.

The broadband connectivity was discussed in the previous chapter but the goods in the above list will be investigated in this section.

The table below summarizes a survey built on interviews with 3 000 Swedish inhabitants in four segments during the fourth quarter 2004. It describes penetration figures for goods that fit into the description of necessary products to achieve a fully communicating home.

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[138] Strategy Analytics (2004) b
[139] Anderson (2002)
[140] Shipley (2004)

	15-25 years old	26-59 years old with children	26-59 years old without children	60-	Total
Mobile telephone	98%	98%	95%	74%	91%
Desktop computer	75%	91%	76%	43%	73%
Printer	58%	84%	73%	41%	68%
DVD player	71%	76%	58%	20%	56%
Digital camera	43%	56%	44%	19%	42%
Advanced handsets	55%	58%	35%	7%	38%
Scanner	26%	44%	35%	16%	33%
DVD Recorder	32%	45%	33%	11%	32%
Set-top box for TV	12%	40%	29%	16%	29%
Game console	40%	50%	16%	30%	28%
Laptop computer	30%	31%	32%	10%	25%
MP3 player	31%	38%	18%	3%	23%
Home theatre system	28%	24%	19%	3%	17%
Webb camera	16%	29%	13%	3%	17%
Burglar alarm	6%	15%	15%	17%	15%
Home network	19%	18%	12%	2%	12%

Table 4.1. Penetration of computers and consumer electronics among Swedish inhabitants 2004[141]

144 695 flat screen TVs were sold during 2004. This was an increase of 281 % compared to 2003. The development is expected to continue in 2005 with 270 000 sold flat screen TVs. Two reasons for this progress are decreasing prices and the increased sales of set-top boxes and media centers.[142]

When sales of consumer electronics is increasing, so is obviously also the cumulated production volume. Boston Consulting Group made an investigation in the 1960s and early 1970s showing that for each doubling of cumulative production the cost or price per unit declines between 20-30 %.[143]

Depending on the goods intended use and what content they are suited for sharing they will be responsible for driving the transition toward a communicating home to different degrees[144]. The first step on the way to a fully communicating home is happening in the living room with focus on media and entertainment. This is enabled by always-on broadband connectivity, home networks and a critical mass of home electronics.[145] Table 4.2 below describes a cost suggestion for one possible implementation of the first step towards a communicating home focused on

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[141] TeliaSonera (2004)
[142] Interview, David Larsson, 2005-03-22
[143] Hill (1985) p.69-72
[144] Webb (2004)
[145] Interview, Karna Norén, 2005-03-29

entertainment in the living room. Prices in the table are taken from Applestore, CDON, Intellibackup, Inwarehouse, SF Anytime, Siba, Telia and Tre in March 2005.

Products	Initial cost (SEK)	Monthly cost (SEK)	Total cost year 1 (SEK)
3G-phone incl. 3G subscription (LG U8180 with a 3fri 300 subscription)		249	2 988
Broadband access (Telia ADSL 28 Mbps)		449	5 388
Digital camera (Canon Digital Ixus 40)	2 990		2 990
External storage (Intellibackup, 500 Mb)			576
Flat screen TV 42" (Philips 37PF9946)	19 990		19 990
Home theatre system (Sony HTSL700WFN)	2 990		2 990
IPTV (Telia Digital IPTV, extended package)		358	4 296
Laptop (Toshiba Qosmio F10 PM 735, 15")	16 131		16 131
Media center (Fujitsu Siemens Scaleo C P4 3.2)	13 990		13 990
MP3 player (Apple iPOD 20 Gb)	2 995		2 995
Music (CDON, 10 songs per month)		9,90 x 10	1 180
Video on Demand (SF-Anytime, 2 per month)		45 x 2	1 080
Wireless printer (Canon PIXMA iP4000R Wi-Fi)	2 163		2 163
Wireless Router (Apple AirPort Express)	1 195		1 195
Total sum	*62 444*	*1 821*	**77 952**

Table 4.2. Cost suggestion for an implementation of a first step towards a communicating home.

4.2. ANALYSIS OF THE DIGITAL LIFESTYLE TREND

The first wave in the digitalization of media content where CDs and DVDs have replaced their analogue counterparts were obvious years ago. This is also supported by a penetration of 56 % of DVD players and 32 % of DVD recorders among Swedish inhabitants. The second wave where CDs and DVDs are replaced or complemented by forms better suited for storage in computers and other devices is ongoing and will continue to reach new ground. This could for example be seen in the impressive growth figures of MP3 players and digital cameras. Many goods using digital technology have also reached a rather high penetration rate in the Swedish households. For example, according to table 4.1, over 20 % of the Swedish population have the following products; mobile phone, desktop computer, printer, DVD player, digital camera, advanced mobile handsets, scanners, DVD recorders, set-top boxes for TV, game consoles, laptop computers and MP3 players.

The above section reveals that the absolute majority of the media content of today is in a digital form. All devices used for consumption of entertainment content also use digital technology. From this the conclusion that the digital home is a fact can be

drawn. The problem is that the digital home consists of discrete islands were the content is stuck in different devices. This is in line with for example the reasoning of Paul Jackson. The convergence to put the discrete islands together to one big continent will be accomplished by the communicating home.

Both the research performed by Chris Shipley and the interview with Karna Norén exposed that the transition to a communicating home will be enabled through broadband connectivity, a home network and a critical mass of home electronics. 23 % of the Swedish households have a broadband Internet access and the total number of Internet accesses is not increasing. This is a rather high penetration degree but it will have to increase more in the future. However a sharp trend of substitutions from dial-up to broadband accesses is visible which will support the development towards a communicating home. The share of Swedish inhabitants with home networks is only 12 %. This is a low figure but is expected to grow as broadband subscribers are more eager to invest in a home networks to connect different devices. When the number of broadband subscribers increases so will the number of home networks. As mentioned earlier many home electronics have reached a rather high penetration. Especially desktop computers and lately also laptops are common in the Swedish homes but much of the consumer electronics has reached a penetration rate between 15-30 %. These figures will have to increase in order to achieve a fully communicating home. When the production volume is increasing it is, according to Terry Hill, possible to decrease production cost and thereby also customer prices. A positive circle can be created where people can afford more products at the same cost and in this way the growth of a communicating home is supported. However, the prices of today and probably also tomorrow are still relatively high. Only the first step towards a communicating home concentrated on entertainment would, according to table 4.2, cost about 80 000 SEK only during the first year. Of course many households already have some of the necessary goods. However, this is still a strong motive for saying that the transition through a communicating home will be incremental for most people.

To sum up the number of Swedish broadband accesses are not very high but increasing and the same is true for home networks and much of the other equipment necessary for a communicating home. From this the conclusion that the communicating home not is in place can be drawn. This is in line Jackson's conclusion that only 2 % of the population in Western Europe has the demanded devices but above all the will to establish a communicating home. Therefore it will be necessary with massive marketing campaigns in order to make users be aware of their need for a communicating home (see next analysis section).

The will to obtain broadband has shifted from being productivity driven to be entertainment driven. This is for example supported by the growth of IPTV. The goods and services with the highest penetration are also concentrated on media and entertainment. Therefore the communicating home will be focused on entertainment in the living room in the first wave which also was stated by Norén during an interview. Already today services offering music and movies are growing at a fast pace. This is in line with the will to pay for content that Swedish consumers have.

However, the lack of new services is holding back the transition to a communicating home. The self created content is not sufficient and there are not enough services offering download of content via the Internet.

4.3. CUSTOMER BEHAVIOR

4.3.1. Customer buying behavior

Customer buying behavior refers to the behavior of individuals and households who buy products for personal consumption. The customers can vary a lot in age, income, education levels and tastes. Customer purchases are influenced by cultural, social, personal and psychological factors. An example of a cultural aspect is the belonging to a social class, where members often show similar values, interest and behavior. Social values could be formed through the belonging to smaller groups. Membership groups have direct influence on a person's behavior and reference groups are groups that the person compares himself or herself with. An aspirational group is a special kind of reference group which the person wishes to belong to. People often buy products to show their status and belonging to certain kind of groups. Examples of personal factors that influence the buying behavior are age, life-cycle stage, occupation, economic situation, life-style, personality and self-concept.[146]

Motivation is an example of a personal factor influencing the buying behavior. This is often described with Maslow's theory of motivation. It aims to explain why people are driven by particular needs at particular times. Maslow states that this can be answered by the fact that needs are arranged in a certain hierarchy where a need at a lower level must be fulfilled before needs at higher levels can be addressed. When the needs at one level are fulfilled it stops being a motivator and the person tries to satisfy needs at the next level. In order of importance the group of needs are; psychosocial- (hunger, thirst), safety- (security, protection), social- (sense of belonging, love), esteem- (self-esteem, recognition, status) and self-actualization-needs (self-development and realization).[147]

4.3.2. The buyer decision process for new products

A new product is defined as a good, service or idea that is perceived as new by some potential customers. It may have been at the market for a while, but the interesting part is how customers hear about a product for the first time and make decisions on whether to adopt it or not. Adoption is in this case defined as the decision by an individual to become a user on regular basis of the product. The adoption process consists of five stages; awareness, interest, evaluation, trial and adoption. First the consumer becomes aware of the product but lacks information. Therefore he or she seeks information about it and considers whether to try the new product. This might result in that the customer tries the product on a small scale and if satisfied decides to make full and regular use of it. Many customers do not move from one stage to

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[146] Kotler et al (1996) p.267-286
[147] Ibid.

another. Especially in the move from the interest stage to the trial stage, many potential customers' drops off because of causes like uncertainty and/or large investments.[148]

People differ much in their will to try new products. This has led to a classification of users into the following adopter categories:
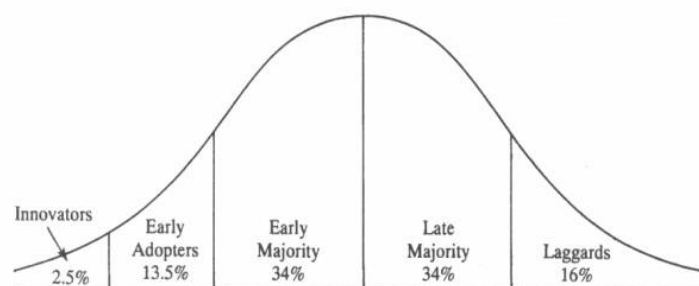
Figure 4.2. Adoption categories for new products.[149]

The five adopter groups have different characteristics. Innovators try new ideas at some risk. Early adopters are opinion leaders and try new ideas at an early stage but carefully. The early majority is deliberate and rarely the leaders in the adoption process although they try new products before the average user. The late majority pursues a wait-and-see policy and is not willing to try new products before other users have proved the success of a new product. Laggards are very tradition bound and suspicious. These people are not willing to try a new product before it almost has become a tradition itself. Marketing theory suggest that firms with new products should direct their marketing efforts to innovators and early adopters. These groups are often younger, better educated and have higher income than late adopters or non adopters.[150]

4.4. ANALYSIS OF CUSTOMER BEHAVIOR

The customer buying behavior is an extremely complex process influenced by cultural, social, personal and physiological factors. Cultural and social factors like belonging to groups such as social classes or a family are hard to measure why this won't be considered further in this report. This doesn't mean that these factors aren't important. On the contrary especially customers that strive towards belonging to an aspirational group can be a very strong driving force to pursue a purchase. If a household have bought a flat screen TV it is possible that the neighbors also want a similar or even larger TV to achieve the same status.

Personal and physiological factors are easier to analyze. Personal factors could include age, life-cycle stage, occupation, economic situation, life-style, personality and self-concept. Table 4.1 presents users divided into four segments according to age and to some extent family status to describe the penetration of wireless routers and

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[148] Kotler et al (1996) p.297-298
[149] Kotler et al (1996) p.298
[150] Kotler et al (1996) p.298-299

other consumer electronics. Life-cycle stage and economic situation are not measured directly but can be considered as included anyway. This is based on that life-cycle stage are close correlated to age and that the middle age segments usually has a stronger economic situation than youths and old people. Life-style, personality and self-concept are not included in the table and are hard to measure. In the previous analysis it was stated that the digitalization of media content, a growing number of broadband subscriptions, a growing number of home networks and a critical mass of home electronics would lead the transition towards a communicating home. The segments that first will invest in a home network and a critical mass of home electronics can be analyzed with the above mentioned table. It should once and for all be stated that when talking about adoption process stages in the coming sections, it is referred to the uptake of different products and not the communicating home which have reached a much lower penetration.

As seen in table 4.1, customers in the age group 26-59 with children at home, have the largest penetration of devices that may drive the implementation of the communicating home. Many of these users have reached a penetration between 30-80 % of the described goods. It means that the adoption processes has reached the early majority and in some cases even the late majority. The explanation could be that this customer group has come to a higher stage in the Maslow hierarchy where they are looking for things like recognition, status and to realize themselves. This, together with the relatively high penetration figures, are an indicator of that this segment will play a leading and important role in the transition towards a communicating home.

Another important segment is the 15-25 years old. They do not have an equally high penetration of consumer electronics. It has reach about a 15-60 % penetration considering the same goods as above. The explanation could be that their economical situation put restrictions on the investments they can afford. Another thinkable explanation is that these young individuals haven't reached as high as the 25-59 years old with children in the Maslow hierarchy. People in this age group are often trying to find a sense of belonging and love which implicates that these individuals are on the third level in the hierarchy. However, the 15-25 years old segment got the highest penetration of wireless routers which must be considered as the most important driver towards a communicating home. Together with Philip Kotler's statement that early adopters often are young, well educated and have a high income the conclusion that the 15-25 years old will be as important as the 26-59 years old with children in the implementation of the communicating home can be drawn. This segment does indeed not earn much money today but they probably will in a 5-10 years perspective.

The segment 26-59 years old without children has similar penetration figures as the segment 15-25 years old. An explanation might also here be that they are still looking for love and belonging in the Maslow hierarchy. However, one important difference is visible in the penetration of wireless routers which is almost 40 % lower for the 26-59 segment. The low penetration of wireless routers can be interpreted as a low desire to connect different devices which probably will make this segment late majority or laggards in the transition to a communicating home. When it comes to the 60 years and older segment they've got a much lower penetration of all devices in the table

except burglar alarms and game consoles (which probably are used by their grandkids). Therefore they will be laggards in the adaptation process of a communicating home, if they decide to invest in such functionality at all.

To sum up the transition towards a communicating home will be led by 15-25 years old and 26-59 years old with children. These two segments will constitute most of the innovators and early adopter's adaptation groups and are willing to try the communicating home at some risk. It will be extremely important for the future communicating home to reach acceptance within these segments since they will be opinion leaders for the two other segments. If pleased, they will tell their older friends and friends without children about the benefits of the concept.

Many people seem to be interested in the possibilities the communicating home offers. It means that they are aware of the concept, they are interested and seek information about some parts of the concept and they might even be in the evaluation stage where they consider trying the concept. The problem is that few people decide to try the concept and even less actually buys the necessary equipment. This is exactly in line with Kotler's reasoning which states that the movement from the evaluation to the trial stage is the hardest to overcome. The solution is probably heavy marketing campaigns combined with attractive offerings so that the customers can afford the communicating home in the beginning. When a critical mass has been reached people will notice that their neighbors have invested in the necessary goods which probably will make it easier for them to make the same decision.

4.5. USER NEEDS

Five characteristics are especially important on the rate of adoption concerning a new product. These are relative advantage, compatibility, complexity, divisibility and communicability. The relative advantage describes to which degree a new product is superior to existing products. Compatibility is a measure of how well the new product fits with values and experiences of potential users. The extent to which a new product is difficult to understand or use is the described with the complexity characteristic. Divisibility describes to which degree an innovation might be tried on a limited basis and communicability the extent to which results of using a new product can be observed or described by others. Examples of other factors that affect the adoption rate are initial and ongoing cost, risk, uncertainty, social approval and efforts from opinion leaders.[151]

There are benefits from launching a product that addresses existing user behavior. If the behavior already exist consumer's uncertainty about what they actually are buying decreases. An understanding for the application area also, to some extent, supports the ease of use factor. It is important to note that people in general are less likely to buy a product if there exist any uncertainty of whether they will be able to utilize its advantages or not. Another central aspect to reflect over in order to achieve a fast adoption of a new product is pricing strategies. Products need to have a suitable and

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[151] Kotler et al (1996) p.299-300

affordable price and a pricing model that is easy for customers to understand in order to reach a fast acceptance.[152]

In order for products to reach a high penetration in the communicating home certain product characteristics have to be fulfilled. The product characteristics demanded by users are:[153]

- Flexibility. Users want simplicity like ease of installation. A new product must be able to be added to the home network on a plug-and-play basis. Furthermore customers demand one ubiquitous home network.
- Control. Users want to be able to share data over a number of platforms. Moreover users want universal, easy and intuitive control of their communicating home.
- Security. Users want to feel secure while using their communicating home. The security issues embrace everything from digital rights management to integrity issues, hacking and virus protection.
- Mobility. Users want to be able to bring parts of their digital content with them while they are out of their homes, e.g. bring parts of their MP3 collection with them in their car. Remote access to their digital content is also something stressed by the users.

4.6. ANALYSIS OF USER NEEDS

The theory of Kotler used in the above section highlights some characteristics that play an important role in the adoption of new ideas, like the communicating home. The relative advantage characteristics must be considered as a matter of course, no one buys a new product if it doesn't offer advantages compared to existing products. What's interesting is that it doesn't seem like users demand totally new goods and services. Instead they prefer improved versions of existing products. If users recognize the usage areas, the risk and uncertainty decreases which otherwise are two strong reasons for not adopting a new product. This can be summarized in that simplicity is a very important factor to consider when developing new goods and services for the communicating home. The more complex a product is the more resistant the customers are to buy it. New products must be able to install to the home network on a plug-and-play basis. The simplicity conclusion is also supported by Kotler, Jackson and Ericsson Consumer Labs.

When developing offerings for the different segments described in the previous analysis the compatibility and divisibility issues are important to understand. The offerings must fit the values and experiences of potential users in the target segment. It is also an advantage if the benefits of using a product are visible to other segments when this might trigger them to invest in similar devices. To accomplish the desired situation is, also the pricing strategies extremely important. If the price is too high few people will decide to adopt a new product. Both the initial and ongoing cost is

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[152] Interview, Anders Kälvemark and Ann-Charlotte Kornblad, 2005-04-05
[153] Jackson (2004)

important. This is a difficult situation for the companies when fierce competition makes the customer demand the same products as yesterday but to a lower price.

The whole meaning of the communicating home is that it should be possible to share content between many devices and access it whenever wanted. This includes remote access and the ability to bring some of the digital content when leaving the home. These two usage areas can be summarized with the user needs mobility and flexible consumption. Mobility means that the content is device independent and flexible consumption means that the user can choose where and when he or she wants to access the content. To offer this functionality in a trustable way the security aspect is vital. Consumers won't adopt new products if they don't feel that security is good and that their integrity is protected.

