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Effects of Disruptive Innovation at an Industry Level: A Case Study of Mobile Network Operators

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Abstract

Title: Effects of Disruptive Innovation at an Industry Level: A Case Study of Mobile Network Operators

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Purpose: The primary purpose of this thesis is to provide a framework for assessing potential effects of disruptive innovation at an industry level. The findings of our primary purpose will contribute to the theoretical field of disruptive innovation and have practical relevance. In addition we also have a secondary purpose, which is that this thesis shall describe how the mobile network operators have been affected by the disruptive innovation.

Methodology: We have created a theoretical framework and performed a case study of mobile network operators to achieve the purpose of this thesis. The case study has been conducted through an examination of value migration, interviews and gathering of information.

Theory: Disruptive innovation, value migration, business models and value networks.

Conclusions: We have provided an assessment framework through our theoretical framework, case study and analysis. The theoretical framework provided 13 potential factors that can be affected by disruptive innovation and the analysis provided two additional factors, opportunities for complementors and perceptions about the future. The assessment framework can be used either ex-ante to analyze possible future effects of an upcoming disruptive innovation at an industry level, or ex-post to understand how an industry has changed.

Key words: Disruptive innovation, value migration, business models, value networks, mobile network operators, smartphones.
Preface

This thesis is part of a project with the purpose to analyze the mobile telecom industry from 2007 until today. Five groups with two members each have examined different parts of the mobile telecom value network and the findings will be part of a published book, which will be distributed to the mobile telecom industry. The project is organized by Lund University School of Economics and Management in collaboration with the analyst firm VisionMobile.

We would like to thank our supervisors, Thomas Kalling and Benjamin Weaver, for their valuable support in the process of writing this thesis. We would also like to give a special thanks to VisionMobile and Andreas Constantinou for providing us with material and insight in the mobile telecom industry. Moreover we would like to thank our other respondents, Jonas Selén, Nils Rådström, Svante Andersson and Arban Gashi, for providing us with their valuable knowledge and time.

Sincerely yours,

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Definitions

These are the working definitions for common terms used in this thesis:

**App** – a software application that is used on a smartphone.

**App store** – an online marketplace where software applications can be downloaded to smartphones.

**ARPU** – average revenue per unit.

**Conventional phone** – a less advanced mobile phone compared to a smartphone.

**Data access** – a way that mobile phones reach online services using wireless mobile telecommunication networks.

**EBITDA** – earnings before interest, taxes, depreciation and amortization.

**Handset OEM** – handset original equipment manufacturer, a company that designs and brands mobile phones.

**Infrastructure provider** – a company that builds mobile telecommunication networks.

**Messaging** – a way of communicating between mobile phones through written text messages.

**Mobile network operator** – a company that provides telecommunication services and often owns and/or operates one or more mobile telecommunication networks.

**OTT player** – over-the-top player, a company that delivers software content on mobile phones through platforms.

**Platform** – a mobile operating system used on smartphones.

**Portal** – an ecosystem with content for mobile phones offered by a mobile network operator.

**Smartphone** – a mobile phone that includes a mobile operating system, and has more advanced connectivity and computing capability than a conventional phone.

**Telco** – slang for mobile network operator.

**Voice** – a way of communicating between mobile phones through voice calling.
1. Introduction

In the initial chapter the background of both disruptive innovation and the mobile network operators is presented. The background is tied together in the problem discussion which leads to the purpose of this thesis. Delimitations are also presented.

1.1 Background

1.1.1 Disruptive innovation

The term *disruptive innovation* was introduced by Clayton M. Christensen (Anthony et al., 2008). According to Christensen (2013), disruptive innovations are products or services with business models that introduce performance packages that are inferior to what mainstream customers value. During the early development of a disruptive innovation it only serves niche segments. Both the disruptive innovation and the established offerings improve; nevertheless the disruptive innovation improves enough over time to satisfy the mainstream customers and eventually replaces the established offerings and incumbents that exceed the demanded performance (Christensen, 2013). The concept has however been expanded by a number of authors and the concept is often used in a broader sense (Danneels, 2004; Dan & Chieh, 2008).

1.1.2 Mobile telecom industry and mobile network operators

The mobile telecom industry is changing and the competitive landscape for mobile network operators has been disrupted. The industry has changed from an environment characterized by reliability and scale of networks, to an environment where choice and flexibility of services is more prominent. This has changed the basis of competition and represents the shift from “mobile telephony” to “mobile computing” (VisionMobile, 2012a).

Mobile network operators launched third-generation (3G) mobile networks in 2001 and the high-speed wireless data transfer enabled the mobile network operators to distribute more services (Steinbock, 2005). The mobile network operators attempted to control the
services in closed ecosystem *portals* (VisionMobile, 2011). The portals gave the mobile network operators the opportunity to build empires and lock-in the customers by restricting them from accessing potential competitors services.