4.7. KEY CONCLUSIONS

The digital home is a fact; people use goods with digital technology and digital content. Different digital goods are however still discrete islands where the content is stuck in the device where it is stored. The communicating home will solve this problem but this concept is far from implemented yet. Only 2 % of the population in Western Europe have the necessary goods and above all the will to invest in a communicating home. Therefore massive marketing campaigns will be necessary. These campaigns should be directed to the 26-59 years old with children and the 15-25 years old segments in the first place. The reason is that most early adopters will be found in these segments and they will therefore lead the development. When these two segments have proved the benefits of the communicating home concept, other groups will follow. The first step of the transition towards a communicating home will be focused on entertainment in the living room. It is enabled by broadband connectivity, a home network and a critical mass of home electronics. All these areas show growing penetration numbers in the Swedish population. To further increase the numbers it is important to address the following user needs; compatibility with values and experiences, simplicity, appropriate price, mobility, flexible consumption and security. Offering products improving existing user needs decreases the users feeling of risk and uncertainty.

This chapter can be summarized in the following picture of the communicating home:
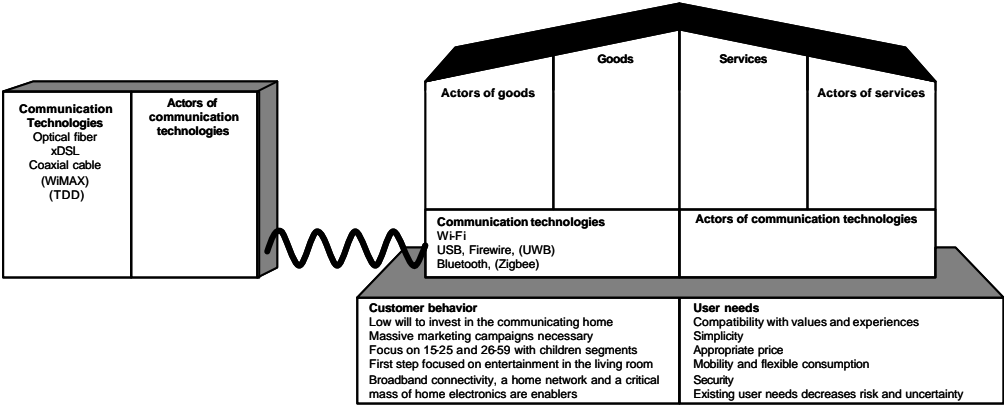
Figure 4.3 Scheme presenting the communicating home.

5. PRODUCTS

This chapter begins with an investigation of product trends identified at major trade fairs across the world. These trends will, together with interviews with industry experts, generate a list of potential products in the
communicating home in a 3-5 years perspective. Products, with features that aren't obvious for the reader, will be described in more detail. Next section in the chapter presents which products that will have the greatest impact on the transition towards a communicating home.
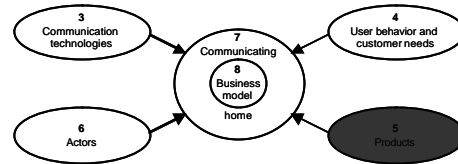
5.1. MARKET TRENDS IDENTIFIED AT TRADE FAIRS DURING 2005

5.1.1. From the International Consumer Electronics Show (CES)

The CES trade fair was arranged in Las Vegas in January 2005. Many of the key speakers at CES focused their orations on the digitalization of the home. Bill Gates, chairman and chief software architect at Microsoft Corporation, shared his vision of how to "realize a digital lifestyle". The vision covers virtually all aspects of digital living including music, photos, TV and gaming. Portability is the key word which means that it should be possible to enjoy all content on different devices and platforms. The PC will play an important role realizing the vision though it is thought of as a media center in the home network. Craig Barrett, CEO at Intel Corporation, also emphasized the entertainment PC which he called "the bedrock of a digital home". He demonstrated sophisticated appliances for audio and video applications which showed simple interfaces and enhanced quality experiences. Carly Fiorina, former Chairman and CEO at HP, meant that digital technology is an enabler to a whole new era of animated entertainment. She also demonstrated a new HDTV media hub. This media hub will allow users to enjoy content from multiple sources through one single platform that is managed in the house. Rich Templeton, President and CEO at Texas Instruments, focused as well on the TV area, but on the television sets. He strongly advocates the DLP-technology which he, together with HDTV, predicts will have a major influence on the users TV experiences. Ron Garriques, President of personal devices business and executive vice President at Motorola Inc., presented the concept of "seamless mobility" which means that, independently of where the user is situated e.g. the house, the car and the office, the content will seamlessly follow the user. Another topic of his speech was personalization of content like home security and other services.[154]

TVs and home theatre systems were common products at the show floor due to the breakthrough of HDTV in USA. Wireless transmission alternatives were also common at CES. If one judge from the exhibition stands, flat screens is the technology of the future when it comes to television sets. Another important issue

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[154] www.cesweb.org, 2005-03-11

was the ongoing standardization war between Blu-ray and HD-DVD of which technology to replace DVDs. Other interesting products found in the exhibition areas were digital cameras with Wi-Fi support, MP3 players with color displays supporting JPEG-pictures, wireless telephones compatible with both regular- and IP telephony, multifunctional PDAs as well as multifunction remote controls with Wi-Fi support. Home control systems able to control electricity, water etc. in the home via Zigbee communications from the cellular phone, was one of the more visionary product ideas. Intelligent ovens, vacuum cleaners and refrigerators were also showed but were not as common as a couple of years ago.[155]

5.1.2. From 3GSM

The 3GSM trade fair was arranged in Cannes in January 2005. TV functionality in mobile handsets was one of the most discussed subjects during the 3GSM world conference in Cannes this year. Håkan Eriksson, CTO at Ericsson, emphasized mobile triple play in his speech. He predicts that the handsets of tomorrow will offer broadband connectivity and TV in addition to voice services. Through this development the mobile terminal is thought of as the only remote control needed independent of where the user is situated.[156] During his presentation Eriksson also stated that in order to succeed with the introduction of new applications and services these must be based on existing customer behavior[157].

Music was another hot topic during 3GSM. Nokia and Microsoft announced a collaboration in the development of music for mobile terminals.[158] Miles Flint, CEO at SonyEricsson, stressed the importance of music as a revenue generator of tomorrow. He also stated SonyEricsson's intention to market mobile terminals with extensive support for digital music.[159] Intel discussed the communicating home during 3GSM. Their conclusion was that connectivity between different devices will be accomplished without wires and that copyright issues have to be solved before the communicating home will have a breakthrough.[160]

5.1.3. From CeBit

The CeBit trade fair was arranged in Hanover in March 2005. This year the CeBit trade fair was dominated by 3G, wireless home networks, IP telephony, 64-bit computers, gigantic flat screens and digital cameras. The essence of the trade fair was rather similar to 2004 but this year's focus was more on how to use the technology. Examples of this are mobile data services and simplified usage of home networks.[161] Other exhibition objects were security solutions and all thinkable kinds of software applications[162]. The upcoming war between HD-DVD and Blu-ray was once more

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[155] M3 Digital World, No.2 (2005)
[156] www.nyteknik.se, Håkan Eriksson: Nu kommer triple play till mobilen, 2005-03-14
[157] www.ericsson.com, 2005-03-14
[158] www.nyteknik.se, Microsoft vill Samarbeta med Sony Ericsson, 2005-03-14
[159] www.nyteknik.se, Sony Ericsson lanserar mobil som Walkman, 2005-03-14
[160] Interview, Johan Wickman, 2005-02-18
[161] www.computersweden.se, Stort uppsving för årets Cebit, 2005-03-10
[162] www.nyteknik.se, Taiwan åter störst när Cebit öppnade idag, 2005-03-10

discussed as well as TV in cellular phones, media centers and all imaginable kinds of MP3 players. Services offering downloading of music were another common topic.[163] A service that enabled a handover from the regular tele phone in the home to the mobile telephone network was also introduced[164].

5.2. MARKET TRENDS IDENTIFIED THROUGH INTERVIEWS WITH INDUSTRY EXPERTS

5.2.1. Jonas Birgersson, CEO Labs2 group

In the future, demand for services that solve problems with spam, computer viruses and other data security issues will increase. Accessing digital content, such as music and video over Internet, will become even more important in the future. The new distribution trend, facilitated by the evolvement of the Internet, is here to stay. Pricing aspects are of highest importance when getting users to pay for the increasing amount of digital content. Except for content services, the future will contain services based on sensors interconnected with cameras and robots, aiming at facilitating customers' everyday life. However, in a 3-5 year perspective, robots will have a very limited uptake. Gaming is another interesting area for further service development. Services of the future, in general, will become significantly more differentiated in order to suit individual customers' demands. An example can be seen in the market for tailor-made Internet portals. Mobile video telephony is an area where the capacity of the distribution systems won't allow satisfying quality when adopted by mass market.[165]

5.2.2. Claes Wellton, CEO Wellton Way

The communicating home will be based on a multimedia computer situated in the living room. Through an add on interface, which offers increased ease of use, consumers will watch digital TV, listen to digital radio, conduct voice calls through IP telephony, use video on demand services, execute easily browsing of the Internet, email and exercise control on other parts of their home. Content will be stored on the multimedia computers' local hard drives or on DVDs. The content colle ction stored on the multimedia computer, e.g. digital images, music and videos will be remotely accessible through Internet.[166]

Internet implies a reduction of former barriers of entry for the media industry. Therefore tailored content will be available to a much larger extent. A larger number of media companies will serve smaller segments of customers.[167]

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[163] www.computersweden.se, Pryl, pryligare, Cebit, 2005-03-15
[164] www.computersweden.se, Vodafone vill ha fler 3G-användare, 2005-03-14
[165] Interview, Jonas Birgersson, 2005-04-01
[166] Interview, Claes Wellton, 2005-04-05
[167] Ibid.

5.2.3. Anders Kälvemark and Ann-Charlotte Kornblad, Senior Advisors, Ericsson Consumer Labs

Internet will play an important role accessing digital content such as music and video in the future. In order to compete with today's free alternatives, content must be attractively priced and offer features that increases ease-of-use.[168]

When it comes to the market for computer security services, e.g. anti virus software, firewalls, data back-up and spam control, Ericsson Consumer Labs foresee an increasing demand. Media storage, a service that gives end-users the possibility to access their content collection independently of location, is a service area that will experience notable growth in the upcoming years. The mobile terminal will be the natural way to access content library remotely. Video telephony and voice + content[169] are also services that will become more common and independent of the terminal used. Future services will become more tailored to suit different users – hyper differentiation of music, news and other services will appear. Future services will mostly be in the area of social interaction, e.g. gaming and messaging, and entertainment. [170]

5.2.4. Ewa Ställdal, CEO Vårdalstiftelsen

There is an ongoing healthcare trend which transfers the less extensive healthcare from hospitals to the homes. If a patient can be given healthcare in their own premises the patient and the people in his/her surroundings will experience a great quality-of-life improvement. These are facts that, most probably, will lead to an emerging market for goods and services that satisfy these needs in the home. According to Ewa, a lot of goods and services for healthcare purposes will have reach the market in a 3-5 years perspective. The penetration figures are however doubtful since the healthcare part of the communicating home industry is sluggish. A number of pilot projects have although been successfully implemented:

- Integrated voice and video. By giving patients the ability to contact nurses and other people in similar situations they see an enhanced healthcare experience through extended personal and social services.
- Pulse and blood pressure supervision. Through home healthcare services it is possible to supervise the pulse of the patient and if something is defect this might trigger an alarm system via SMS, voice or video.
- Intelligent toilets. This service offers the possibility to alarm a supervising unit after a quick analysis of the urine or the faeces.

5.3. LIST OF POTENTIAL PRODUCTS IN THE COMMUNICATING HOME IN 3-5 YEARS

According to the above referred trade fairs and industry experts, a list of products potentially included in the communicating home are presented below:

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[168] Interview, Anders Kälvemark and Ann-Charlotte Kornblad, 2005-04-05
[169] Voice complemented with interactive content features
[170] Interview, Anders Kälvemark and Ann-Charlotte Kornblad, 2005-04-05

Goods	Services
Advanced mobile handset (e.g. PDA)	Broadband access
Digital camera	Content accessibility
Digital video camera	Data security
DVD recorder	Digital TV
Game console	Healthcare
Home theatre system	Home automation
Intelligent white goods	Home control
Media center/PC	Home security
MP3 player	IP telephony
Multifunctional remote control	Music on demand
Portable media center	Online gaming
Sensors	Online storing
Set-top box	Socializing services (e.g. messaging)
TV set	Tailored services
Web camera	Video on demand
Wireless router and digital media adapter	Video telephony

Table 5.1 List of products potentially a part of the communicating home.

5.4. DESCRIPTION OF SELECTED GOODS

The fundamentals of the above described goods are well known. However, the function of some of the goods can't be considered as self explanatory and will therefore be explained in more detail below. The products chosen to be further elucidated are game consoles, media centers, portable media centers, set-top boxes, TV sets, wireless routers and digital media adapters.

5.4.1. Game console

Game consoles are becoming more and more advanced. The consoles have developed from just delivering simple gaming features to becoming more of a media center. A major player offers a game console featuring video and music playback, a hard drive, online gaming with voice communication, interactive gaming environments and media streaming. [171] [172]

5.4.2. Media center

The PC manufacturers are developing new products called media centers intended for use in customers' living rooms. The functionality of a media center varies but the most advanced ones are able to gather music-, movie-, TV-, photo-, game- and web content in the same device. This is accomplished by equipping the media center with a DVD burner, TV-tuner, hard drive recorder and radio receiver in addition to the usual PC-kit. This enables the media center to be connected to the TV set and the

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[171] www.xbox.com, 2005-04-15
[172] www.sourceforge.net, 2005-04-15

home theatre system. A lot of effort is put on a small and appealing design which makes the media center go well with the other furnishing in the living room.[173] [174]

5.4.3. Portable media center

A portable media center shows similarities with a regular MP3 player. The difference between them lies in the new and enhanced functionality offered by the media center. Instead of just being able to play audio files, functionality is increased by the ability to record, store and play video files. A portable media center also features the functionality to store and view digital images. Content stored in the media center can be accessed using either the built in display or through a connection to a larger monitor.[175] The devices available today connect to PCs via the use of USB 2.0.[176]

5.4.4. Set-top box

Traditionally a set-top box has been referred to as electronics box that connects a TV with an incoming signal. The set-top box decodes the digital signal to its analogue counterpart so that it can be viewed on a TV.[177] Today the development of the IP-technology has enabled triple play services (broadband, TV and telephony) which are supported by advanced IP set-top boxes. Depending on the offered services and the type of set-top box, services like Internet content, e-mail, video on demand, broadcast-TV, IP telephony, etc. can be delivered. Usually the advanced set-top boxes supports external upload of new software which facilitates the ease-of-use for both end-users and content providers.[178]

5.4.5. TV set

Traditionally screens using the Cathode Ray Tube-technology (CRT) have dominated the market – especially when it comes to television sets. However this is a technology of the past and is therefore about to be replaced by a new generation of screens. Two different technologies have emerged during the last decade; LCD screens and plasma screens.[179] Until today, LCD screens have only dominated the market when it comes to screens with a size of 32 inches or less because of the high production costs. However, recent investments in new production plants by some of the leading manufacturers will probably solve this problem in the future.[180] In the case of plasma screens it has been almost impossible to find them with a size less than 36 inches.[181] However, things are about to change. Plasma screens are becoming smaller and above all LCD screens are becoming much larger.[182]

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[173] www.nyteknik.se, Datorn tar plats vid teven, 2005-03-16
[174] www.onoff.se, 2005-03-16
[175] www.microsoft.com, 2005-02-28
[176] www.amazon.com, 2005-03-01
[177] www.alcatel.se, 2005-03-17
[178] www.i3micro.se, 2005-03-17
[179] Parker et al (1999)
[180] www.nyteknik.se, Prisfall för lcd-skärmar väntas i vinter, 2005-02-25
[181] www.onoff.se, 2005-02-22
[182] www.nyteknik.se, Prisfall för lcd-skärmar väntas i vinter, 2005-02-25

There are several comparison parameters when evaluating plasma and LCD screens e.g. screen size, contrast, brightness, resolution, refresh rates and price. The organization Japan Electronics and Information Technology Industries Association forecasts that LCD flat screens will be the absolutely dominating technology in 2009.[183] David Larsson at IT Research believes as well that the LCD technology will be most common when it comes to screens with a size of up to 40 inches in a five years perspective[184].

5.4.6. Wireless routers and digital media adapters

A small home network can be established by connecting at least two computers to each other by using a device called switch. If an Internet access should be shared by computers in the home network the switch must be connected to the Internet. This is accomplished by using a router which is a device that connects networks to each other. The switch and router functionality are often put together in just one box which in the wireless case often is referred to as wireless router. Many notebooks are delivered with built in Wi-Fi-support which allows them to connect to a wireless router. If this feature is missing a special kind of PC-card or USB-device is able to solve the problem. It is also possible to connect a stationary computer to the wireless router by installing a hardware card for wireless transmission or by using the same kind of USB-device which was described above.[185]

A new product that complements the wireless router is the wireless digital media adapter. This appliance is often used as a client to a wireless router and is connected to the TV and the home theater system. This facilitates sharing of digital media from different computers and the ability to access them in the living room whether it is music, video or photos.[186]

5.5. DESCRIPTION OF SELECTED SERVICES

As in the case of goods many services are well known but some can't be considered as self explanatory and will therefore be presented in more detail below. These are digital TV, home automation, home control, home security, IP telephony, online storing, video on demand and music on demand.

5.5.1. Digital TV

Digital TV is the future method of distributing television signals. This can be accomplished by terrestrial, cable or satellite broadcasting or by IPTV[187]. Digital TV is received without any ghost- or snow-effects that can occur in analogue transmissions. The picture can be sent in a number of formats, including high- and standard-definition television which is referred to as HDTV and SDTV. Both HDTV

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[183] www.nyteknik.se, LCD-TV dominerar helt 2009, 2005-02-25
[184] www.nyteknik.se, Prisfall för lcd-skärmar väntas i vinter, 2005-02-25
[185] www.linksys.com, 2005-03-01
[186] www.dlink.se, 2005-03-01
[187] www.dvb.org, 2005-04-07

and SDTV can be transmitted in conventional and widescreen versions. In the SDTV-mode, broadcasters will be able to transmit up to six programs simultaneously – which is often referred to as multicasting.[188]

HDTV is being successfully deployed in the USA. In Europe regulatory authorities haven't come to a unified decision of which standard to use for HDTV. Today there are two standards competing: 720p (progressive scan) and 1080i (interlaced) where both standards is broadcasted in widescreen formats. 720p implies a resolution of 1280x720 pixels where the picture is updated 50 times per second while 1080i have a resolution of 1920x540 and an update frequency of 25 pictures per second. HDTV broadcasts are expected to begin during the winter Olympics and FIFA World Cup of soccer in 2006.[189] [190]

5.5.2. Home automation, home control and home security

Home services are a generic term for services that either simplifies, streamlines or secures the way of living in the home. Sections included in this area are home automation, home control and home security. In later sections of the report these three services will be referred to as home services.

Home automation simplifies functions related to comfort, convenience, energy-saving, etc. in the home.[191] Home control features lighting and appliance control, optimal climate control and audio and video distribution systems.[192] Home security offers a range of features such as: the ability to shut down the HVAC system (Heat, Ventilation & Air Condition) in case of fire as well as put on the lights in all of the house if a burglar enters the home.[193]

5.5.3. IP telephony

IP telephony is a service that delivers voice communications through a broadband connection. This service features e.g. integrated voice, voice mail, conferencing and video. The operating costs of an IP telephony network are smaller relatively to an ordinary circuit switched network (see chapter 3).[194]

5.5.4. Online storing

Different storage media is used to make back up copies of important information. Online storing refers to the use of Internet to store a copy of critical data elsewhere. In cases when data stored locally is lost, the back up copy can be retrieved through the Internet and then restored on the local hard drive.[195]

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[188] www.svt.se, 2005-04-13
[189] Ibid.
[190] www.digitag.org, 2005-04-15
[191] www.francetelecom.com, 2005-04-07
[192] www.homecontrols.com, 2005-04-07
[193] Ibid.
[194] www.voip-architecture.com 2005-04-15
[195] www.nyteknik.se, Backup på nätet sparar kopian utanför huset, 2005-04-07

5.5.5. Video on demand and music on demand

Video on demand and music on demand offer songs, albums, movies and other programs when the users demand it. Video on demand offers the same abilities as an ordinary rental movie with features like pausing, rewinding and forwarding. [196] Music on demand refers to a new way of distributing music. Through the use of Internet, users can at anytime, given that they have the appropriate equipment, access songs on demand. [197]

5.6. ANALYSIS OF THE MOST COMMON PRODUCTS IN 3-5 YEARS

Almost all information gathered from different sources point in the same direction; the evolution from the digital home towards the communicating home will in the first step be entertainment oriented. Through new technology, interconnection of goods and the use of new distribution channels, customers will be offered an enhanced entertainment experience. Because of the entertainment focus in, the authors believe that communicating home solutions initially will be more present in the living room than in other parts of the home.

5.6.1. Goods in the communicating home

The anticipated trend with increased user demand within the service area will of course not be realized without any hardware support. Hence, appliances that enables these services will flourish in sales e.g. media centers, wireless routers, hardware for IP telephony and set-top boxes. Today there exist two different standards, for delivering triple play, which live in parallel: the media center and the set-top box. While the media center is dependent on the functionality of a computer the set-top box system is applicable without any computer support. The authors believe is that the set-top box system will be the winner of this battle, at least in the short run. This is because of the modular feature the set-top box possesses. It can be arranged in the current electronic landscape of the users without any major new investments in electronics or abandoning of existing products. The media center will, on the other hand, replace many of the present products in the home. Another feature favoring the set-top box is that if a "media center-crash" occurs, all media stored in the media center will possibly vanish. Nevertheless, a migration towards the media center will take place. This will, however, most likely turn out beyond the 3-5 years perspective.

Based on the entertainment focus, it is natural that industry experts state that flat screens have a prominent position in the communicating home. While retail prices fall and the industry keeps on increasing available screen sizes flat screens will, without a doubt, be a part of the communicating home. However some uncertainty surrounds the choice to constantly differentiate the screens by using size. For mass market segments there most likely exists an optimal size, which will pave the way for other differentiation variables such as price, resolution and refresh rates. In addition to the flat screen, a home theatre system is likely to find a place in the living room.

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[196] www.sf-anytime.com, 2005-04-06
[197] www.itunes.com, 2005-04-07

Combined, these appliances will provide the customers with an aesthetical and attractive entertainment experience. These appliances will, as well, function as drivers for each other as both audio and video are important factors concerning multimedia experiences.

Besides the flat screen TV there are a couple of other goods that according to trade fairs and industry experts will have an obvious part in the communicating home. These are digital video cameras, digital cameras, portable media centers, DVD recorders and MP3 players. Sensors, web cameras and intelligent white goods will not have reached mass market within 3-5 years. They will although most probably have a dedicated part in the home in longer time perspective.

In many areas a clear pattern concerning convergence between different product categories can be seen. This is exemplified by actors within mobile communications industry who believes in a future where the functionality of mobile handset is extended. It can be accomplished by equipping a mobile cellular terminal with MP3 and digital camera-functionality. The advanced mobile handset is then thought of as a commonly used appliance for consumption and creation of content when on the move.

Many industry experts also focus on gaming which has gained momentum during the past years. The interactive nature of online gaming and the growing functionality of game consoles as well as ever decreasing retail prices are key characteristics which will push these products into the communicating home.

In order to implement communicating home interconnectivity, portability is a must. On the trade fairs during the past months, the industry has stressed their belief in interconnecting appliances using wireless solutions. With the intention to remotely control a large number of appliances the need for a universal remote control becomes apparent. Håkan Eriksson CTO at Ericsson stated, during 3GSM, that the mobile terminal will fulfill this need in the coming years. Other parts of the industry have also addressed the same issue by the development of a more regular remote that features controllability of multiple devices. With the cellular terminal being a natural part of people's lives the development towards a universal control unit seems right. However, cellular terminals that today support this functionality are not being offered, which indicates that mass market hasn't adopted them in a 3-5 year perspective.

5.6.2. Services in the communicating home

The IP-convergence between data, voice and video called triple play is an obvious trend supported by both trade fairs and industry experts. This trend is primarily fuelled by the relatively recent digitalization of video and music which facilitates an enhanced user entertainment experience. There exists a joint opinion regarding the importance of music, video and self sourced content in the communicating home. By the use of Internet, customers will be able to access video on demand and music on demand. Both Jonas Birgersson and Claes Wellton stated that Internet causes reduction of barriers of entry such as costly establishments of distribution channels.

With this in mind the supposed additional differentiation of content is quite likely to appear. Services delivered through the Internet will facilitate more tailored solutions to better suit users needs. According to basic financial interests differentiation of content will only proceed as long as the costs of differentiation can be charged for. When users are more exposed to Internet an increased interest of data security services, advocated by a number of industry experts, is likely to evolve. Services of the communicating home will also be about remote accessibility. If one combines Bill Gates' vision of portability and Håkan Eriksson's belief in mobile broadband, desires for mobile accessibility to the content library are likely to evolve. According to Ericsson ConsumerLabs there is a will to safely store personal content. This can easily be accomplished by the online storing service that are about to expand. Gaming is another area addressed by major parts of the industry. The growing online gaming trend, emphasized by Jonas Birgersson, is another area where both internal and external interconnectivity is fostered due to the demand for broadband/home network sharing. Jonas Birgersson also states that the ability to create/differentiate services are key aspects that will drive the gaming trend even further.

Industry experts stress another trend which point in the direction of a changing communication technology. Claes Wellton foresees a future where all voice communication will be conducted through IP telephony. This isn't a farfetched conclusion when looking at the ongoing digitalization trends. Yet, considering the vast penetration of analogue telephone subscriptions in Sweden, IP telephony won't have reached the dominating telephone standard in 3-5 years. In a longer perspective it is no doubt that telephone systems are about to be IP-based because of clear benefits such as lowered operational costs.

Enhanced TV experiences are another service the industry has high beliefs in. HDTV has had a breakthrough in USA while uptake in Europe hasn't reached as far. This might depend on the lack of a unified European standard. The uncertainty around standards might be solved when broadcasting from several sport events in 2006 will be conducted. However, while flat screens imply bigger screens which demands higher resolution for retained quality, the future of HDTV is doubtless.

According to Ericsson Consumer Labs and Ann-Charlotte Kornblad a future demand for socializing services e.g. integrated video and voice will be acknowledged in many areas. This can be declared as an enhancement of the already existing communication behavior. Other services fulfilling the socializing service demand are e.g. messaging services, mail services, and interactive online gaming services. In addition to pure entertainment and socialization services there will exist a minor market for services that are able to save customers time e.g. home automation, home control and home security services. Healthcare services are another promising area which, however, not will have a great breakthrough in a 3-5 years perspective. Jonas Birgersson stated that well developed Internet portals will function as both a time saving service and an entertainment experience. In addition to this he believes that a market for integrated cameras and sensors will develop but with reason of the non productified nature of this market, the authors find this market development not to be present within our time frame.

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5.7. KEY CONCLUSIONS

Entertainment is the key word considering the adaptation of the communicating home. The living room, where entertainment is far most consumed, is the first place where the communicating home is visible.

Products with characteristics that enhance users entertainment experiences are therefore likely to be the first ones to be adopted in the communicating home. The products that have been analyzed to play an important role in the transition towards a communicating home are found in the below figure. Products that not have been judged as dominating are intelligent white goods, sensors and web cameras. These products might however reach a high market penetration in a longer time perspective than 3-5 years.

When it comes to dominating services, these are also found in the below figure. Entertainment is, of course, a key word also concerning services since goods and services usually works together to create value for the users. Services not being analyzed as dominating are healthcare services, home automation, home control, home security and video telephony. As in the goods case, these services might also turn into successes beyond 5 years.

This chapter can be summarized in the following picture of the communicating home:
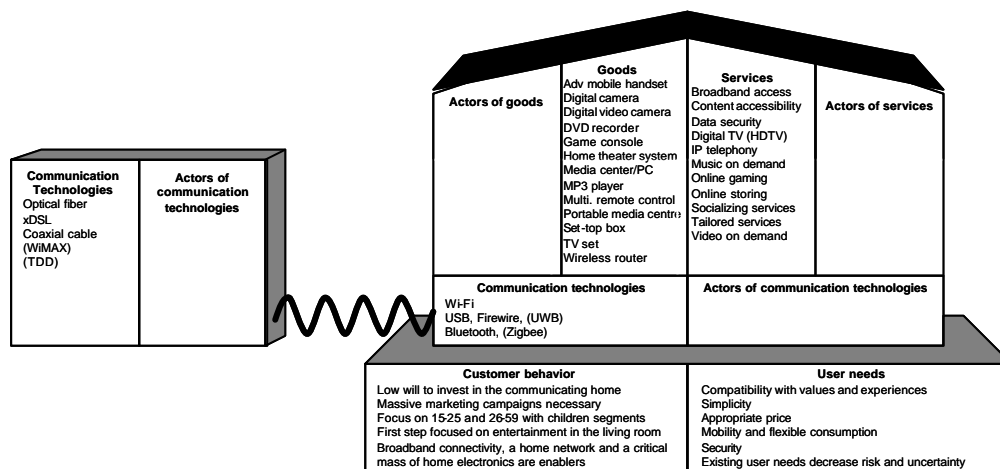
Figure 5.1 Scheme presenting the communicating home.

6. ACTORS

This chapter aims to identify the most important actors of the communicating home. To accomplish this, the point of departure is taken in the dominating communication technologies and products analyzed in previous chapters. The actors identified are complemented with retailers, regulatory authorities, standardization bodies and information brokers, which completes the picture. Thereafter an analysis follows where the most important actors are identified.
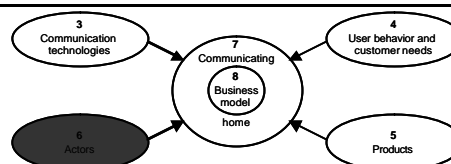
6.1. ACTORS CONCERNING DOMINATING COMMUNICATION TECHNOLOGIES

6.1.1. Wired access technologies to/from the home

In the last decade of the 21st century many Swedish companies working with optical fiber solutions were born. Two examples are Transmode and Lumentis who recently decided to fusion their businesses.[198] Netinsight is another Swedish company working with optical fiber solutions. Among the large players Alcatel, Cisco and Ericsson are worth mentioning.[199] These companies are also members of the DSL Forum which is a consortium of nearly 200 leading industry players working for a global mass market for DSL broadband. Huawei, Intel, Microsoft, NEC, Nokia, Philips, Samsung and Siemens are some of the remaining members.[200] One of the counterparts to DSL Forum, when it comes to broadband delivery via the coaxial cable net is European Cable Communications Association (ECCA) with 35 members. This organization holds a yearly congress where Cisco last year was the most well known of the represented companies.[201] Macab is a Swedish actor offering equipment which enables broadband through coaxial cable [202].

6.1.2. Wireless access technologies to/from the home

TDD and WiMAX are two wireless alternatives to fiber, xDSL and coaxial cable. IP Wireless, NEC and Siemens have developed systems for the TDD-technology[203] [204]. Smaller companies like BIM2002, Kustbandet, Azent, Atenit and Airnet have got most of the Swedish licenses for TDD[205]. When it comes to WiMAX the biggest promoter is Intel who has started to build in WiMAX-support in their chips. Other

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[198] www.nyteknik.se, Transmode och Lumentis går samman, 2005-03-23

[199] www.nyteknik.se, Svensk opto överlevde krisåren, 2005-03-23

[200] www.dslforum.org, 2005-03-29

[201] www.eccacongress.com, 2005-03-29

[202] www.nyteknik.se, Ratad Ericssonuppfinning ger 100 megabit i tevekabeln, 2005-03-29

[203] www.nyteknik.se, Här är de nya utmanarna till 3G, 2005-03-29

[204] www.nyteknik.se, Siemens är teknikre ligösa, 2005-03-29

[205] www.nyteknik.se, Fem småföretag utmanar trådlöst, 2005-03-29

members of the WiMAX-forum are Alcatel, Cisco, Dell, Ericsson, Huawei, Intel, Microsoft, Motorola, Nokia and Siemens.[206]

6.1.3. Wired/wireless communication technologies in the home

The USB Implementers Forum consists of more than 1 000 companies. Almost all large companies in the areas of telecommunications, computer manufacturing and consumer electronics are members. Examples are HP, Intel, Microsoft, NEC and Philips.[207] These companies are also members of an organization called the 1394 Trade Association which promotes Firewire. Other actors in that group are Apple, Canon, Compaq, Dell, Hitachi, JVC, LG Electronics, Matsushita (with the Panasonic brand), Motorola, Pioneer, Samsung, Sanyo, Sharp, Sony, Texas Instruments, Thomson and Toshiba.[208] Bluetooth, Zigbee and possibly UWB are three wireless alternatives/complements to USB and Firewire. The Bluetooth Special Interest Group (SIG) promoter members include: Agere, Ericsson, IBM, Intel, Microsoft, Motorola, Nokia, and Toshiba. Promoters are highly engaged in the strategic and technical development of Bluetooth technology. Associate members, on the other hand, have the opportunity to work with other Associate and Promoter companies on enhancements to the core specification and profile specifications. Among these Apple, Canon, HP, LG Electronics, Matsushita, Samsung, Sharp, Sony Ericsson and Texas Instruments are worth mentioning.[209] The Zigbee Alliance has the same structure as Bluetooth SIG with promoter and associate members (called participants). Among the promoters Honeywell, Motorola, Philips and Samsung are the most well-known. Cisco, LG Electronics, NEC and Texas Instruments are examples of participant companies.[210] The promoters of the UWB technology have developed a forum to spread knowledge about the technology to the industry. Among the participating companies Samsung, Siemens and THX can be mentioned.[211]

Actors of Wi-Fi technology will, because of its productified nature, be described in the goods section below.

6.2. ACTORS CONCERNING DOMINATING GOODS

Goods identified as dominating in the product chapter were advanced mobile handsets, digital cameras, digital video cameras, DVD recorders, game consoles, home theatre systems, media centers/PCs, MP3 players, multifunctional remote controls, portable media centers, set-top boxes, TV-sets, wireless routers and digital media adapters. The actors in this section have been identified by looking at homepages of big Swedish retailers like ONOFF, Siba and Elgiganten. To avoid an unnecessary amount of references these sources are not printed out in this section. This course of action brings a risk of missing important actors that not yet have

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[206] www.wimaxforum.org, 2005-03-29

[207] www.usb.org, 2005-03-29

[208] www.1394ta.org, 2005-03-29

[209] www.bluetooth.org, 2005-03-29

[210] www.zigbee.org, 2005-03-29

[211] www.uwbforum.org, 2005-05-12

entered the Swedish market. Therefore the procedure has been complemented with a global search, for example at Amazon, when necessary.

6.2.1. Advanced mobile handsets

Advanced mobile handsets are offered by Nokia, SonyEricsson, LG, Samsung and Motorola. By equipping their PDAs with cellular functionality manufacturers like PalmOne and Qtek today also offer advanced mobile handsets.[212]

6.2.2. Digital cameras and digital video cameras

Digital cameras are primarily manufactured by Canon, Casio, HP, Kodak, Konica Minolta, Nikon, Olympus, Matsushita, Pentax, Samsung, Sanyo and Sony. All these companies are considered as high quality brands and offer a wide range of cameras with different functionality. Which one to chose is a matter of cost versus size, design, optical zoom ability, resolution, etc. Digital video cameras are mostly offered by Canon, Panasonic and Sony.

6.2.3. DVD recorders

Several vendors of DVD recorders exist. From the ones with the most recognized brand Sony, Panasonic, JVC, LG and Samsung can be mentioned.
Regarding the next generation DVDs, fierce standards competition is taking place between the two standards HD-DVD and Blu-Ray. HD-DVD is marketed by among others; NEC, Toshiba and Sanyo. Blu-Ray is supported by companies such as Dell, HP, Apple and Matsushita.[213]

6.2.4. Game consoles

Game consoles are offered by Microsoft, Nintendo and Sony.[214] Sony is dominating the market for game consoles. Nintendo is suffering from profitability problems. Moreover Nintendo states that their present game console has lost in competition with Sony.[215] The online gaming trend is expected to help Microsoft in competition with Sony.[216] The only provider of online gaming, as of today, is Microsoft with XBOX-live. The online gaming service is therefore left out in the below service section.

6.2.5. Home theatre systems

Home theatre systems are offered by JVC, LG, Panasonic, Sony and Yamaha. It should be noted that the home theatre systems most often comes bundled with a DVD player.

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[212] www.dustin.se, 2005-04-18
[213] www.nyteknik.se, Sony fredsmäklar i kampen om dvd-formaten, 2005-04-04
[214] www.nyteknik.se, Microsoft aktar sig för apparater, 2005-04-18
[215] www.nyteknik.se, Nintendo sätter hoppet till Kina, 2005-04-18
[216] www.nyteknik.se, Konsolkriget fortsätter på nätet, 2005-04-18

6.2.6. Media centers/PCs

Microsoft will not release their Windows XP Media Center edition in a Swedish version until late autumn 2005[217]. The consequence has been that only Fujitsu Siemens offers media centers for the Swedish market so far. However a lot of companies like HP, NEC, Sharp, Sony and Toshiba have signaled their intention to launch a media center when Microsoft's software is released.[218] The Swedish company Welton Way with the product MultiMedia Center has emerged as a competitor to Microsoft concerning software for media centers.[219]

6.2.7. MP3 players

Apple has with their MP3 players taken a leading market position and has also made this market grow at a fast pace. This has opened up for other actors and at CES and CeBit hundreds of companies showed their products. In Swedish retail stores brands like Apple, Creative, Jens of Sweden, Philips and Sony are dominating. Other examples of brands are Asono, Iaudio, Iriver, Napa, Packard Bell and SanDisk.