The development of 3G technologies provided a foundation for the upcoming smartphone era and in 2007 Apple launched the iPhone (Sharma, 2012a). Smartphones had earlier been used by a small segment of primarily business people, but the iPhone managed to target mainstream customers. According to Ahonen (2011) the introduction of iPhone transformed the industry and he refers the demarcation of time in the mobile telecom industry as “before iPhone” and “after iPhone”.

The smartphone era has enabled dozens of new services for phones (Sharma, 2012a), which were boosted by touchscreens (Salz, 2011). Content of smartphones is controlled by platforms such as Google Android and Apple iOS, and not by the mobile network operators. It has caused the mobile network operators portals to decline rapidly and made them loose some of their interaction with end-users (VisionMobile, 2011).

The mobile network operators have previously been able to generate large profits and maintain high margins from the traditional voice and messaging services. But in the smartphone era the profits from voice services have are stopped growing and even declined for some mobile network operators. The usage of data access on the other hand has increased rapidly due to the smartphone usage (Sharma, 2012a).

### 1.1.3 Disruptive innovation in the mobile telecom industry

Disruptive innovation is a relative phenomena, i.e. an innovation can be disruptive to one business model but not to another (Christensen, 2006). Christensen (2013) has defined smartphones as disruptive innovation in relation to computers. In relation to conventional phones, smartphones can also be framed as disruptive innovation since mainstream customers did not value its performance package initially, as discussed earlier in the background of this thesis. Furthermore, services that have been introduced through the platforms have disrupted a large number of markets, for example the mobile network operator portals. Moreover, the basis of competition and structure of the entire mobile
The telecom industry has been disrupted according to Sharma (2012a) and VisionMobile (2012a). The disruptive innovation caused by smartphones and its content is hereinafter referred to as the disruptive innovation.

1.2 Problem discussion

Disruptive innovation has completely reshaped numerous companies and industries, and caused companies to fail while other flourish. Many firms need to periodically engage in processes of disruptive innovation for long-term survival (Christensen & Raynor, 2003). Disruptive innovation has drawn an unusual amount of attention from both scholars and practitioners, which is rare (Danneels, 2004).

We have examined research from a number of authors (Danneels, 2004; Dan & Chieh, 2008; Adner, 2002; Ansari & Krop, 2012; Govindarajan & Kopalle, 2006; Markides, 2006; Bower & Christensen, 1996; Charitou & Markides, 2003; Danneels, 2006, Schmidt, 2004; Utterback & Acee, 2005; Christensen, 2013; Christensen, 2006; Bower & Christensen, 1995; Sandstrom et al., 2009; Christensen et al., 2001; Christensen & Raynor, 2003; Wessel & Christensen, 2012; Adner & Zemsky, 2005; Tellis, 2006; Gilbert & Bower, 2002) to see what previously has been written about the effects of disruptive innovation, as a part of our literature review. The effects are often described generally or through examples and the focus is on issues as definitions, what causes disruptive innovation and how it can be classified, foreseen or handled. There is no extensive research on the overall effects of disruptive innovation at an industry level. We have been able to identify three major areas that disruptive innovation affects at an industry level through the examined research. These are business models, value migration and value networks.

Knowledge about the effects of disruptive innovation can help managers understand the consequences of their strategic decision-making. Some question the ability of making predictions of disruptive innovation in advance (Thomond & Lettice, 2002), but for example Christensen (2006) and Govindarajan & Kopalle (2006) emphasize that predictions are possible. Hence, findings about the effects of disruptive innovation can
result in more cost-efficient investments, which is positive from both a company and a societal perspective. Thus new knowledge adds to the theoretical field of disruptive innovation, which can have practical relevance. The practical significance can also be accentuated by the large interest in disruptive innovation by practitioners (Danneels, 2004).

We have identified five main categories of the mobile telecom value network through gathering information (Sharma, 2012a; Ahonen, 2012; VisionMobile, 2012b) on mobile telecom:

- Mobile network operators
- Infrastructure providers
- Handset OEMs
- OTT players
- Platforms

All of these parties have faced changes due to the disruptive innovation in the mobile telecom industry. For example many handset OEMs have lost dominance to new players, while OTT players have been given a new market through app stores (Sharma, 2012a). However, mobile telecom is a 1.4 trillion USD industry, which is 2 % of world GDP, where mobile network operators have played a critical and dominant role of the mobile telecom since its inception. Close to 74 % of the value of the mobile telecom flowed through the mobile network operators and they captured 82 % of the profits in 2011 (Sharma, 2012b). Ahonen (2012) claims that the mobile network operators are one of the most unexplored parts of the mobile telecom value network by analysts. Constantinou (interview, March 21, 2013) claims that everyone writes about OEMs and their changes, while there is a lot of novelty factor in researching the mobile network operators.