6.2.8. Multifunctional remote controls

Universal remote controls are manufactured by companies such as Universal Electronics and Philips. Other companies have also signaled their intention to enter this product segment.[220]

6.2.9. Portable media centers

A number of vendors today offer portable media centers. The ones offered by Samsung, Creative, iRiver and Sanyo have a common characteristic that they are based on a software platform supplied by Microsoft.[221] However the American company Archos is choosing not to base their media center on a Microsoft platform. Instead they have developed what they claim to be the most advanced software available for portable video devices.[222] When it comes to PCs large and capital intensive companies like Acer, Amitech, Compaq, Dell, Fujitsu Siemens, HP, Packard Bell, Philips, Sony and Toshiba are most prominent. Dell has with their revolutionary business model which offers relatively low prices, due to the minimization of intermediaries, emerged as the most successful player.

6.2.10. Set-top boxes

There exist several vendors of set-top boxes with different functionality. At the Swedish market Kreatel and I3 Micro are two important actors. Kreatel supplies boxes supporting IPTV to for example TeliaSonera[223]. I3 Micro develops set-top

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[217] www.microsoft.se, 2005-03-22

[218] www.nyteknik.se, De japanska klapparna vi bara får drömma om, 2004-11-25

[219] www.weltonway.com, 2005-03-22

[220] Interview, Oskar Staf, 2005-04-15

[221] www.nyteknik.se, Microsofts nöjescentral lagrar hundra långfilmer, 2005-02-28

[222] www.archos.com, 2005-03-01

[223] www.nyteknik.se, Kreatels boxar i Telias IP-teve, 2005-03-22

boxes for both VoIP and IPTV and has won many prices for their appealing design[224]. Ericsson has also developed a very small set-top box for IPTV[225]. When it comes to regular digital TV Nokia is, among others, one of the actors offering set-top boxes.

6.2.11. TV sets

The majority of flat screen produced for the world market comes from Japanese companies. Lately many South Korean companies also have entered the market and are likely to gain market share in the future.[226] Taiwan and China are two other countries that probably will compete fiercely in a longer perspective.[227] In Sweden Samsung is the largest plasma actor followed by Matsushita and LG Electronics[228]. When it comes to LCD screens Sharp has 50 percent of the world market[229]. Samsung is the second largest supplier of LCD screens[230]. Sony, Sanyo and Hitachi belong to a group which aims at gaining market share in the flat screen market. Especially Sony was late to the market but has through collaboration with the Korean company Samsung taken a more prominent market position.[231] Other companies active in the Swedish market are Canon[232], Daewoo, Denver, Intel, JVC, Luxor, Medion, NEC, Philips, Pioneer, Saba, Sagem[233], Tandberg, Thomson and Toshiba. Due to an overall price reduction of 20 percent per year and high manufacturing costs a consolidation wave has begun and is expected to continue[234].

6.2.12. Wireless routers and digital media adapters

In large Swedish retailer chains selling wireless networking architecture D-link and Netgear is the dominating brands. Apple, Amitech, Belkin, Intel in form of Linksys, Philips and Topcom are examples of other brands. When it comes to digital media adapters the same companies are active but D-link and Amitech seems to offer the best products as of today.

6.3. ACTORS CONCERNING DOMINATING SERVICES

The actors presented in this section are suppliers of services identified as part of the communicating home in chapter 5. The important services are; broadband access, content accessibility, data security, digital TV, IP telephony, music on demand, online gaming, online storing, socializing services, tailored services and video on demand. While content accessibility and tailored services are services that are hard to couple

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[224] www.nyteknik.se, Ännu ett designpris till svensk bredbandsbox, 2005-03-22
[225] www.nyteknik.se, Ericsson vill ha teve i telefonledningen, 2005-03-21
[226] www.nyteknik.se, LCD-teve dominerar helt 2009, 2005-02-25
[227] www.nyteknik.se, 2005-02-28
[228] www.nyteknik.se, Explosiv ökning av lcd-tv, 2005-02-25
[229] www.nyteknik.se, Väggteve får ny chans i jul, 2005-02-25
[230] www.nyteknik.se, Explosiv ökning av lcd-tv, 2005-02-25
[231] www.nyteknik.se, Väggteve får ny chans i jul, 2005-02-25
[232] www.nyteknik.se, Ny typ av skärm i Canons första TV, 2005-02-28
[233] Ibid.
[234] www.nyteknik.se, Fujitsu ger upp platta skärmar, 2005-02-25

with actors, since they are more of a concept that have to be fulfilled by all actors, they have been left out in the below presentation.

6.3.1. Broadband access

Broadband via different technologies is offered by a number of companies. Glocalnet, Telia and Tele2 sell broadband through xDSL. Bredbandsbolaget offer broadband through Ethernet and xDSL, and Comhem markets broadband through existing coaxial cable networks.[235]

6.3.2. Data security

When it comes to data security services, Antivirus software is among others marketed by global companies such as; F-secure, Symantec, CA and Panda.[236] Microsoft has also entered this service area through the acquisition of the anti-spyware company Giant software.[237]

6.3.3. Digital TV

Digital TV is available through a number of different technologies. Bredbandsbolaget, Fast TV and TeliaSonera offer digital TV through xDSL and Ethernet.[238] [239] [240] Comhem provides digital TV through existing coaxial cable networks.[241] Boxer markets digital TV through terrestrial broadcast.[242] ViaSat and Canal digital vends digital TV through satellite, Canal digital also have a digital TV offering through the use of existing coaxial cable networks.[243] [244]

6.3.4. IP telephony

The major players selling IP telephony solutions to the Swedish consumer market are Bredbandsbolaget, Comhem, Digisip and Tele2.[245] Companies such as Skype[246], Microsoft through MSN Messenger and ICQ[247] offer software solutions that enable IP telephony through the use of a computer. IP telephony requires in some cases additional hardware. This market segment is dominated by Cisco, Avaya and I3 Micro technologies.[248]

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[235] www.pts.se, 2005-04-11
[236] www.computersweden.se, 2005-04-12
[237] www.nyteknik.se, Microsoft bygger nätverk mot spioner, 2005-04-19
[238] www.telia.se, 2005-03-21
[239] www.bredbandsbolaget.se, 2005-03-21
[240] www.idg.se, Bonnier lanserar IP-tv, 2005-03-21
[241] www.comhem.se, 2005-03-21
[242] www.boxer.se, 2005-03-21
[243] www.viasat.se, 2005-03-21
[244] www.canaldigital.se, 2005-03-21
[245] www.pts.se, 2005-02-17
[246] www.skype.com, 2005-02-28
[247] www.pts.se, 2005-02-17
[248] Ibid.

6.3.5. Music on demand

Music on demand is being offered by among others; iTunes[249], CDON[250], Vodafone[251], Åhlens[252], Bengans[253] and MilliMilli[254]. The globally popular music on demand service Itunes is not available for the Swedish market yet.[255]

6.3.6. Online storing

In the Swedish market for online storing the four companies Intellibackup, Storegate, Backup and Online-backup appear most prominent.[256]

6.3.7. Socializing services

In the area of socializing services Microsoft holds a dominant position. While e.g. offering MSN Messenger, Outlook, Hotmail and XBOX Live the full spectrum of services within this area is covered. Other large players within this service area are e.g. ICQ and gmail. [257] [258]

6.3.8. Video on demand

The Swedish market for video on demand is dominated by SF-anytime.[259] Like Fast TV, SF-anytime is owned by the Bonnier group.[260] However rumors exist that MSN is planning to launch a global video on demand service.[261]

6.4. OTHER IMPORTANT ACTORS

6.4.1. Triple play

Triple play is today being marketed by; Telia, Bredbandsbolaget and Comhem. Triple play requires additional hardware, depending on how the access is provided, which is supplied by Packetfront, Operax, Net Insight, I3Micro, Kreatel, Ericsson and Net Intact.[262]

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[249] www.nyteknik.se. Itunes musikaffär öppnar i Sverige, 2005-05-12
[250] www.cdon.com, 2005-03-21
[251] www.vodafone.se, 2005-03-21
[252] www.ahlens.se, 2005-03-21
[253] www.bengans.se, 2005-03-21
[254] www.millimilli.com, 2005-03-21
[255] www.itunes.com, 2005-04-12
[256] www.nyteknik.se,
[257] www.microsoft.com, 2005-05-12
[258] http://gmail.google.com 2005-05-12
[259] Interview, Henrik Nilsson, 2005-03-21
[260] www.nyteknik.se, 2005-01-28, Bonnierbolag bäst på bredbandsteve?
[261] Interview, Henrik Nilsson, 2005-03-21
[262] www.nyteknik.se, 2004-09-29, Därför vill Telia sälja teve via telefonjacket.

6.4.2. Entertainment content developers

In the area of music production a large variety of companies exist. Among the most prominent, Sony BMG[263], Warner Bros[264] and Virgin records[265] are found. Sony BMG[266] and Warner Bros[267] are also dominating companies producing movies. In the movie industry Miramax[268] is also a well recognized production company.

6.4.3. Retailers

Elgiganten, Expert, ONOFF, Power and SIBA hold dominant positions and have well established traditional physical retailing centers in most part of Sweden.[269] However retailing through the Internet has increased the variety of available vendors, and in the online market already mentioned retailers experience competition from companies such as NetonNet, Dustin, komplett.se and InWareHouse.

6.4.4. Regulatory authority

PTS, the Swedish National Post and Telecom agency is the governmental authority that monitors the communications and postal sectors. The authority works in four different areas: consumer issues, competition issues, efficient utilization of resources and secure communications. In these areas PTS issues regulations and ensures that existing legislation is followed. Operators wishing to start or conduct postal and telecom operations must apply to PTS for a license.[270]

6.4.5. Standardization organizations

There are a number of actors of standardization that also are equally important to recognize such as ETSI (European Telecommunications Standards Institute), IEEE (Institute of Electrical and Electronics Engineers), HGI (Home Gateway Initiative), IETF (Internet Engineering Task Force), the OSGi Alliance and OMA (Open Mobile Alliance).[271]

6.4.6. Information broker

Information brokers are persons and companies that eliminate unnecessary actors in the value system through collecting and presenting valuable information for end customers. If delivering demanded products the information broker attracts customer loyalty. The involvement of an information broker helps the customers by delivering transparency of products.[272] A well known information broker today is Pricerunner[273] who collects and synthesises price information and product specifications from

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[263] www.sonybmg.com, 2005-05-12
[264] www.warner.com, 2005-05-12
[265] www.virginrecords.com, 2005-05-12
[266] www.sonybmg.com, 2005-05-12
[267] www.warner.com, 2005-05-12
[268] www.miramax.com, 2005-05-12
[269] www.netonnet.se, Årsredovisning 2003, 2005-04-12
[270] www.pts.se, 2005-04-07
[271] Interview Karna Norén 2005-04-25
[272] Nordström, A et al (2002) p.46-47
[273] www.pricerunner.se, 2005-05-06

vendors. In addition to the information collected by Pricerunner, a forum for customers have been developed where the customers can express their criticism about different products.[274]

6.5. ANALYSIS OF MOST IMPORTANT ACTORS

It is happening, just like Bill Gates presented in his vision - e-commerce changes retailing structures. Through online stores dominant retailers of electronic appliances are challenged by new entrants. The best example is probably found in the computer industry where Dell, with their new distribution form without intermediaries, has emerged as the dominant player. The trend can also be seen in the Swedish retail landscape where a company like NetonNet has gained market shares with a business model similar to the one used by Dell. This has been noticed by the traditional retailers who now have complemented their traditional stores with on-line retailing. Which companies that will win the battle for the customers in the future is, according to the authors, most probably a question of price versus quality and convenience.

6.5.1. Communication technologies to/from and in the homes

Suppliers of communication technologies to/from the homes are to the largest extent giant cooperations that offer a vide variety of different solutions based on different technologies. Examples of such companies are Alcatel, Cisco, Ericsson, Intel, Nokia and Siemens. These actors will continue to play an important role in the communicating home industry. Especially Intel, who has a great involvement in the WiMAX technology, will be a very interesting actor if this technology turns out to be a success.

When it comes to in-house communication technologies these are productified in form of wireless routers and digital media adapters. D-link and Netgear are dominating the Swedish market as of today but future development is hard to predict. Linksys which is owned by Intel has a considerable size in a global perspective and might gain market shares in Sweden as well. Also Apple and Belkin seem to be important actors. However, D-link has an, according to the authors, very interesting vision of the future communicating home and will therefore play an important role in the future.

6.5.2. Goods and services

Manufacturers of home electronic goods are mostly enormous global players which all have strong brand recognition. Almost all the manufacturers of goods also have product portfolios that cover many aspects of the communicating home. However, two companies appear a bit more innovative and driven then the rest of the industry. According to the authors, it is Samsung and LG that are most likely to hold a dominant position concerning goods in the future communicating home. These two companies seem to have well balanced product portfolios and also have the objective of being the dominant player concerning almost all of the product areas where they

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[274] www.pricerunner.se, 2005-05-06

are active. With constantly declining product prices, being a leading player implicates great competitive advantage as it allows the company to utilize economics of scale advantages.

Technology transitions such as IPTV and IP telephony have also brought new business possibilities. These new business opportunities are being pursuited by the two very promising companies I3Micro and Kreatel. Given the market potential these companies possess, they have great opportunities to be the next Ericsson or Nokia if they make the correct strategic decisions.

Microsoft, that already today has a strong and significant position, seems to be aiming at building an even stronger position in the software industry. During the past years Microsoft has increased the scope and today offer operating systems for PCs, media centers, portable media centers and advanced mobile handsets. From almost a total lack of competition Microsoft's position in the software industry shows monopoly characteristics. Given their position and the market size, Microsoft's market power is astonishing. Microsoft has also entered the gaming industry by the introduction of their XBOX game console. Uncertainty surrounds who will dominate the market for game consoles. Nintendo appears to experience significant problems. The impact of online gaming etc. will affect Sony's and Microsoft's competitive advantage differently and moreover somewhat determine who will be the dominant supplier of tomorrow.

Different services, like broadband access, digital TV and IP telephony, are dominated by, from a Swedish perspective, relatively large companies such as TeliaSonera, Tele2, Comhem, Canal Digital and Bredbandsbolaget. Skype is another interesting actor concerning VoIP solutions. When it comes to more content oriented services like video and music on demand an interesting pattern can be seen. This area is not, to the largest extent, dominated by large multinational players. Instead, the service sector consists of, in the context, small players. Being an area that is expected to grow significantly in the coming years it is more than likely that more companies will make an entrance. If the rumor about Microsoft's global video on demand service is true, Microsoft's position in the communicating home will become even stronger. The companies offering music and video on demand services to the Swedish market do not have any content production. Even though the Internet enables changes to former sales channels, similar market structure as before with intermediaries therefore also exist in cyberspace.

Large multinational companies dominate the production of music and movies. These companies hold a dominant position in the communicating home because of the entertainment focus. Just like stated by Intel during 3GSM, the authors believe that it is of greatest importance that the industry reaches a common opinion regarding how to solve copyright issues for content delivered on demand.

Online data storing is another area where competing companies are quite small. As the demand for storing services increases, more companies are likely to enter this area.

Data security is one of the few service segments where market presence is characterized by large multinational companies. However, since next generation security issues are about spy applications, existing giants might experience competition from Microsoft that through acquisitions has entered this market segment.

6.5.3. Other important actors

When it comes to information broking the most widely known actor is Pricerunner. However the competitive situation in this area isn't as harsh as in e.g. the consumer electronics industry. This might trigger the involvement of new actors within this area.

It is also important for all actors to recognize the power of standardization organs. If a company has a new product idea it is of greatest importance to anchor it in a standardization body like ETSI or IEEE in order to be able to reach a mass market and to make it interoperable with other products.

Last but not least it is important for all actors of the communicating home to be aware of the regulatory authorities. In Sweden, PTS is the most prominent one. Especially the largest actors concerning access services will have to follow PTS directions which might alter the foundation of their business.

6.6. KEY CONCLUSIONS

Microsoft will be the most dominant player in the communicating home industry. The communication area for technologies to/from the homes is dominated by giant global players like Alcatel, Cisco, Ericsson, Intel, Nokia and Siemens. However, there exist great business opportunities for new smaller companies like I3Micro and Kreatel. When it comes to in-house communication technologies D-link is a very interesting player but there will be enough with space for more actors. Consumer electronics is dominated by enormous global players. Samsung and LG will be the most prominent of these. Access services are also dominated by relatively large players, at least from a national Swedish point of view. Examples of these are TeliaSonera, Tele2, Comhem, Canal Digital and Bredbandsbolaget. The area of more content oriented services leaves space for smaller actors but the risk for acquisitions must be considered as imminent. It is important for all actors of the communicating home industry to be aware of the implication decisions from regulatory authorities and bodies of standardization will have on their business.

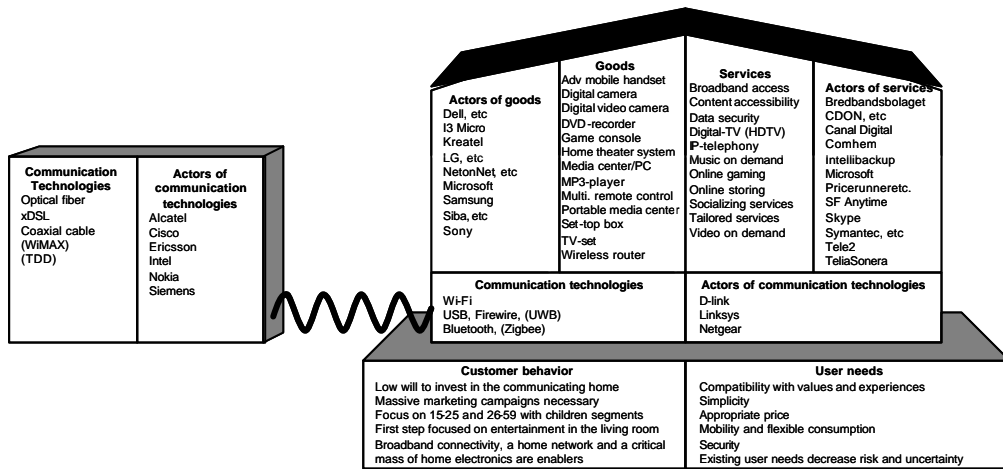This chapter can be summarized in the following picture of the communicating home:

Figure 6.1 Scheme presenting the communicating home.

7. EVALUATION OF THE COMMUNICATING HOME

In this chapter the competitive situation and the structure of the communicating home industry will be evaluated. First the industry, from a competitive perspective, will be addressed by the five forces framework *followed by an evaluation of the value structure for the communicating home industry. This will synthesize in how the value structures of the industry exist today and how they are likely to evolve.*
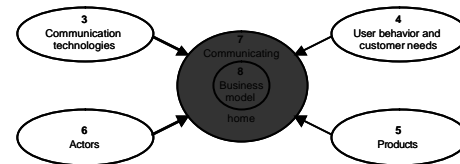
7.1. THEORY CONCERNING COMPETITION ANALYSIS

7.1.1. Industry definition and the five forces framework

The structure of an industry plays an important role in deciding the competitive situation for companies active within the industry. How fierce the competition is in an industry can be analyzed with the five forces framework. This framework is developed by Michael Porter and judges the state of competition in an industry by analysing five basic competitive forces. These are;

- Rivalry among existing firms
- Bargaining power of suppliers
- Bargaining power of buyers
- Threat of new entrants
- Threat of substitute goods or services

The total strength of these five forces decides the profit potential of the industry. Since the five forces usually affects the companies within the industry in a similar way the key is found in the differing abilities of firms to handle them. The objective concerning competitive strategy for a company in an industry is to find a position within the industry where it can defend itself from the competitive forces and/or influence them in its favour.[275]

Porter defines an industry as a group of firms producing products that are close substitutes for each other. However, he admits that there in practice often is a great deal of controversy of the correct definition. As an example economists define an industry as a group of firms that supplies a market[276]. A definition of an industry is a choice of where to draw the lines between established competitors and substitute products, between existing firms and potential new entrants and between existing companies and suppliers and buyers. The reason for this discussion is the fear of overseeing latent sources of competition that may threaten the industry in the future. Focusing broadly on competition well beyond the existing rivals, as in the five forces

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[275] Porter (2004) p.3-4
[276] Grant (2002) p.86

framework, will decrease the risk of missing important actors and thereby making the discussion of where to draw industry boundaries unnecessary. It should also be recognised that the definition of an industry is not the same as definition a of a business which tells where in an industry a company wants to compete.[277]

According to Porter competition in an industry works to drive down the rate of return on invested capital to a level where perfect competition is present in the industry. Perfect competition is when the rate of return is equal to the long term interest offered by banks and other governmental institutes adjusted upward with the risk of capital loss. Investors will not tolerate a rate of return on capital lower than this since they in that case could receive higher yields by investing in other industries and firms earning less than this return will eventually go into bankruptcy. In industries offering rate of returns above perfect competition inflow of capital occurs via new entrants or by extra investments by existing firms. The strength of the barriers to entry determines the extent to which this inflow of capital will occur. If the inflow of capital continues long enough it will drive the return on invested capital to a perfect competition level. However, if the barriers to entry are strong it is possible for the companies within the industry to sustain above-average returns.[278]

7.1.2. Threat of new entrants

When new entrants decide to enter a new industry they bring new capacity, the desire to gain market shares and often a lot of resources. As a result product prices may go down or the incumbents' costs may increase, which both decreases the profitability of the industry. Barriers of entry and how fiercely existing firms react to entrants are the two major factors which decide the treat of entry. According to Porter there are six sources of barriers of entry:[279]

- Economics of scale (decline in unit cost when total volume increases)
- Product differentiation (established firms have brand recognition and loyal customers)
- High capital requirements (especially in risky and unrecoverable areas like advertisement and R&D)
- High switching cost (one time cost for the buyer to switch supplier)
- Access to distribution channels
- Cost disadvantages independent of scale (like proprietary product technology, learning or the experience curve or government subsidies)

7.1.3. Intensity of rivalry among existing competitors

Existing competitors in an industry are striving for holding a favourable position or to improve their current position which creates rivalry. The reason for companies to seek new positions can be that they feel pressure to do something new or that they see an opportunity. A new position can be accomplished by using different tactics like price competition, advertising campaigns, product introductions and increased customer

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[277] Porter (2004) p.32-33
[278] Porter (2004) p.5-7
[279] Porter (2004) p.7-17

services or warranties. Some actions of a firm within an industry, like massive advertising, might leave the initiating firm and the whole industry better of. Other actions, like price competition, are instead likely to leave the industry worse off.[280]

According to Porter there are a number of structural factors that decide how intense the rivalry in an industry is. Examples of factors that increase competition are
- Numerous or equally balanced competitors
- Slow industry growth
- High fixed or storage costs
- Lack of differentiation or switching costs (products are commodities)
- Capacity augmented in large increments
- High strategic stakes
- High exit barriers

The above mentioned factors, that determine rivalry in an industry, can and do change over time. An example worth mentioning is when an industry moves from the growth stage to maturity. As a consequence the growth rate declines which results in intensified rivalry, lower profits and often a shake-out.[281]

7.1.4. Threat of substitutes and opportunities from complements

A substitute product is defined as a product that can perform the same function as the products of the industry. This kind of products limits the profits on the industry since customer will switch to the substitute if the price of the product of the industry is set to high. Most attention should be given to substitutes that improve the price-performance trade off with the product of the industry and/or are produced by industries earning high profits.[282]

Adam Brandenburger and Barry Nalebuff have developed the five forces framework with an additional force. The sixth force is the one from complements and in opposite from the threat from substitutes the complements add value to the industry. Thereby, complements are not a competitive force. On the contrary, the more complements that exist and the closer their relationship are to the products supplied by the industry, the greater are the potential profit within the industry.[283]

7.1.5. Bargaining power of buyers

Buyers wants lower prices, higher quality, more services and are often playing competitors within the industry against each other. All these things are at the expense of industry profitability. A buyer or buyer group is powerful if the following criteria's hold true:[284]
- The purchases volume is large compared to the seller's sales

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[280] Porter (2004) p.17
[281] Porter (2004) p.18-22
[282] Porter (2004) p.23-24
[283] Grant (2002) p.90
[284] Porter (2004) p.24-26

- The purchased products represents a significant fraction of the buyer's costs
- The purchased product is standard or undifferentiated
- The buyer's switching costs are low
- The buyer earns low profits
- The buyer is a threat for backward integration
- The purchased product is unimportant to the quality of the buyer's product
- The buyer has perfect information

Most of the above sources of buyer power can be applied to both industrial buyers and end customers.[285]

7.1.6. Bargaining power of suppliers

Suppliers can threat to raise prices or reduce quality of sold products. If the buying industry can't recover this by increasing its own prices the profitability will decline. The criteria's that make a supplier powerful tend to mirror those of powerful buyers:[286]

- The supplying industry is more concentrated than the buying industry
- The buying industry is not an important customer of the supplying industry
- The supplier's product is important input for the buyers business
- The supplier's products are differentiated or it has built up high switching costs
- The supplier is a threat for forward integration

7.1.7. Value migration

A business design includes how a company selects its customers, defines and differentiates its offerings, defines the tasks it will perform itself and those it will outsource, configures its resources, goes to market, creates utility for customers and captures profit.[287]

Value continually migrates from outdated business designs to new ones that are better able to satisfy customers' most important priorities.[288] Value can flow either between industries, between firms or between business designs within a single company.[289]

There are three phases of value migration: *value inflow* (limited competition, high growth & profitability), *stability* (competitive stability, stable market share, stable margins) and *value outflow* (competitive intensity, declining sales, low profits).[290] According to Adrian Slywotzky value migration between some of these three stages can be predicted by a thorough strategic understanding of the customers, a

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[285] Porter (2004) p.26
[286] Porter (2004) p.27-28
[287] Slywotzky (1996) p.25
[288] Slywotzky (1996) p.3-4
[289] Slywotzky (1996) p.52
[290] Slywotzky (1996) p.6-7

hypersensitive competitive radar and a rich vocabulary of value migration patterns from other industries.[291] Indicators of such a value migration are:[292]

- Change in value growth/decline
- Change in market value/revenue ratio[293]
- Changes in the number of companies and their employment
- Change in venture capital and initial public offering (IPO) activities
- Changes in Industry profit growth/decline

7.2. ANALYSIS OF THE COMPETITIVE SITUATION IN THE COMMUNICATING HOME INDUSTRY

7.2.1. Industry definition and five forces analysis

In order to perform an analysis of the competitive situation in the communicating home industry the industry has to be defined. In the above theory section it was stated that there exist a great deal of controversy regarding how this should be done. However, the decision of where to draw industry boundaries is not extremely important as a long as the fear of overseeing latent sources of competition in the future is low. Hence, the five forces analysis used in this section has been given the following appearance:

- Suppliers are represented by the dominating actors of communication technologies to/from the homes.
- Industry competitors constitute dominating actors of communication technologies in-house, goods and services.
- Buyers are made up of different kind of retailers and end customers.
- Substitutes in Porter's framework have been replaced by Brandenburger and Nalebuff's complements category. The reason is that these products, which consist of products not evaluated as dominating in the product chapter, don't constitute a threat against the industry. Instead they will add value to the industry and increase the profit potential when reaching a high penetration on the market.
- New entrants are all actors of communication technologies, goods, services and retailing that haven't been considered as dominating in previous chapters.

This division gives the following appearance of the five forces framework for the communicating home industry:

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[291] Slywotzky (1996) p.251
[292] Slywotzky (1196) p.51
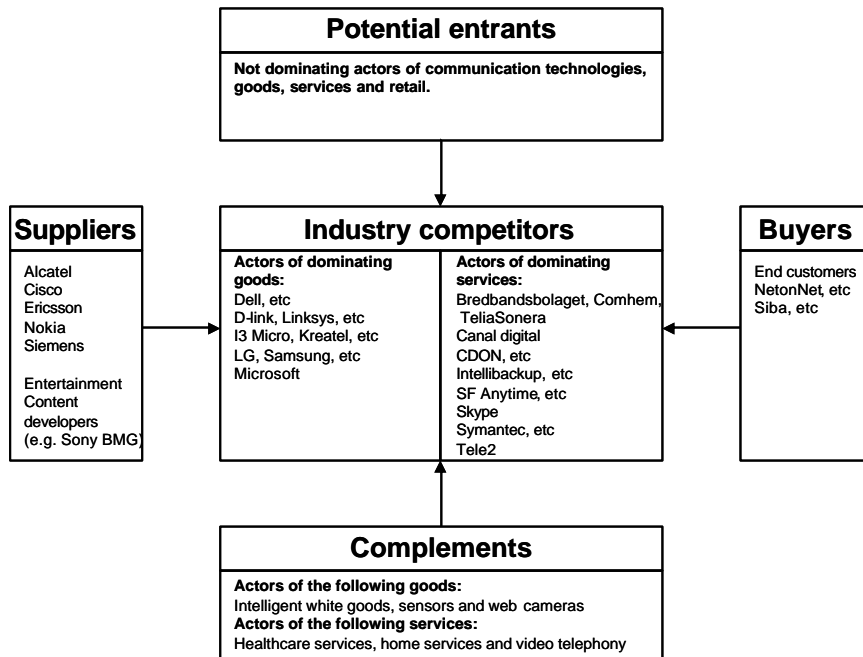[293] Market value = number of shares x stock value + long-term debt

Figure 7.1. The competitive situation in the communicating home industry.

As seen in the above figure the communication home industry is not restricted to only the box in the middle which an industry usually is. Instead, the communicating home industry is seen as embracing all five boxes. This doesn't agree with Porter and Grants thoughts of how to define an industry but, according to the authors, this will give a picture that is easier to grasp. The alternative would have been to gather almost all actors in the central box and use things like buying expensive bathroom equipment as a substitute and hardware manufacturers as suppliers, etc.

7.2.2. Competitive situation for actors of communication technologies and goods

The figure shows that there are very large companies battling in the supplier box and the in the goods part of the industry competitors box. This was also seen in the actor chapter. These boxes, especially goods, show many characteristics that indicate that extensive rivalry is present; there are many rather balanced competitors, high fixed and storage costs, capacity augment in large increments, high strategic stakes, high exit barriers and to some extent a lack of differentiation. A good example is the many manufacturers of flat screen TVs. They face high fixed costs since the manufacturing equipment is expensive and also large boosts in manufactured volume when new extremely expensive plants are built. These new plants are also built at high strategic stakes since they imply high exit barriers. The above described pattern also holds true for many other R&D-intensive goods and communication technologies. On the other hand is the threat from new entrants concerning these goods and communication technologies are relatively low. This is a consequence of economics of scale, strong built-up brand recognition, high capital requirements, access to distribution channels, proprietary rights and learning effects. However, these companies meet very demanding end customers who can chose between many rather undifferentiated

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products and has almost perfect information due to the Internet. As a consequence end customers are playing manufacturers against each other and always search for products with better quality at lower price which decreases the margins for manufacturers and retailers. The competitive situation for these companies has gotten even tougher since a convergence between the traditional PC and consumer electronics industries is happening, which implicates that companies from these industries now compete in the same arena.

7.2.3. Competitive situation for actors of services

When it comes to the service part of the industry competitors box the situation is to some extent different. First of all, the service part can be seen as divided into two. The first consists of relatively large actors like Bredbandsbolaget, Canal digital, Comhem, TeliaSonera, Tele2, etc. that offers access services for broadband, digital TV and IP telephony. These companies are rather balanced, meet slow or declining growth in some of their historically important business areas, suffer from a lack of differentiation and switching costs and meet high exit barriers. As a consequence some of these actors have, or is about to, to increase their product portfolios and are now offering all three of the above mentioned access services. It means that a convergence has occurred also in the access service sector and that former broadband-, digital TV and telephony-companies now are competing in the same arena. As in the case of communication technologies and goods the entry barriers are high, especially since new entrants need access to a distribution net which is costly to build by their selves or rent. The bargaining power of buyers is also high as they have an abundance of alternatives to chose between.

The second part of the service sector consists of actors providing content to end users like video and music on demand. Here the situation is completely different. Many of these business areas consist of relatively few and rather new firms, which are showing impressive growth figures, have low fixed costs, no storage costs. These companies meet low exit barriers and can furthermore tailor their offerings. On the other hand, it is easy for new entrants to step into these business areas since the investment requirements are rather low and it is cheap and easy to use Internet as medium for offering services. Buyers are, of course, fastidious also when it comes to content services. Indeed, there exist a will from customers to pay for content which also was stated in chapter 4. In that chapter it was also stated that the lack of appealing services is holding back the transition towards a communicating home. It is therefore extremely important to get this area going but it is still under developed. In the future a larger amount of actors within this area is to be expected which will increase competition. However, so far the window of opportunity is open and it is not impossible that the actors of today will have a first mover advantage if they succeed in building customer loyalty. This can result in sustained above-average returns for the companies that provide content also in the future.

7.2.4. Value migration in the communicating home industry

The value migration within the communicating home industry is obvious. The established actors of communication technologies to/from the home and actors of

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goods are meeting ever toughening competition. In order to sustain acceptable margins, economics of scale is a must and future acquisitions are to be expected. These companies are in what Slywotzky calls the stability phase which is characterised of relatively stable market shares and margins. However, this part of the communicating home industry also got features like competitive intensity and rather low profits which fits into the description of the value outflow phase. As concluded above the same situation holds true for actors of access services.

When it comes to actors providing content they are most certainly in the value inflow phase. This statement is supported by rapid profitability and penetration growth by these relatively few companies. So, value is migrating from communication technologies, goods and access services towards content providing services. But how will this affect the communicating home industry as a whole? There are a number of possible scenarios. The first, which was stated above, is that content providing actors play their cards right and are able to utilize their first mover advantage to sustain their competitive advantage. However, these actors are rather small and risk for acquisitions from the large actors of goods and access services are imminent. The question, how the communicating home industry will be transformed during the coming 3-5 years will be further investigated in the coming sections.

7.3. THEORY CONCERNING INDUSTRY VALUE STRUCTURE

In this section the connections between different actors in an industry are described. The choice of theoretical framework is based on the dominant position of Porter and complemented with articles concerning value networks.

7.3.1. Value chains

In 1985 Porter introduced the value chain framework with intentions to represent and analyze the logic of firm-level value creation which still today is the most adopted framework. Value chain analysis is a generic method for decomposing the firm into strategically important activities and understanding their impact on cost and value creation.[294] Porter declares that this kind of analysis is valid for all industries even though the importance of the different activities, in a competitive advantage kind of view, is industry dependent.[295]

7.3.2. Value systems

Integrated value chains from raw material to end user forms a value system. To gain and sustain competitive advantage a company must focus on a wider area than just the company. Porter accentuates the need to understand how the whole industry works – from buyer's buyer to customer's customer. The total set of actors providing end user with the intended product is called a value system. Porter's conclusion about the value system is, that independently how well a company structures its own internal

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[294] Stabell and Fjeldstad (1998)
[295] Ibid.

activities, competitive advantage isn't reachable if the value chain isn't fitted with the rest of the value system.[296]

7.3.3. Value network

A value network has similarities with the value system. The difference originates from the fact that companies are less static tied together in a value network. A value network is constantly changing form, which implicates that several members may offer similar products or activities at the same time. The introduction of e-commerce can force a previous value system into becoming a value network.[297] There are two forces equally important transforming value systems into value networks;[298]

- Continuous changes in the roles of the network members', forces companies to constantly repositioning themselves.
- Customer/user needs changes and forces companies to always create new offerings.

In a value network, economic value is created through dynamic exchanges between enterprises, its customers, suppliers, strategic partners and the community. Transactions can be in three different forms or currencies;[299]

- *Goods, Services and Revenue* (GSR); this currency contains all transactions for goods and services, such as contracts, invoices, return receipts on orders, conformations or payments etc. Knowledge products, that generate additional revenue or is expected to be included in the goods or service is also a part of the GSR flow.
- *Knowledge*; this refers to the exchange of strategic information, planning and process knowledge, technical know how etc. that support the core product.
- *Intangible benefits*; exchanges generate additional value and benefits that current financial measures cannot monitor. The additional value generated is for example image enhancements, sense of community and co-branding opportunities etc.