Mobile telecom has become critical to drive technological growth, and it impacts how humans communicate and interact in everyday life (Sharma, 2012a). The mobile network operators have been affected by disruptive innovation as described in the background of this thesis. However, no complete analysis with the lessons from the mobile network operators in relation to the disruptive innovation is available yet.
1.3 Problem definition

Based on the problem discussion above we have defined two issues that we will analyze:

1. How have the mobile network operators been affected by the disruptive innovation caused by smartphones and its content?
2. What can the effects of disruptive innovation at an industry level be?

1.4 Purpose

We have a primary purpose we want to achieve through this thesis:

- This thesis shall provide a framework for assessing potential effects of disruptive innovation at an industry level. The findings of our primary purpose will contribute to the theoretical field of disruptive innovation and have practical relevance.

In addition we also have a secondary purpose, which is that this thesis shall describe how the mobile network operators have been affected due to the disruptive innovation. The findings of our secondary purpose will empirically add to research on the mobile telecom industry.

1.5 Delimitations

Our empirical study is delimited to the mobile network operators’ perspective of the mobile telecom industry in order to provide a profound analysis with accurate conclusions. In the information and data gathering process we have solely gathered information related to the mobile segment of the network operators. Some of the network operators provide fixed-line services that also may have been affected by the disruptive innovation. However, in accordance with our purpose, this thesis is delimited to the mobile segment of the network operators. As a consequence, less focus will be provided to other segments and other participants in the mobile value network.

The iPhone was launched in 2007, which was an event that enabled the disruptive innovation as discussed in the background of this thesis, and our empirical study will therefore focus on the time period from 2007 until today.
1.6 Disposition

The thesis comprises the following chapters:

**Chapter 1: Introduction**
In the initial chapter the background of both disruptive innovation and the mobile network operators is presented. The background is tied together in the problem discussion which leads to the purpose of this thesis. Delimitations are also presented.

**Chapter 2: Methodology**
The methodology chapter presents the methods used to achieve the purpose of this thesis. It includes a discussion of how the examination of value migration, interviews and gathering of theory and information has been conducted. At the end of the chapter information about how a theoretical framework has been developed is presented.

**Chapter 3: Theory**
The theory chapter presents four theoretical fields in accordance with what has been presented in the methodology chapter. It leads to a theoretical framework of factors that can be affected by disruptive innovation.

**Chapter 4: Mobile network operators development**
In the fourth chapter the development of mobile network operators is presented with a focus on the time period from 2007 until today. The headings are based on the factors in the theoretical framework to provide a clear view of how the mobile network operators have changed.

**Chapter 5: Analysis**
The analysis chapter begins with an introduction of the analysis. The factors in the theoretical framework are then analyzed in relation to the case study in order to provide theoretical findings. Additional factors that were found though the case study are presented thereafter. The chapter ends with a revised theoretical framework and an assessment framework.
Chapter 6: Conclusions

The conclusions chapter presents the results of the analysis and discusses how they match the purpose of this thesis. At the end of the chapter proposals for future research are presented.
2. Methodology

The methodology chapter presents the methods used to achieve the purpose of this thesis. It includes a discussion of how the examination of value migration, interviews and gathering of theory and information has been conducted. At the end of the chapter information about how a theoretical framework has been developed is presented.

2.1 Choice of research methodology and research design

Bryman and Bell (2005) describe that the purpose of a case study research design is to analyze one or a few cases in detail. Yin (2003, p. 13) identifies the characteristics of a case study as something that “investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident”. Both of these definitions apply to this thesis, since we analyzed the mobile telecom industry from the mobile network operators’ perspective to provide an assessment framework of potential effects of disruptive innovation at an industry level. This is done in combination with a theoretical framework.

We have chosen the above mentioned case study because it is a current and significant example of disruptive innovation with sufficient information available. It also fulfills our secondary purpose, which is to describe how the mobile network operator have been affected due to the disruptive innovation in the mobile telecom industry.

Yin (2003) says that case studies involve one or several cases, which he refers to as single- or multiple-case studies. Since our purpose is to provide findings at an industry level, we do not analyze individual companies; therefore this is a single-case study of an industry.

Case studies can be exploratory, explanatory or descriptive according to Yin (2003). Our case study is both explanatory and descriptive, since it seeks primarily to test and find potential effects of disruptive innovation and secondarily to explain how the mobile network operators have been affected by the disruptive innovation.
The research methodology used in this thesis is illustrated in Figure 1.