A value network is mapped out through diagramming transactions occurring between the members of the business or organisational network. The transactions diagrammed should belong to the currency categories previously stated. [300]

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[296] Porter (2004) p.34-35
[297] Johnson(2002)
[298] Andrews (1998)
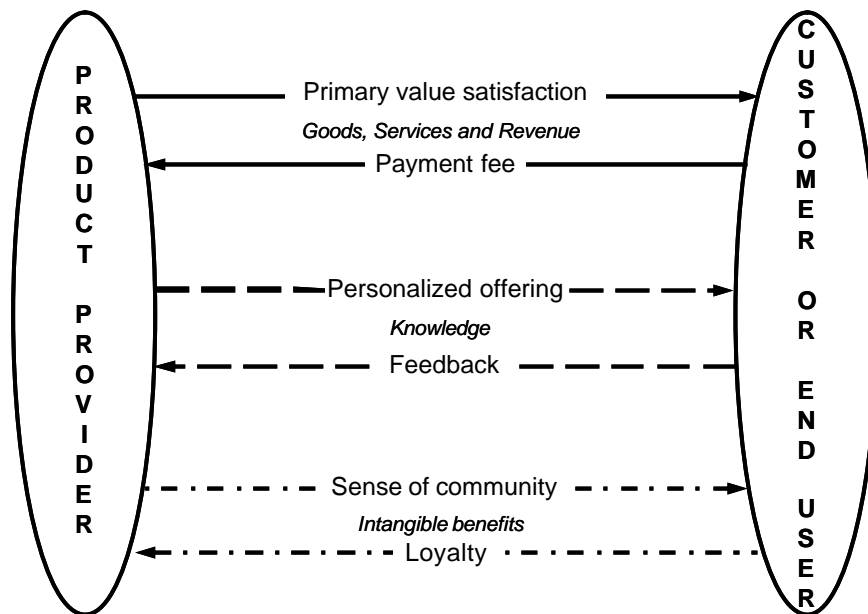[299] Allee (2000)
[300] Ibid.

Figure 7.2. Scheme over value exchanges in a value network

7.4. ANALYSIS OF VALUE STRUCTURE FOR GOODS IN THE COMMUNICATING HOME INDUSTRY

Because of the physical aspects of goods in the home and the product specifications of the dominating goods, several parallels can be drawn with the PC and consumer electronics industries. All the products described in chapter 5 virtually share the same retail structure from an end user perspective.

While the presence of actors in the value systems behind the manufacturers are affected, in equal ways, by the involvement of Internet, the choice have been made to cut the value system from where the participation of e-commerce starts to differ. Another factor influencing the focus on selected parts of the value structure is that the activities that occur behind the manufacturer are of minor or no importance for the end user.

There are three different ways an end user can obtain the good wanted: by a physical retail store (e.g. Expert, ONOFF), by an Internet based retail store (e.g. NetOnNet) and by an Internet based reselling store run by the manufacturer (e.g. Applestore, Dell). By the use of an information broker (e.g. Pricerunner) end user can appropriate most possible value due to the possible access to all information needed to perform a rational purchase – according to the individual preferences. The involvement of the upcoming information broker affects the rules of the game in several ways:

- Brand loyalty partly tends to migrate to information broker loyalty.
- End user is presented an "infinite" range of products and product specifications.
- End user's network of preferences is extended by Internet forums which imply a shift of brand perception from manufacturer to the forum.

- Geographical locations of the equipment providers decrease in importance.
- Minor players are offered a greater possibility for success hence the reduction of brand loyalty.

The above stated the value systems give the following figure from an end-user point of view:
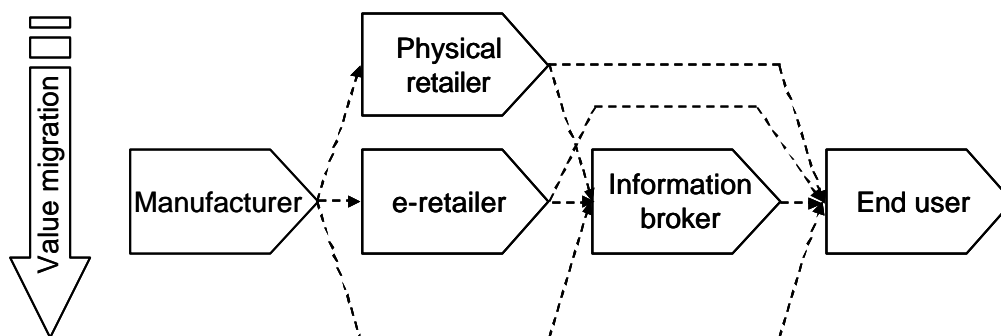

Figure 7.3. Value network for goods in the communicating home

The above shown three value systems potentially providing the same good at the same time constitutes a value network for goods in the communicating home. A migration between these systems ought to be stressed. Historically the way for end customer to achieve a good for the communicating home has been through the involvement of a physical retailer. The involvement of Internet has opened up a possibility for this system to be virtualized. Even though e-commerce has entered the game the intermediates, from manufacturer to end user, still hold equal positions as before. However, the participation of e-commerce has the ability to change the current value structure in a longer run – a value migration within the industry is likely to occur.

Eventually, most probable beyond our time frame, the loss of intermediates in the value system will result, according to cost minimization, in lower prices to customers. This fact is tempting both for the actors in front of the outplayed segments in the value system, who in the beginning will experience higher margins, and to end users who in time will be offered faster deliveries to better prices.

As stated above, the increasing involvement of an information broker, changes the rules of the game. With customers being more conscious and therefore less brand loyal, and having more knowledge in the purchasing process they will with higher possibility more often switch supplier. Higher switching frequency increases the dynamics of the industry, and furthermore implicates tougher competition. The information broker holds one of the most interesting positions in this network. The position beholden by the information broker can be resembled as a hub. Except from enlightening, and providing information to customers regarding which possible suppliers that exist, they in extension create a sense of community and furthermore loyalty. As the market power of the information broker strengthens, the importance for the supplier to have a good relation with the information broker increases.

7.5. ANALYSIS OF VALUE STRUCTURE FOR SERVICES IN THE COMMUNICATING HOME INDUSTRY

Value networks characterize most of the industry structure for the service part of the communicating home. Broadband connectivity is however a service area which shows static appearance which furthermore implicates system structure. The value system for broadband connectivity has the following appearance,
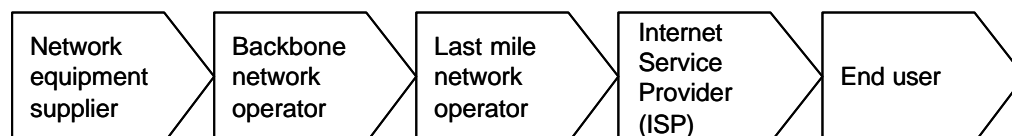

Figure 7.4. Value system for broadband connectivity

Even though competition in the broadband service delivery area has increased significantly during the last years, the amount of dynamics in this part of the industry is compared to many other service areas quite low. Only in urban areas users are offered broadband connectivity by a number of players. As population density decreases, so does also the variety of companies marketing broadband connectivity. Broadband connectivity is marketed through subscriptions. This creates a lock in effect, which furthermore decreases the dynamics of the industry. However new technology advances such as WiMAX might alter the existing industry structure significantly. The fact that WiMAX aims at competing with existing technologies in the last mile access, and furthermore the fact that strategic innovation is required to gain market share in established markets will increase the dynamics in the industry significantly, as the companies marketing access via WiMAX are new entrants. WiMAX is also advocated by among others Intel, which must be considered as a new entrant in the area as supplier of network equipment. As the amount of companies' increases, today's system structure will evolve into a more network oriented one.

The figure below presents the value structure for the other services identified in the products chapter as dominant in the communicating home industry. Two stages, broadband connectivity and goods, present in all networks, are left out in order to increase ease of comprehension. The value network for goods and the value system for broadband connectivity have previously been presented in this chapter. All services are delivered through broadband connectivity, and when services are being consumed the goods needed are assumed to already be purchased and installed.
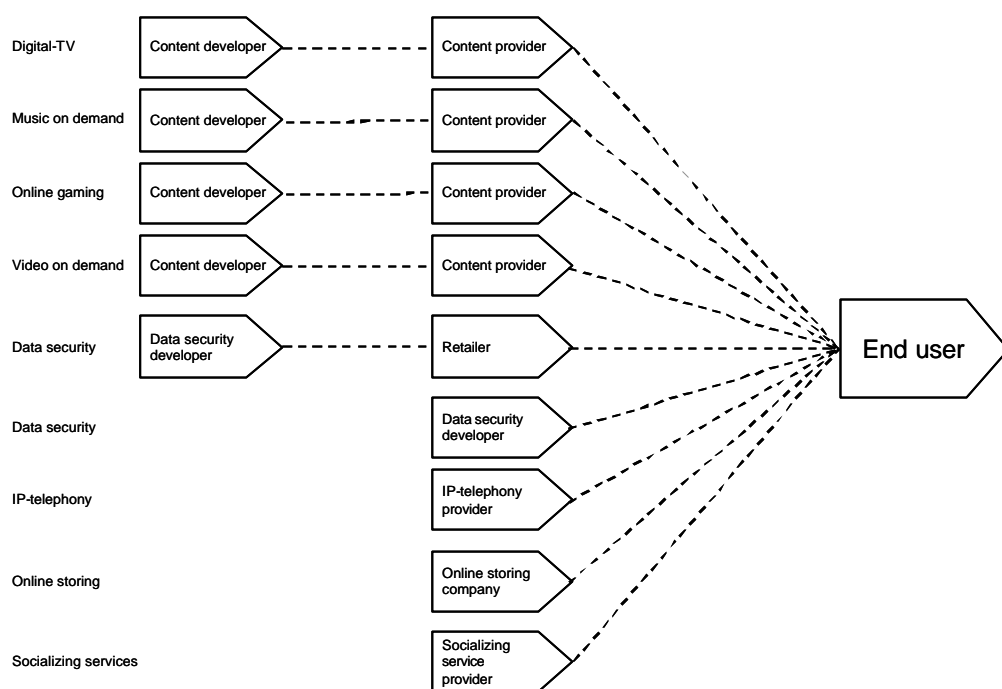
Figure 7.5. Value structure for services in the communicating home

7.5.1. Digital TV

The transition into digital TV, changes the value creation process for the TV-service area somewhat. However the dynamics of the industry is dependent on what technical solution that is present. When it comes to terrestrial broadcast this does not change the former value creation process remarkably. The most notable structure changes are visible when digital TV is broadcasted through coaxial cable, xDSL or Ethernet. Through the use of new broadcasting technology broadband providers are becoming a part of the value creating process for TV. The involvement of these players will change business models as new ways of sharing revenue must be developed. Strategic alliances and partnerships will furthermore increase as these are needed to ensure competitiveness and success. While having very different heritage, broadband providers and TV companies are not likely to use acquisitions or internal development to enter each others core business.

The largest change to the value creating process will however be visible if IPTV becomes a success. TV companies will in this case experience significant increase in competition. Through the Internet customers will be able to access content from a larger variety of TV companies. Internet enables global broadcast, i.e. Internet causes at least hypothetical competition between the large American TV-network HBO and SVT. As customers demand a more tailored experience content providers will establish a larger amount of strategic alliances and partnerships. Tailored content implicates the end of bundled offerings of channels aimed at large customer segments. A larger amount of companies present in the value creation process and

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constant adjustment to new customer preferences creates and environment where network structure without doubt will exist and prosper.

7.5.2. Music on demand and video on demand

All developers within the music and video on demand service area do to the largest extent rely on intermediaries in form of content providers, marketing their products to customers. Content developers like Miramax and Sony BMG still rely on content providers like SF-Anytime and CDON to market their content. Given that intermediaries still are present, on demand distribution and the move into e-commerce have not shortened the length of the value creation process. However the influence of e-commerce is forcing former system structures to evolve into networks. Among the companies marketing video and music on demand services, new entrants exist. Related diversification has for example led Apple into the music on demand service area through the introduction of Itunes. Furthermore SF-Anytime is a pure video on demand company and has never marketed media in physical form. Through the Internet customers are offered a larger diversity of content. Making content available through downloads decreases barriers of entry such as establishment of physical retail stores. Shipping costs for content in the new consistency are close to zero. Through the Internet content providers will be able to launch and market new content more cost efficiently than in the past. With this in mind customers' loyalty to one single company will decrease as the difference between buying from a local company and buying from e.g. an American company cease to exist. The dynamics of the industry structure will grow as e-commerce for video and music services takes off. If content providers market power increase, artists might choose to do business with them directly. If this holds true, the value networks for music and video on demand services would change noticeably. In extension content providers might compete fiercely with content developers. On contrary content developers might also extend their business through the use of Internet to market their content to end users, e.g. Sony BMG starts to market content on demand through their website.

7.5.3. Online gaming

Online gaming is conducted either using a game console or a PC. In the game console industry Sony and Microsoft holds dominant positions. Microsoft is extending their product portfolio through supplying in-house sourced online gaming services. However if this proves to be an important area Sony will probably allocate resources to also supply these services. While there is not any interoperability between the different brands of game consoles, competition online is limited, customers have to use the game portals supplied by the game console manufacturers. However through offering a larger diversity of game portals, the PC gaming industry is challenging game consoles in the online gaming segment. If customers favour the lager variety of game portals, game console vendors will most likely have to give up their lock in strategy and open up this part of the value network for other content providers.

7.5.4. Data security

Data security services are offered either with or without intermediaries. Through e-commerce customers can buy the required software directly from the manufacturing companies, e.g. Symantec. However through different bundled offerings these services, with the same manufacturing companies, are offered to customers by broadband providers. The most significant change to this value network would appear if Microsoft continues to strengthen their position in this service area. By equipping all products with a Microsoft operating system with their additional anti-virus software the market for additional companies within this area would be eroded. The evolution of viruses might cause disruption in this industry. New viruses might require totally new solutions. If the dominating companies within this service fail to constantly monitor the virus evolution, opportunities for new entrants will arise.

7.5.5. IP telephony

Through offering IP telephony, broadband providers have also become providers of voice services. While there are different technical solutions to implement IP telephony, companies such as the new entrant Skype are also challenging incumbent telecommunication companies in the voice service area. IP telephony enables a less static relationship between customers and their service provider. Larger amount of companies marketing similar solutions in combination with increased buyer power, implicates increased network dynamics. Dynamics might also increase as IP telephony solutions become available for mobile handsets. These solutions fuel the fixed to mobile replacement and forces existing communication providers to change their offerings.

7.5.6. Online storing

Online storing companies today have a direct relation with customers. As customer behaviour and user needs changes more players are likely to be a part of this network. If the forecasted demand for content accessibility everywhere holds true, the value networks appearance will change. The ability to offer seamless content accessibility would be an excellent opportunity, given the resources and competencies required, for communication providers to enter this business.

7.5.7. Socializing services

Providers of socializing services have a direct relation with customers. Messaging applications can be downloaded from different developers' websites. The suppliers of these services create a lock in effect of customers while there is limited interoperability between the messaging clients from different companies. The suppliers of messaging clients hold an interesting position for the future. Further development of these clients would constitute as an excellent platform to offer additional services. If the existing rumours, presented in chapter 6, regarding the launch of a video on demand service through MSN messenger are true, extreme changes will be apparent. This change would cause the interplay of previously unrelated networks. The interplay would moreover increase competition and in extension introduction of new service offerings and reposition of companies.

7.5.8. Triple play

The increased dynamics from the introduction of e-commerce and new technology transitions is being addressed by a number of companies' part of the communicating home industry. To decrease the dynamics and also secure larger flows of revenues, a number of companies converging from different industries, such as Comhem and TeliaSonera, have started to market bundled services - triple play. Except from broadband connectivity the triple play offering includes IP telephony and digital TV. Through strategic alliances other companies will market similar solutions. If triple play becomes a commodity product, dynamics will ones more increase as new ways to compete will be sought.

7.6. KEY CONCLUSIONS

In this chapter a five forces framework for the communicating home industry has been developed (see figure 7.1.). One of the competitive forces is somewhat different from Porter's original framework. It is the substitute category that has been replaced by a complement category since the growth of new goods and services will add value and increase the profit potential for the industry when reaching a high penetration. Actors of communication technologies, goods and access services are meeting tough and increasing competition. The competition has been further reinforced by the convergence that is taking place in this part of the industry. However, the barriers of entry are high. Concerning actors providing content the situation is completely different. These, often small actors, are meeting sparse competition and high growth. On the other hand it is relatively easy for new actors to enter this part of the industry. Last, but absolutely not least, all actors of the communication home are meeting ever more fastidious end-customers with almost perfect information that wants better products at lower cost.

The above described development shows that value migration is present within the communicating home industry. Actors of communication technologies, goods and access services are found to be in what Slywotzky calls the stability stage or in the value outflow stage. Actors providing content services are on the other hand in the value inflow stage. This will have great implications and will most probably transform the appearance of the communicating home industry structure in the coming 3-5 years.

There is a strong resemblance between the value creating processes for the PC industry and the consumer electronics industry. The value structure is composed of three parallel value systems forming a value network. However the involvement of Internet changes the rules of the game in a couple of different ways; a new actor, the information broker, enters the value network with characteristics that enables, end users to perform a rational purchase, basically by providing information. Another impact of Internet is that the importance of where the actors are located vanishes. This opens a window of opportunity for non virtual retailers, due to the decrease of barriers of entry, to enter the value network and increase the dynamics of the market.

The value creating processes for the service part of the communicating home is characterized by networks structures. The Internet increases buyer power. To meet changes in user demands and tougher competition, companies' must constantly change their positions. The pursuit of new business opportunities and adaptation to changes in market dynamics conveys new industry interplay, convergence, and opportunities for new entrants. Companies' part of the industry is trying to decrease the dynamics through bundling of services, e.g. triple play. Some companies hold very attractive positions as they are present in several of the value networks for the services part of the communicating home. As these companies, e.g. Microsoft, capitalize on their attractive positions significant changes to the value networks part of the communicating home will be present.

8. BUSINESS MODEL FOR TELIASONERA IN THE COMMUNICATING HOME INDUSTRY

This chapter of the master thesis aims at using the facts and conclusions from previous chapters to develop a business model for TeliaSonera in the communicating home industry. The chapter begins with
theory explaining what a business model is and how to develop one by answering six questions. These questions are then used to design a business model suggesting TeliaSonera to develop a service content portal. Other possibly attractive and unattractive business opportunities within the communicating home industry are also addressed.
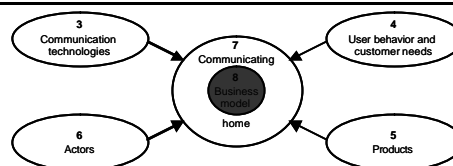
8.1. THEORY EXPLAINING WHAT A BUSINESS MODEL IS

During the Internet boom business model was one of the most used concepts. Misused during most of the time, the meaning of the concept got confused. Nevertheless a business model is the core of every successful business, no matter if it is an established firm or a new venture. At its essence, a business model is a story describing how a company works.[301]

A business model should be developed in an iterative fashion. When the first draft has been implemented, a launch should follow and then careful attention to market reactions should be given. The market reaction act as feedback which is used to set the strategic directions for further development of the business model. This working process has similarities with the scientific method where point of departure is taken in a hypothesis which thereafter is tested and changed if necessary.[302]

8.2. THEORY EXPLAINING HOW TO DEVELOP A BUSINESS MODEL

To derive a business model a number of areas must be addressed. The development process can be structured by answering six questions:[303]
1. How will the firm create value?
2. For whom will the firm create value?
3. What is the firm's internal source of advantage?
4. How will the firm position itself in the marketplace?
5. How will the firm make money?
6. What are the firm's time, scope and size ambitions?