![Figure 1: Illustration of the working process of this thesis.](image)

A theoretical framework of factors that can be affected by disruptive innovation has been developed by gathering relevant theory (see Figure 1). Information about the mobile network operators has been gathered from numerous sources. We have collected financial data from mobile network operators’ annual reports to see how value has migrated. Value migration is one of the major areas that disruptive innovation affects as discussed in the introduction of this thesis. Furthermore, we have conducted interviews with representatives from the mobile telecom industry once the financial data and information was gathered, to be able to ask the right questions. Then we have analyzed the case study in combination with the theoretical framework and revised it based on our findings. Finally we have provided an assessment framework of potential effects of disruptive innovation at an industry level.

Qualitative and quantitative methods are often combined in case studies (Bryman & Bell, 2005), and the interviews have been conducted in a qualitative manner. The financial data has on the other hand been examined in a quantitative manner since we have examined data from multiple firms.

The mobile telecom industry has certain characteristics that differ from other industries. The mobile network operators provide access to telecom services through an infrastructure that requires large investments and licenses for radio spectrums which
makes it very difficult for new mobile network operators to enter the market (Selén, interview, April 23, 2013). The effects of disruptive innovation that are identified through this case study may therefore not be relevant to all industries. However, the primary purpose of this thesis is to provide potential effects, and it has been achieved though the case study in combination with our theoretical framework.

According to Bryman and Bell (2005) it is important to consider reliability and validity when research is conducted. The reliability of a research can be determined by asking if the research would render the same results if conducted again, and if the results have been affected by random events and temporary conditions. The validity examines whether the conclusions from the research are related or not. It raises the question if the indicators measure the factors they were meant to measure. These definitions have been used when we have considered the reliability and validity of our research.

2.2 Examination of value migration

2.2.1 Gathering of data

In order to provide an explicit view on how value has migrated for the mobile network operators data was gathered in a quantitative manner from the examined companies annual reports. According to Byrman and Bell (2005) this type of data can be classified as a secondary data since the data has been gathered by the companies as a part of their regular operations for other purposes.

The selection of mobile network operators was based on Forbes list of the “World’s biggest public companies within the telecommunications services” (Forbes, 2013). Due to the need of public annual reports to conduct the data gathering, we have only been able to study public companies, however almost all major mobile network operators are public companies (Sharma, 2012a). In order to determine which mobile network operators to collect data from and analyze we chose to view the 30 largest public telecom operators based on their annual sales turnover. We chose to focus on the 30 largest companies to cover a large part of the telecom industry and because the smaller companies usually follow the bigger ones according to Constantinou (interview, March 21, 2013). Several of
these companies operate in a wide range of segments within the telecom industry, which required us to separate the data from their mobile business from the other segments. Some of the companies did not provide sufficient information about their mobile segments, and data from their mobile business could therefore not be extracted from their annual reports. We were able to collect data from the 12 mobile network operators that provided adequate information about their mobile segments to fit the purpose of our analysis.

The data extracted from the annual reports were revenues, net income, EBITDA and number of subscribers between the years of 2007 to 2011. We did not include annual reports for the fiscal year of 2012 in the data gathering since several companies had not yet published their results for 2012. Some of the mobile network operators did not provide net income or EBITDA for their mobile segments, and in those cases we have estimated net income or EBITDA by viewing the mobile segments revenue as a percentage of the company’s total revenue.

Revenues, net income, EBITDA and number of subscribers has been examined and used for calculations to provide an explicit view of the effects caused by the disruptive innovation. According to Slywotzky (1996) companies’ market value should be divided by their revenues in order to establish were the companies are in the value migration process. In our case this procedure was not possible to execute since most of the companies we have studied have a variety of business segments and the market value for the different segments is difficult to determine, an issue that Slywotzky recognizes. To examine value migration within the mobile network operators’ value network we have instead use the data collected to calculate profit margin, EBITDA margin and ARPU for the chosen companies.

In addition to the studied companies’ annual reports we have also gathered aggregated data from the ICT indicators database, which is complied by the International Telecommunications Union, ITU. This data will be used to determine how the number of mobile subscribers and the penetration rates has evolved in developed and developing countries.
2.2.2 Analysis of gathered data

The data gathered from the chosen mobile network operators’ annual reports have been imported into Excel were profit margin, EBITDA margin and ARPU was calculated. These ratios were chosen to provide an explicit view over the mobile network operators’ development during the observed time period and to determine how value has migrated.

To calculate the profit margin the net income for each year was divided by the revenue for the same year. The profit margin measures the amount of the revenue that is kept in earnings, and is a useful margin when profitability is measured and compared among companies in the same or similar industries (Koller et al, 2010). EBITDA margin is a financial metric that can be used to measure the operating profitability of a company. To calculate this ratio the companies’ earnings before interest, tax, depreciation and amortization, EBITDA, divided by the revenue. Since EBITDA does not take depreciation and amortization into account the EBITDA margin can provide a clearer vision of a company’s core profitability. The EBITDA margin is derived from revenue and shows the proportion of revenue that remains when operating expenses is deducted (Koller et al, 2010).

Average revenue per unit, ARPU, measures how much revenue each user generates. This measurement makes it possible to view the company’s revenue growth on a per-user level and can be used to identify which products or services that are low or high revenue generators.

The mobile network operators in our analysis define their fiscal year differently, some use the calendar year while others have split their fiscal year. When the results from the companies with a split fiscal year could not be determined on an annual basis we have accounted their results as the year of which they end in. The fiscal year June 2010 to March 2011 have for example been compared and analyzed as the calendar year of 2011. This may cause displacements in the results for some of the companies in our analysis but it is still possible for us to capture the trends and larger movements in in the industry.
The data has not been adjusted to one uniform currency since we are interested in the percentage change for each company, not the increase or decrease in for example a dollar amount. The mobile network operators’ development over the observed period has been calculated as a percentage change for each company, and this change has been compared to the other companies in our analysis. By not transforming the currency we can avoid some variances in the result caused by macroeconomic factors.

The data form the ITU has been used to provide a view on how the number of mobile subscribers in the developed and developing countries has increased during the observed time period. The number of mobile subscribers per 100 inhabitants has been used to determine the mobile penetrations rate in the world and in the developed and developing countries.

2.2.3 Critique, reliability and validity

Our data analysis is considered a secondary analysis of data according to Bryman and Bell (2005). The benefits of a secondary analysis are primarily that it is a time efficient and inexpensive way to gather data of high quality from a reliable source. Since less time can be spent gathering the primary data, there can be more time allocated to the analysis of the data. The limitation of a secondary analysis is that you are not familiar with the data, which also can be quite complex. The data has initially been collected by another party, which was not aware of your purpose, so there might be some key variables missing and it can be difficult to determine the quality of the data (Bryman & Bell, 2005).

The data has been gathered from some of the largest public telecom companies’ annual reports, and since there are extensive regulations associated with public companies annual reports the data collected from these can be considered to be credible. The information in the annual reports used is publicly available and the same data can be gathered at any other point in time. The data from the International Telecommunication Union, ITU, is the United Nations specialized agency for information and communications technologies, which can be considered as a credible source. This data is also publicly available and another gathering will yield the same data, which increases the reliability for our thesis.
Initially we planned to gather data from the 30 largest public telecom operators in the world, but due to the lack of sufficient data we were only able to analyze 12 companies mobile businesses. We aimed to capture the effects of value migration in the 30 largest mobile network operators because it would cover a large percentage of the industry. The fact that we did not achieve that can affect the reliability and validity of our findings since it may not be representative for the companies we could not include in our analysis, and therefore it may not be representative for the value migration in the telecom industry as a whole.

The data we gathered did lack some of the key variables our analysis required, so we had to make some assumptions and estimations to achieve the data we needed for our thesis. These estimations may affect the results of the analysis and distort the comparison among the mobile network operators. Our treatment of the companies with a split fiscal year may cause displacements in the analysis since some of the operations will be analyzed and compared to a time period different from when the results incurred. Different countries have varying accounting standards, which enables the variances in our data set to be attributable to different accounting techniques. These factors may affect the reliability and validity of our findings since the results may be affected of our assumptions and the results may vary in another analysis where other assumptions are made.

Another factor than can offset and displace the results in our analysis is the fact that countries and mobile network operators have differing practice when it comes to the length of subscriber contracts. For companies or countries were it is custom with longer subscriber contracts the effects of value migration may be deferred compared to companies and countries were shorter contracts are custom.

2.3 Conducting interviews

2.3.1 Preparing and conducting interviews

Interviews were conducted to achieve a greater understanding of how disruptive innovation has affected the mobile network operators at an industry level. The interviews
have been an efficient way to attain additional and deeper insight on the changes for the mobile network operators, since these recent changes are not that well documented yet. To prepare for the interviews we studied literature and reports concerning the mobile telecom industry to achieve a solid knowledge base. Moreover, the data gathering and data analysis was performed to get a better view on how the mobile network operators are performing. These preparations were conducted to provide well-aimed interview questions to enable us to get the most out of the interviews. We tried to arrange interviews with all the mobile network operators included in our data analysis and managed to reach three of them.