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[301] Magretta (2002)
[302] Ibid.
[303] Morris et al (2005)

8.2.1. How will the firm create value?

The value offering of a firm addresses decisions like the nature of the goods/service mix, the firm's role in the goods/service delivery and how the value offering is made available to customers and users. In order to make these decisions, questions like the degree of customization, the size of the market, the degree of bundling in the offerings, which parts that should be outsourced and which distribution channels to be used need to be answered. A value proposition is necessary in all businesses to justify the business entity.[304]

8.2.2. For whom will the firm create value?

To reach success with the value creating process, the target segments of the offering have to be identified. It involves investigating the customer types, their geographic location and in what way they want to interact with the selling actor. Another important topic to discuss is where in the value chain the customer is positioned. The customer could for example act as a supplier, wholesaler, retailer or final customer. Last but not least it is important to decide whether to market the offering to a broad or niche market. Many business models fail because of a lack of understanding for the intended customer group.[305]

8.2.3. What is the firm's internal source of advantage?

Understanding the firm's internal source of advantage means to develop a thorough understanding of core competencies of the firm[306]. Core competence is a term coined by C. K. Prahalad and Gary Hamel to distinguish those capabilities fundamental to a firm's performance and strategy.[307]

Advocators of the resources based view on strategy states that competitive advantage is created by exploiting the unique resources and capabilities a company possesses. Capability has, in this context, the same meaning as core competence which was described earlier but it is important to recognise the difference between resources and capabilities of a firm. A firm's resources are basic units of a resource based analysis. Examples of such resources are manufacturing equipment, human resources, intellectual capital, patents and the ownership of brands and trademarks. However, in most cases, these resources do not create value for the company by themselves. Instead, they must work together in order to create an organizational capability. A firm must continuously develop their resource and capabilities, fill resources gaps and build organizational capabilities for the future.[308]

Robert M. Grant analyses resources of a company by dividing them into three different categories: tangible, intangible and human resources. Financial and physical

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[304] Morris et al (2005)

[305] Ibid.

[306] Ibid.

[307] Grant (2002) p.145

[308] Grant (2002) p.138-140

resources are the two major forms of tangible resources. These resources decide a company's ability to make investments and to produce in a cost efficient way. Technology, reputation and culture are examples of intangible resources. Technological resources, in this case, refer to patent portfolio, copyright, trade secrets, research facilities, technical and scientific employees, etc. Good customer reputation can be accomplished through the ownership of brands and trademarks which ultimately make the users draw parallels to quality and reliability. Human resources can be employers' skills, know-how, capacity for communication and collaboration and their motivation and commitment. These factors will, among other things, decide a company's ability to adapt to a swiftly changing environment.[309]

Jay Barney uses a slightly different categorization of resources. He divides them into four categories called financial, physical, human and organizational assets. Financial and physical resources are the same as what Grant refers to as tangible resources. This includes debt, equity, retained earnings, machines, manufacturing facilities, etc. Human resources are also a category in both the division of Grant and Barney and consist of all experience, knowledge, judgement, risk-taking propensity and wisdom of the employees of the company. Barney's organizational resources show similar characteristics as Grant's intangible resources. These assets consist of history, relationships, trust and culture between groups within the firm. They also include a company's internal structure, control systems and dominant management style.[310]

8.2.4. How will the firm position itself in the marketplace?

Given the capabilities of the firm and the competitive situation in the marketplace, a firm should position themselves to achieve competitive advantages within the chosen industry. Positions that could be taken are e.g. innovation leadership, cost leadership, differentiation strategies.[311]

To identify an attractive industry position, theories from Porter and advocators of the resource based view can be combined. According to Porter, strategy formulation is about finding an attractive industry and then positioning the firm to achieve cost or differentiation advantages within that industry. This is often referred to as strategy as position. Advocators of the resource based view instead states that competitive advantage is created by exploiting the unique resources and capabilities a company possesses which was stated above. Companies using Porter's theories have had a tendency to adopt similar strategies. Firms with resource based strategies, on the other hand, assert that profitability is not created by doing the same thing as competitors. Instead, these companies try to exploit the differences.[312]

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[309] Grant (2002) p.139-140
[310] Barney (1994)
[311] Morris et al (2005)
[312] Grant (2002) p.137

Grant has developed a method in order to take advantage of the best ideas from both strategy as position and the resource based view of strategy. It tells how a company can think to implement a strategy that brings competitive advantage. In the below figure, Grant's resource categorization has been replaced by the categorization of Barney:[313]
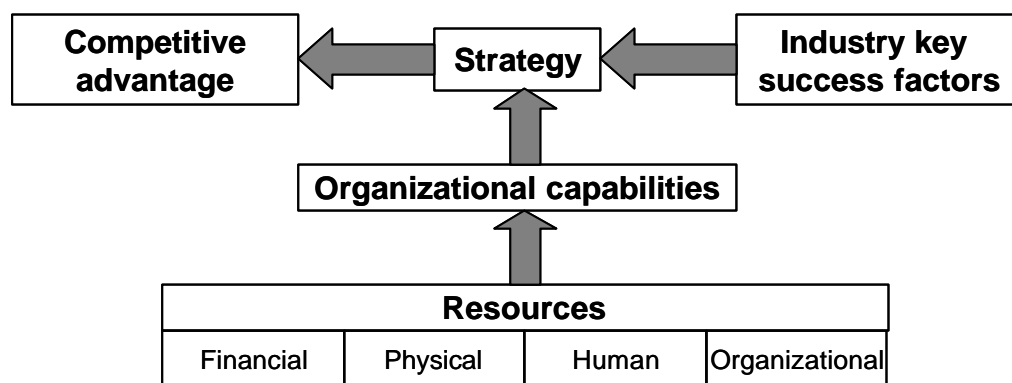

Figure 8.1. Grant's view on how to combine strategy as position and the resource based view. Grant's resource categorization has been replaced with the one of Barney.[314][315]

Grant states that a strategy implementation should begin with two parallel activities. One of these is to analyse the resources of the firm and the organizational capabilities these resources constitutes. The other one is to analyse the outer environment of the company by identifying the key success factors within the industry. A strategy, which leads to a competitive advantage, can then be developed by matching the internal advantages of a firm (the organizational capabilities) with the opportunities in the industry (the industry key success factors).[316] Raphael Amit and Paul Schoemaker have developed a model that has a similar message as the one of Grant but with different nomenclature.[317]

8.2.5. How will the firm make money?

By establishing an economic model which addresses how a company will make money, a consistent logic for earning profits can be found. This model must address areas such as the flexibility of pricing and revenue sources, the operating leverage i.e. in which extent the business is run by fixed and variable costs, the firm's emphasis on production volumes in terms of both market opportunity and internal capacity and the firm's ability to achieve satisfying margins.[318]

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[313] Grant (2002) p.139
[314] ibid
[315] Barney (1994)
[316] Grant (2002) p.139-152
[317] Amit & Schoemaker (1993)
[318] Morris et al (2005)

8.2.6. What are the entrepreneur's time, scope and size ambitions?

A business model has to be consistent with the vision of the firm. This can be achieved by using an investment model. The model must address factors such as growth plans, financial obligations, time frames and risk preferences.[319]

In order to realize a business model, the appropriate resources and capabilities must be in place. Missing resources and capabilities can be addressed in different ways depending on the growth plans, financial power, time frame and risk preferences of the company. There are basically three different ways to do this:[320]
- Internal development.
- Acquisitions.
- Alliances.

How an organization chooses to develop the needed resources and capabilities is situation dependent. Internal development is especially a favorable solution in cases where there are competitive advantages to be gained by a good understanding of the development process. By using internal development political, and cultural issues that sometimes are present in times of post-acquisitions do not arise.[321]

Acquisition means that a company is taking over another firm. It offers great time to market advantages as it allows an organization to enter new market or product areas very fast. Acquisitions are often triggered by the need to keep up with an ever changing business environment.[322]

An alliance means that two or more companies share a set of mutually needed resources and capabilities. There exist several types of alliances. Which form an organization chooses is dependent on the intention with the alliance. There exist formal alliances such as joint ventures where companies devote some of their resources to a new organization that is owned by the participating companies. More informal alliances such as networks also exist. In network alliances two or more organizations work together through mutual trust and not through formal contracts.[323]

8.3. DEVELOPMENT OF A BUSINESS MODEL FOR TELIASONERA

Below is a business model developed which describes how the authors suggest TeliaSonera to act in the communicating home industry. Point of departure is taken in the six questions telling how to develop a business model which was described in the theory section.

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[319] Morris et al (2005)
[320] Johnson(2002)
[321] Ibid.
[322] Ibid.
[323] Ibid.

8.3.1. How will TeliaSonera create value?

As stated in chapter 7 a value migration is present from communication technologies, goods and access services to more content oriented services. Therefore, content oriented service areas will offer excellent business possibilities to capitalize on for TeliaSonera. This is further reinforced by the high willingness from customers to pay for correct priced content services and the lack of content services which is holding back the transition towards a communicating home. These conclusions were made in chapter 4.

To capture the business possibilities enabled by the emerging service market for the communicating home, TeliaSonera must develop resources and capabilities to increase their presence in the service area. The suggested industry position of TeliaSonera in the communicating home can be seen as a further development of today's triple play offering. In the first place the offered services should, according to the authors, include IPTV, music on demand, online gaming, video on demand, data security and online storing. These content services should be collected at the one place which makes them easy to access for the users – a content service portal. The portal can in a later phase easily be complemented with more services.

The following five questions of how to develop a business model will explain why a portal is a lucrative business opportunity and how it should be implemented. Before proceeding to these issues, an investigation of other possibly profitable and not profitable business areas will be discussed. As seen from the suggested services, IP telephony is left out. The reason is that the authors can not see any benefits of offering the IP telephony service through the portal as of today. TeliaSonera should evidently, continue to supply IP telephony and regular telephony to the Swedish population. The plans of TeliaSonera to build a new IP-based core network to support mobile telephony, fixed telephony, TV and other Internet services through a single network is a good idea. This network can be used to offer all services in a cost efficient manner. It will also be an advantage when implementing a solution for roaming between IP telephony and mobile telephony which was suggested in chapter 5. The future will also bring business opportunities for TeliaSonera by letting customers control their homes and access their content through mobile handsets and other devices. It will make mobility and flexible consumption possible, which were two of the most important user needs identified in chapter 3.

In addition to the content service portal, the authors suggest that TeliaSonera continues to sell broadband accesses. As stated in chapter 7, increased competition is however to be expected within this area with decreasing margins as a consequence. The problem with shrinking margins can be solved if today's trend with dial-up to broadband replacement is followed by a broadband to faster broadband replacement. The price can then be hold rather constant with equal margins as of today as a result. This is a likely scenario since the services of the communicating home, like video on demand, require more bandwidth.

When it comes to goods, the authors strongly recommend TeliaSonera not to participate in this part of the communicating home industry. The competition is growing even stronger and the margins are ever decreasing. There is neither any risk that the customers not will be able buy the necessary equipment since many actors are offering the goods. A possible opportunity could be to let these actors sell their goods through the portal and take a percentage of the profit. The Telia stores, with competent staff, could also play a role in advising the customers in which type of goods to buy. These stores should however not sell goods but will play an important role in form of a show-room and to sell access services. In this kind of show-rooms the benefits of the communicating home concept can be demonstrated to the customers. It is likely that manufacturers of goods gladly contribute with goods to show the customers in this kind of forum, which will improve the relations with these kinds of actors. In a longer time perspective it is possible to use the competence from the Telia stores to advice customers regarding which goods to buy. This service is today offered by well established information brokers so TeliaSonera must have a very good strategy to reach success within this area.

Another, possibly attractive, role in the future communicating home is the one of being an installer and maintainer of home networks. According to the authors, this market might not be mature enough in a 3-5 years perspective but when users are beginning to connect goods in the homes into network this might be an attractive position to take. This evolution will most certainly come true, but the question is when. TeliaSonera has however the essential knowledge to take this kind of role although it is not seen as part of the core business today.

8.3.2. For whom will TeliaSonera create value?

Appropriate market segments to which the marketing campaigns should be directed to were identified in chapter 3. The first conclusion from this chapter was that the communicating home is far from implemented and it will be necessary with heavy marketing campaigns to accomplish this. The first wave on the transition towards a communicating home will however be focused on entertainment in the living room.

In order to understand where to direct the marketing campaigns, the Swedish population was divided into four segments which were analyzed. This analysis concluded that 15-25 years old and 26-59 years old with children are the two most important segments. These two segments will constitute most of the innovators and early adopters and are willing to try the communicating home at some risk. It will be extremely important for the future communicating home to reach acceptance within these segments since they will be opinion leaders for the 26-59 years old without children and the above 60 years old segments.

8.3.3. What is TeliaSonera's internal source of advantage?

The analysis in this section builds on facts from TeliaSonera's report for the first quarter 2005. These facts has been complemented with the authors own opinions of

the organization which has been developed through lots of interviews with employees and informal discussions in the open-plan office.

Barney and Grant exemplify financial resources with debt, equity and retained earnings which constitute a company's ability to make investments. The TeliaSonera group had cash and cash equivalents of 14 950 million SEK at the 31st of March 2005[324]. This must be considered to constitute a high investment capability. Another important financial resource is the customer base. The TeliaSonera group had a customer base of 26 million customers at the 31st of March 2005[325]. This figure further reinforces the conclusion that TeliaSonera got strong financial muscles.

Skanova is TeliaSonera's brand name for offerings at the Swedish network capacity wholesale market. The network is the largest and most secure of the Swedish networks which allow TeliaSonera to produce communication services in a cost efficient manner.[326] The access and ownership of the network is the absolute most important physical resource of TeliaSonera.

Human resources could, according to Barney and Grant, be things like employers' skills, know-how, motivation, commitment, experience, risk-taking propensity, etc. The authors' comprehension is that TeliaSonera holds state-of-the-art technical skills and know-how due to many years of experience. The employees of TeliaSonera also seem to have great commitment and there exist some kind of "TeliaSonera spirit". The age structure, with many employees that are 50 years old or above, might be a threat in the future. A good guess is that this age structure in some cases brings lower motivation and risk-taking propensity. It is a consequence of the stage of life that many employees are in where they are rather satisfied with their current situation and don't want to much change. This might be a bottleneck in the attempt to adapt to an ever changing environment. TeliaSonera's understanding of what the users want and the ability to quickly translate this knowledge into appealing offerings could also be better. The authors' think this is a remnant from the long time as a monopoly company where the competition from other companies didn't need to be addressed. Another reason might be the low risk-taking propensity and the high fear of failures.

Research facilities, ownership of brands and the relationships, trust and culture between groups within the company are, according to Barney and Grant, examples of organizational resources. Internal structure and dominant management style are other examples. TeliaSonera has a strong tradition of research facilities like Telia Research which today has been transformed into other R&D-organizations. The Telia brand which is used to market the products of TeliaSonera to the Swedish market is most likely associated with quality and reliability which is extremely important to attract customers. The brand is however also coupled with above average prices which work in the other direction. Other brands like Halebop are however associated with low

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[324] www.teliasonera.com, Interim report Q1 2005, 2005-05-05
[325] Ibid.
[326] www.skanova.se, 2005-05-05

prices. The authors think that there, to some extent, exist segregation between different groups within the TeliaSonera organization, especially between different cities and countries. Together with the fact that TeliaSonera is a large company with 27 000 employees, the segregation makes the company a sluggish organization. It takes time to adapt to changes and to get new products on the market. This can also be seen in the internal structure and management style where there exist to many decision levels resulting in a long time to make decisions which further reinforces the slow adaptation process.

8.3.4. How will TeliaSone ra position themselves in the marketplace?

This section aims at answering the above question by using the theory of Grant described in figure 8.1. It means that the internal resources and capabilities will be matched with an appealing industry position which can create a competitive advantage for TeliaSonera.

As stated in chapter 7, the value creating process for the service part of the communicating home is mostly characterized by network structures. Some of these networks include large multinational actors, while others consist of smaller and more local companies. In all networks further technical development, new customer demands, new companies and the chase for new revenue sources are expected to increase the dynamics and incur more changes to the value creating processes. To decrease the dynamics and secure larger flows of revenue companies have started to market bundled service offerings, i.e. triple play. However, in other parts of the service industry strategies focused on just one kind of service dominate. As an example are companies offering video on demand not the same as those offering music on demand.

In the figure below the suggested position of TeliaSonera's content service portal is presented:
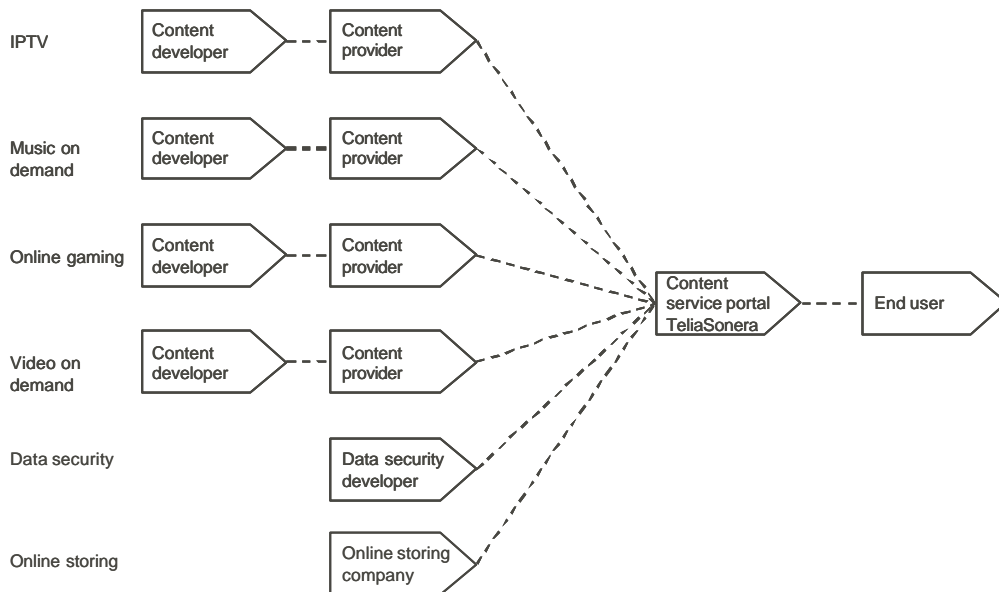
Figure 8.2. The suggested position of TeliaSonera's content service portal.

As seen in the figure above the suggested position shows resemblance with the position the information broker holds concerning goods. The idea is that the six services should be collected at one place where the customers can access them all – a content service portal. TeliaSonera has great prerequisites to offer the customers such a solution since they can make the portal to the users "first page" when they are installing a broadband access service from TeliaSonera. Many users do not change their first page and will then go through the portal every time they access the Internet. The portal must however be much more appealing than Telia's current portal (www.startsidan.telia.se). It contains too much information and is hard to navigate. The authors suggest a benchmarking strategy against other successful portals outside Sweden. By developing the "first page" to a portal, a win-win situation between TeliaSonera and the customers will be created. TeliaSonera sells content and the customers get all wanted content collected at on place which will save time and increase convenience. The large customer base that TeliaSonera holds will also attract content developers and content providers to offer their services through the portal. This will attract even more customers, TeliaSonera will generate even more revenues which will attract even more content developers and content providers. A good circle is created.