In addition to the three interviews with the mobile network operators we have also interviewed one infrastructure provider and one analyst to provide a broad view of the industry and the effects of disruptive innovation. The chosen mobile network operators are part of our data analysis and vary in size which will give us a broad perspective of the mobile network operators. The infrastructure provider is one of the largest in the world and was chosen to provide us with insights from other parts of the mobile telecom industry value network. The analyst was chosen to supply us with information and analysis about the entirety of the mobile telecom industry.

Our respondents were:

- **Svante Andersson**, Group product manager for Mobile Broadband, TeliaSonera (Mobile network operator). Phone interview on May 3, 2013.
- **Arban Gashi**, Retail Sales Manager, Chicago Market, AT&T (Mobile network operator). Phone interview on May 7, 2013.
All the interviews were performed through telephone, except one which was conducted in person, since it was difficult to meet the respondents in person due to distance and the availability of the respondents. Three of the interviews were performed in Swedish and translated to English by us after the interviews. We sent the questions to the respondents in advance so that they were able to reflect over their answers prior to the interview. The interviews were qualitative and conducted in a semi-structured manner to enable a flexible interview process (Bryman & Bell, 2005). The semi-structured interview approach enabled us to ask supplementary questions and follow up on interesting statements made by the respondents.

2.3.2 Analysis of interviews

The interviews were recorded and the information gathered during the interviews was transcribed and summarized shortly after the interviews were held. The information was structured and categorized to facilitate the analysis of the material further on (Backman, 2008). The respondents did receive the main questions in advance but we had also prepared some additional questions that the respondents were not aware of in advance. The semi-structured interview approach made it possible for us to receive the answers needed and obtain a broader perspective of the mobile telecom industry (Bryman & Bell, 2005).

The questions asked during the interviews were essentially similar, but some adjustments were made before each interview to customize the questions for the respondent. This customization was necessary to get the most out of the interviews since different parts of the mobile telecom industry were interviewed.

The information gathered during the interviews is presented primarily in chapter 4 of this thesis where it is set in relation to literature and reports concerning the industry.
2.3.3 Critique, reliability and validity

We interviewed representatives from different parts of the mobile telecom value network, which gave us a broad view and increases the reliability and validity of the information collected from interviews since multiple perspectives are included. The respondents’ statements may be biased since they view the mobile telecom from a certain perspective, but we will supplement our interviews with other sources of information. However, it would have been desirable to interview a larger number of respondents in addition to the ones we interviewed. The interviews were transcribed and categorized shortly after the interviews were conducted. This decreases the risk for misinterpretations and increases the validity and reliability of the interviews (Bryman & Bell, 2005).

The respondents received the main questions in advance and follow-up questions were asked to supplement the respondents’ answers during the interviews. A consequence of this semi-structured interview approach is that the content of the interviews will vary, but that is the intention of a semi-structured interview, to provide a flexible interview process (Bryman & Bell, 2005). A flexible interview process effects the reliability of the information since it will be difficult to gather the same information in another interview.

Three of the interviews were conducted in Swedish and translated to English by us afterwards. Nuances may be lost as a consequence of the translation of the interviews, but since we are studying the content and not the nuances in the respondents’ answers that will not affect the quality of our interviews.

2.4 Gathering theory and information

Theory and information about the mobile telecom has been gathered from various secondary sources – articles, industry reports, industry related web pages, textbooks, newspapers and scientific publications. These have been collected from Lund University’s web-based article search tool, libraries at Lund University, International Telecommunications Union, VisionMobile and Google search.
There are not many printed sources like textbooks or scientific publications available on mobile network operators since 2007 because it is recent history. However, industry reports, newspapers and industry related web pages have been able to provide us with accurate information on the industry. We have been critical to these sources, as well as all other sources, to avoid for example subjective opinions, speculations or groundless studies. Our aim has also has been to find as updated versions of sources as possible to increase the reliability and validity. In order to avoid misinterpretation, we have used original sources to the highest possible extent. Our sources as well as respondents have given us a consistent view of the development in the mobile telecom industry, which increases the reliability of this thesis.

2.5 Theoretical framework development

Effects of disruptive innovations are often described generally or through examples, and by examining these descriptions we have been able to identify three major areas that disruptive innovation affects, as described in the background of this thesis. These areas are business models, value migration and value networks. Therefore we have developed our theoretical framework based on these three theoretical fields and theory on disruptive innovation. The theories have given us a broad view of potential effects of disruptive innovation, and have been used to identify factors that can be affected by disruptive innovation.
3. Theory

The theory chapter presents four theoretical fields in accordance with what has been presented in the methodology chapter. It leads to a theoretical framework of factors that can be affected by disruptive innovation.

3.1 Disruptive innovation

According to Christensen (2013), disruptive innovations are products or services with business models that introduce performance packages that are inferior to what mainstream customers value. During the early development of a disruptive innovation it only serves niche segments. Both the disruptive innovation and the established offerings improve; nevertheless the disruptive innovation improves enough over time to satisfy the mainstream customers and eventually replaces the established offerings and incumbents that exceed the demanded performance, see Figure 2 (Christensen, 2013).

![Figure 2: Disruptive innovation in accordance with definition by Christensen (2013).](image)

Eventually almost all products improve beyond the needs of the mainstream customers. This triggers a shift in the basis of competition to focus on price, flexibility, convenience or customization, and disruptive competitors start to replace established offerings (Christensen et al., 2001). Christensen & Raynor (2003) describes disruptive innovation
as a process rather than an event. Many disruptive innovations fail because they are part of a value network that cannot be adapted to support the disruption.

Most waves of disruptive innovation are captured by others than the earlier leaders of an industry (Christensen, 2013). One example is the computer industry, where IBM dominated the mainframe computer market, but missed the emergence of minicomputers by years (Christensen & Raynor, 2003). The mainframe computers were available to a few experts at universities only, but minicomputers made the technology available to a much larger population. The minicomputers have been preceded by desktops, then laptops and now smartphones. One reason is that leading companies listen too carefully to their customers, so they miss the emergence of innovation that is not valued by their customers initially. However, there are also exceptions when leading companies manage to stay on top (Christensen & Raynor, 2003).

The concept of disruptive innovation has been broadened by a number of authors and there is a debate on what exactly can be defined as disruptive innovation. Many authors classify and use disruptive innovation in a broader sense (Danneels, 2004; Dan & Chieh, 2008). Christensen (2006) recognizes that disruptive innovation has been improved by other authors and sees the building of theory on disruptive innovation as an ongoing process.

Christensen & Raynor (2003) divides disruptive innovation into low-end and new-market disruption. New-market disruptive innovation creates a new value network, i.e. expands the market to new customers. Low-end disruption on the other hand, target the most over served and least-profitable customers at the low end of the original value network. Markides (2006) agrees that disruptive innovation can enlarge the industry, by attracting new customers and making existing customers consume more. Furthermore, he states that disruptive innovation can significantly change customers’ behaviors and habits.

Govindarajan & Kopalle (2006) on the other hand, refers to high-end and low-end disruptive innovation. High-end disruptive innovation is disruptive innovation with a higher-per unit margin than established offerings, but with different performance features
that mainstream customers do not value at the time of introduction, so it serves a small niche before it disrupts the market.

### 3.2 Value migration

#### 3.2.1 Life cycles of business designs

According to Slywotzky (1996) business designs go through life cycles, from growth to economic obsolescence. Value migration occurs when value moves from outdated business designs to new ones that better satisfy the customers’ priorities. The driving force of value migration is the changing pattern in what customers want, need and are willing to pay for.

Slywotzky & Baumgarter (2006) defines the term business design as the blueprint of the way a company does business. For example how a company selects its customers, what value proposition it offers, which profit model it uses, which activities it engages in, what strategy it uses to capture profits and which organizational architecture it uses to implement decisions.

Three phases of value migration can be identified; these are the value inflow, value stability and value outflow phase, see Figure 3 below (Slywotzky, 1996). The phases describe how well a business designs can create value, which matches customers’ priorities in relation to its competitors, and as a result generate high returns. The model can be used to describe value migration within a company, between companies and between industries.
The value inflow phase provides several opportunities to abstract value from a surrounding with high growth, limited competition and profitability (Slywotzky, 1996). Value can be absorbed from other parts of for example an industry if the business design is superior in meeting customers’ priorities. A shift in value migration can be initiated when a company employs a new business design, which responds to customer priorities that established competitors have failed to see or neglected. Companies with business designs in the value inflow phase are often characterized by excitement, confidence and a capability to attract top talent.

In the second phase, value stability, business designs match customer priorities well and a competitive balance predominates the market (Slywotzky, 1996). Companies can grow by continuing to serve customer’s priorities and improving operational efficiencies, but only at a low or moderate pace. Market shares and margins remain steady. Focus is on improving activities that have led to success in the past.

In the final phase, value outflow, the competition is intensifying, the opportunities to abstract value are decreasing and profits decline (Slywotzky, 1996). Value migrates from
obsolete business designs to new ones, which are better able to satisfy customers’ evolving priorities. Moreover, in-bound talent, customers and resources leave at an accelerating rate. In the value outflow phase, focus should be on redesigning obsolete parts of a business design.