Through the content service portal TeliaSonera achieves the central position in the value network concerning content services in the communicating home, which will increase TeliaSonera's power in this part of the industry. Increased power implicates less influence from network dynamics, and in extension a higher and sustainable profitability. The value creating process for the services offered through the portal will differ in appearance. In order to extend the service portfolio, and realize the future position in the communicating home, a mix of internal development,

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acquisitions and alliances will be needed. How to implement the six different services will be presented when question six is addressed below.

To reach success with the content service portal the most important user needs identified in chapter 4 must be addressed. It means that the portal must offer simplicity which is achieved by collecting all wanted services in a way so that they are easy to access. By making the services accessible from all kinds of devices at all times, mobility and flexible consumption is also guaranteed. The portal also offers a possibility to collect information about the users, which can be used to tailor the offering to the customers. Security and integrity is addressed by the data security service which will decrease the feeling of risk and uncertainty that the users are struggling with today. Most important of all, the services must have an appropriate price. In addition to the large customer base and the advantage of providing the "first page" to most of these customers, TeliaSonera has other resources that are suitable in the development of a portal. These were discussed above and are high investment capability, the ownership of the communication network, state-of-the-art technical skills, know-how and experience and a brand associated with quality and reliability. However there also exists a low risk-taking propensity, the brand is associated with above average prices and there is danger that the organization can't adapt fast enough to a changing environment.

8.3.5. How will TeliaSonera make money?

To establish a consistent logic of how TeliaSonera are able to make money in the chosen market segment a thorough mapping of the three different currencies in the value network, described in chapter 7, must be accomplished. These value flows have the following appearance:
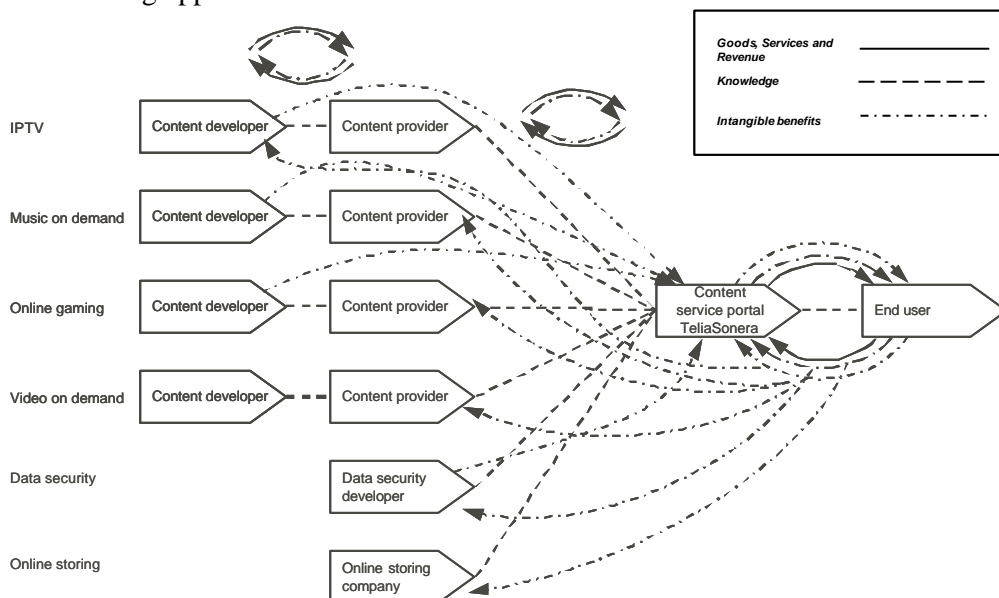

Figure 8.3. The flow of the three value currencies between actors being part of the suggested content service portal.

Between all actors, interconnected with each other in the value network, a flow of the goods, service and revenue currency is present. With starting point from end user, every actor providing value is paid a fee for their value adding service. This is shown in figure 8.3 as the continuous arrows that display the currency transactions of the value exchange. In this context every arrow is symbolizing a fee for a value adding service.

The content service portal position suggested to be taken by TeliaSonera holds other great values than just delivering a service for a fee. By getting to know the customers via e.g. questionnaires and the understanding of buying patterns, a differentiated and personal offering to every end customer can be offered. This extensive understanding about the customers gives TeliaSonera great business opportunities as the gathered knowledge can be capitalized by selling this information to actors positioned further back in the value network. This knowledge facilitates an optimized production flow of services with a minimized risk of producing obsolete services that are not demanded. However it is up to the actor holding the position as a content service portal to determine how and if this information should be spread in the network. It is however likely that TeliaSonera wants to share the gathered knowledge since they can earn profits from it and it will also favour the content service part of the industry as a whole.

Launching new services through the content service portal incurs low costs. This enables TeliaSonera to, in a cost efficient manner, further develop their business model for the communicating home in an iterative fashion. By using the content service portal new services can be tested and the markets reaction to these services can thereafter easily be collected. The collected information can then be used to point out in which direction further development should be done. This is just in line with Magretta's theory of how a business model is supposed to be developed which was described in the theory section. Realizing an evolution based approach for the development of new services helps TeliaSonera to reach success in the communicating home industry.

Taking a point of departure in the position of the content service portal, TeliaSonera will receive loyalty from end users through providing them what they demand in an easy way. In addition to this an Internet forum, administrated by TeliaSonera, with all users of the portal having the ability to express their preferences will establish a sense of community around the content service portal. This might be a first step towards the information broker role which was discussed in an earlier section. The Internet forum can in a later phase be enlarged to include other demanded community services and other socializing services. Another way for the portal to receive loyalty from customers is by providing mechanisms to offer payment in an easy manner, e.g. by letting users specify their credit card number when visiting the portal for the first time which then is stored in a secure and reliable way.

Looking backwards in the value network shows that the loyalty of the customers is twofold. While TeliaSonera achieves loyalty through providing demanded services,
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the reception of the services is closely interconnected with the manufacturers' brands. If the brand delivered through the content service portal is well established, an image enhancement in the form of a value flow, will occur to the portal (see figure 8.3). In the case of IPTV, TeliaSonera will receive loyalty from providing the customers demanded programs and movies. However, customers are not loyal to the specific TV provider e.g. TV4 but to the programs/movies that are shown. This gives a value flow of loyalty from the end user back to the content developer. When it comes to music on demand and video on demand the value transactions for these two services are similar; artists/actors/directors, the content provider and the portal are likely to receive customer loyalty. The artists/actors/directors will get personal loyalty from customers while the content provider and the portal will get loyalty for their ability to deliver a great access to the created content. This was discussed in chapter 7. In the area of online gaming TeliaSonera have to develop a gaming portal which will function as a community to keep customer loyalty within the content service portal. Hence, having a service like this will create enhanced customer loyalty both to the content service portal, which again provides the customer they want, and to the content provider. As stated in chapter 4, the data security service is likely to reach a high and fast market penetration. Collaborating with key players within this industry will therefore be of great importance for TeliaSonera for offering a data security solution. In this scenario, trust of the manufacturing brand will most likely create loyalty from customers, given that the service fulfils their needs. The content service portal will therefore receive loyalty from customers. The value exchange within the area of online storing is closely related to the data security area. Loyalty will be connected to both the content service portal and the manufacturer's brand. However, because of the non-existence of well-known brands within this area, as of today, most loyalty will transacted to the portal.

8.3.6. What are TeliaSonera's time, scope and size ambitions?

Internal development or acquisitions are not economically feasible solutions to realize offerings in the following service areas; data security, IPTV, music on demand and online gaming. The barriers of entry in these areas are high and the participating companies are large multinational actors. Consequently, internal development would be to resource consuming and acquisition to capital intensive. Therefore, alliances appear to be an attractive solution to create these service offerings. However, the alliance characteristics in the IPTV area will be somewhat different compared to the other areas. To offer a large variety of channels and fulfilling customers' future demand for a more tailored experience, TeliaSonera needs to create alliances with a large amount of TV channels. In the other service areas the alliances should be characterized by tight interaction with a small amount of partners. The partners chosen should be dominant and well recognized actors within their service area, e.g. Symantec supplying data security services, iTunes supplying music on demand services, and EA games supplying online gaming services. A win-win situation is created for the participating companies. While TeliaSonera owns the content service portal which many customers view when they access the Internet, content providers will be given a guarantee that their offerings reach large amount of customers. Portal

traffic will reach fast uptake and growth because chosen partners' brands are well recognized among customers.

As TeliaSonera already possesses the resources and capabilities needed to create an online storing service, internal development of this service is the most attractive solution. The corporate brand TeliaSonera has already got the perception needed among consumers to trust them with their highly valued information. Reliability is another key word, that TeliaSonera is associated with, which is important to reach success within this service area.

The industry structure for video on demand services offers attractive business possibilities. TeliaSonera should develop resources and capabilities to become the dominant content provider within this area. Resources and capabilities needed to succeed in this area are missing. With TeliaSonera's financial strength an excellent solution is however to buy an existing content provider. Acquisition also enables fast market presences, and furthermore well established connections with content developers which is essential as the window of opportunity for this service area is wide open but will be closed in the near future. Considering the recent merger between Telia and Sonera, competence to ensure a successful acquisition and minimization of post-acquisition issues exist in-house.

It should be noted that the content service portal is well in line with TeliaSonera's vision, presented in chapter 1. Extending the service portfolio, and making services available to users in the above presented way, is a strategic action that doubtlessly will increase the perception of TeliaSonera as the leading service provider *"supplying users with the most optimal technical solutions perfectly tailored for their needs"*

8.4. KEY CONCLUSIONS

A value migration from communication technologies, goods and access services to more content oriented services is present. Among customers there is a high will to pay for content services. The number of suppliers of such services are however quite sparse in some of these service areas. TeliaSonera's suggested future position in the communicating home industry can be seen as an extension of the existing triple play offering. By extending the product portfolio TeliaSonera should initially market IPTV, music on demand, video on demand, data security, online storing and online gaming. The services can easily be extended and will be made available to users through a content service portal. It gives TeliaSonera a position in the content service industry similar to the one of the information broker in the goods part of the communicating home industry. Through the content service portal TeliaSonera's power in the service part of the industry will increase. More power implicates less influence from network dynamics and furthermore higher and sustainable profitability.

TeliaSonera should also continue to sell their broadband accesses. It is very important to defend the leading position in this market segment since it implies that most of the

subscribing customers will go through TeliaSonera's content service portal to access the Internet. The goods part of the communicating home industry should be avoided as the profitability will be low. The Telia stores will however play an important role as a show-room to demonstrate the benefits of the communicating home concept. The knowledge that the Telia stores have might also be used to offer information broker services in a longer time perspective. The competitive situation in the information broker area will however be fierce since well-established actors are present. Another interesting business possibility is the roaming between the IP telephony and mobile telephony. In a longer time perspective than 3-5 years, services enabling access of content and control of the homes might be attractive. To be installer/maintainer of home networks might also be a business opportunity.

The initially most important segments for TeliaSonera to address in the communicating home industry, will be the segments 15-25 years old and 26-59 years old with children. Most innovators and early adopters are found within these segments and they will act as opinion leaders for other segments.

TeliaSonera holds a number of resources which provides an excellent foundation for developing services for the communicating home. For example has TeliaSonera an impressive financial strength, extensive technical know-how, strong corporate brands, ownership of infrastructure, and a "TeliaSonera spirit". However, age structure and the presence of subgroups are issues that have a negative impact on the organizations ability to adapt to changes which might jeopardize the future success.

The content service portal enables TeliaSonera to capitalize on all three currencies present in a value network. The ordinary transaction currency in the form of goods, services and revenue will be present throughout the whole value network. In addition to this, TeliaSonera has the ability to capitalize on information collected from customers – the knowledge currency. TeliaSonera would preferably sell this information to companies further back in the value network to be able to offer demanded services fast and to eliminate the risk of producing obsolete services. When it comes to the loyalty aspects TeliaSonera has great potential to receive much of that value currency through the content service portal. While TeliaSonera receives loyalty from customers through providing demanded services, they will as well get a part of the loyalty already created by well established brands through establishing partnerships.

When it comes to implementing the declared services, TeliaSonera has the choice to develop them internally, to buy a company which provides the service or to collaborate with other actors through partnerships. IPTV, data security, music on demand and online gaming should be provided through alliances. It is of great importance to form alliances with well-established and strong brands. TeliaSonera has a strong negotiating position in forming these alliances. The negotiating power originates from the fact that the other parties of the alliance are guaranteed a large number of customers since the customer base of TeliaSonera is extensive. Regarding the online storing service the recommendation for TeliaSonera is to internally develop

such a service. The reason is the already existing resources and capabilities within the firm are well suited for developing such a service. Concerning the video on demand service, it is probably best to implement it through an acquisition of a video on demand provider. By making an acquisition TeliaSonera will be able to reach market presence while the window of opportunity still is open.

9. CONCLUSIONS

In this chapter the three purposes from chapter 1 are addressed. Purpose one is treated by summarizing the key conclusions from chapter 3-6, purpose two is taken care of by summarizing the key conclusions from chapter 7 and the third and last purpose is addressed by summarizing the key conclusions from chapter 8.

9.1. DEFINITION OF THE COMMUNICATING HOME IN A 3-5 YEARS PERSPECTIVE

The communicating home concept can be defined by investigating the dominating communication technologies to/from and in the homes, the most important customer behavior and user needs, the dominating products and the dominating actors of the industry.

Communication technologies in the access network will in urban environments be dominated by xDSL, coaxial cable and to some extent Ethernet. In more rural areas wireless access alternatives like TDD and WiMAX are alternatives. The core network will consist of optical fiber which on average will reach to the closest station before the buildings (FTTC). Wi-Fi will be the absolutely dominating communication technology to connect equiptment in-house. Wired alternatives like USB and Firewire and wireless alternatives like Bluetooth, and possibly UWB and Zigbee will complement Wi-Fi in some usage areas.

The digital home is in place but the communicating home has a long way to go to reach mass adoption. Therefore, massive marketing campaigns directed to the segments 26-59 years old with children and the 15-25 years old, are necessary. The first step towards a communicating home will be focused on entertainment in the living room. It is enabled by broadband connectivity, a home network and a critical mass of home electronics. The following user needs are important to address; compatibility with users values and experiences, simplicity, appropriate pricing, mobility, flexible consumption and security.

Products that have been found to play an important role in the transition towards a communicating home are advanced mobile handsets, digital cameras, digital video cameras, DVD recorders, game consoles, home theatre systems, media centers/PCs, MP3 players, multifunctional remote controls, portable media centers, set-top boxes, TV sets and wireless routers. Products that not have been classified as dominating are intelligent white goods, sensors and web cameras. These products might however reach a high market penetration in a longer time perspective than 3-5 years. Broadband connection, content accessibility, data security, digital TV, IP telephony, music on demand, online gaming, online storing, socializing services, tailored services and video on demand been identified as dominating services in 3-5 years. Services considered as not dominating are healthcare services, home automation, home control, home security and video telephony. As in the goods case, these services might also turn into successes beyond 5 years.

Microsoft will be the most dominant player in the communicating home industry. The communication technologies to/from the homes will be dominated by giant global players like Alcatel, Cisco, Ericsson, Intel, Nokia and Siemens. However, there exist great business opportunities for new smaller companies like I3Micro and Kreatel. When it comes to in-house communication technologies D-link is an interesting actor. Consumer electronics is dominated by global players. Samsung and LG will be the most prominent of these. Access services are also dominated by relatively large players like TeliaSonera, Tele2, Comhem, Canal Digital and Bredbandsbolaget. The area of more content oriented services leaves space for smaller actors but the risk for acquisitions must be considered as high. Information brokers such as Pricerunner will also have a very important role in advising customers about which goods to buy in the future communicating home.

The first purpose, definition of the communicating home in a 3-5 years perspective, was summarized in the picture in the end of chapter 6.

9.2. EVALUATION OF THE COMMUNICATING HOME AS A MARKET PLACE IN A 3-5 YEARS PERSPECTIVE

A value migration is present within the communicating home industry. Actors of communication technologies, goods and access services are meeting tough and increasing competition. The competition has been further reinforced by the convergence that is taking place in this part of the industry. However, the barriers of entry are high. Concerning actors providing content the situation is completely different. These, usually small actors, are mostly meeting sparse competition and high growth. On the other hand it is relatively easy for new actors to enter this part of the industry. This will have great implications and will transform the structure of the communicating home industry in the coming 3-5 years. This transformation will be further reinforced by ever more fastidious end customers with almost perfect information that demands better products at lower cost.

The value creating process for traditional industries, like the PC and consumer electronics industry, supplying goods for the communicating home has a similar appearance. The value structure is composed of three parallel value systems forming a value network (see figure 7.3). However, the involvement of a new actor, the information broker, which offers customers advices and comparisons when buying devices, will change the value structure of the goods part of the industry. The information broker will have a central role as the spider in the web, which will make value migrate in the value network described in figure 7.3. When it comes to the value structure of the service part of the communicating home industry the "information broker-role" is absent. It means that the value creating processes for the service part of the communicating home is characterized by a large amount of network structures connected directly to the end customer without any intermediaries.

9.3. DEVELOPMENT OF A BUSINESS MODEL, EXPLAINING HOW TELIASONERA SHOULD ACT IN THE COMMUNICATING HOME INDUSTRY IN ORDER TO GENERATE PROFIT

TeliaSonera is suggested to take the missing "information broker-role" in the content service part of the communicating home industry. This can be accomplished by developing a content service portal which can be seen as an extension of the existing triple play-offering. By extending their product portfolio TeliaSonera should initially market IPTV, music on demand, video on demand, data security, online storing and online gaming. These services can easily be extended with more services when the time is right. Through the content service portal TeliaSonera's power in the content service part of the industry will increase. More power implicates less influence from network dynamics and furthermore higher and sustainable profitability.

The TeliaSonera group holds many resources and capabilities that will support the development of a content service portal. By developing a content service portal TeliaSonera will receive much knowledge and loyalty in addition to regular monetary value. The gathered knowledge about customer buying behaviours can be capitalized by selling it to other actors of the value network. IPTV, data security, music on demand and online gaming should be implemented through alliances, the online storing service should be internally developed and video on demand should be implemented through an acquisition of a video on demand provider.

TeliaSonera should also continue to market their broadband accesses. Marketing the goods part of the communicating home industry should be avoided as the profitability will be low. The Telia stores will however play an important role as a show-room to demonstrate the benefits of the communicating home concept. Another interesting business possibility is the roaming between the IP telephony and mobile telephony. In a longer time perspective than 3-5 years services enabling remote access of content and control of the homes might be attractive. To be installer/maintainer of home networks might also be a business opportunity for the future.

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