The length of the phases varies depending on at which rate new business designs that better respond to the customer priorities emerges (Slywotzky, 1996). However, shorter product life cycles, international competition and well-informed customers have made the phases shorter. A company can only exist in one phase at the time, and only move from value outflow to value stability, or from value stability to value inflow, if it applies a new business design.

Performance is generally demanded early in business designs life cycles (Slywotzky, 1996). However, as products or services mature and competitors match the performance, the consumers’ priorities often shift to cost-efficiency as long as the business designs remain the same. The reason is that what was initially new is regarded as something that all products or services must have at a later phase, i.e. commoditization.

### 3.2.2 Transition of phases

Business design phase transitions are typically subtle with no sharp transition points, so managements can easily miss them (Slywotzky, 1996). Managers have tendencies to dismiss downturns as seasonal effects or special circumstances. The above-mentioned limitations can lead to unexpected collapses of companies that have not adapted their objectives in line with the business design life cycle. Furthermore, value can migrate towards several new types of business designs simultaneously and it is even harder to be prepared for. Flexible organizations with an ability to detect early signals of transitions and adapt to them, have better preconditions of handling transitions.

As mentioned, transitions normally occur when new business designs, which better meet customer priorities, become available and customers’ priorities change (Slywotzky, 1996). However, unexpected external shocks can also trigger business design phase transitions. For example trade restrictions, aggressive pricing, war, regulations and
innovation can result in value migration from one business design to another. Companies can sometimes reduce the damage or even benefit from these external events if they understand them at an early stage.

### 3.2.3 Bargaining power in relation to value migration

Bowman & Ambrosini (2000) argues that the realization of value is determined by the bargaining relationships between the sellers and buyers. For instance, the level of differentiation, switching costs, presence of substitutes, strength of distribution channels and supplier competition can determine a supplier’s bargaining power (Porter, 2008), which in turn decides its ability to capture value (Bowman & Ambrosini, 2000). Cox (2001) comes to the same conclusion, i.e. that value migrates in the direction of power. If the buyer is dominant, the seller has few alternatives for its services and products, thus the value flows to the buyer.

### 3.3 Business models

#### 3.3.1 Introducing the concept

There are diverse definitions and interpretations of the concept of a business model, and it is often used vaguely to describe how companies are organized to generate profits (Porter, 2001). Magretta (2002) describes that a business model should identify customers, what they value and how the company should make profit from delivering this value. Amit & Zott (2001) argue that a business model represents in what way a company makes transactions possible that benefit participants like customers, suppliers and partners.

#### 3.3.2 Creating and delivering value

Johnson et al. (2008b) states that many companies do not understand their own business model because of the lack of definition. To solve this problem, a business model can be divided into four interlocking elements that in combination both create and deliver value. These are the customer value proposition, profit formula, key resources and key processes.
The most important element is the *customer value proposition*, the sum of total benefits offered in return for a payment, because a company can only be successful as long as it creates value for its customers (Johnson et al., 2008b). The *profit formula* is the blueprint of how a company creates value for itself; it consists of cost structure, revenue model, margin model and resource velocity (Johnson et al., 2008b).

*Key resources* are assets that are crucial when delivering value, for example products, employees, brands, information, technology, partnerships and equipment. *Key processes* on the other hand, are the operational and managerial processes that allow companies to deliver value, such as manufacturing, budgeting, planning, service and sales (Johnson et al., 2008b).

### 3.3.3 Changing business models

Many companies make substantial efforts to innovate on their products, but it is often expensive, time-consuming, requires large investments and returns are uncertain (Amit & Zott, 2012). Business models often go unchallenged for a long time, but more and more companies are turning towards business model innovation as a way to create new value. This could be done by adding new activities, linking activities in novel ways or changing who that performs an activity. Business model value drivers can also be identified, for example novelty, lock-in, complementarities and efficiency (Amit & Zott, 2012).

### 3.4 Value Network

#### 3.4.1 Definition

Porter (1985) models a *value chain* as series of activities, within and around an organization, which creates a service or product for the market. There are primary activities like operations, logistics and sales, and support activities such as technology development and human resource management. However, a single organization rarely undertakes all these activities in-house. Therefore the term *value network* is used to describe a number of value chains that work together in an interconnected system, from raw material or design to delivery of a final product or service (Johnson et al., 2008a).
Christensen & Raynor (2003) describes a value network as a collection of suppliers and channel partners that collaborate to respond to the needs of customers.

### 3.4.2 Characteristics of value networks

Value-adding activities and costs occur in many parts of a value network, for example in the distribution and supply chains (Johnson et al., 2008a). Thus firms need to understand the entire the value network to improve the value that customers receive. Different levels of profits are available to different parts of a value network, depending on the competitive intensity. Firms are faced with decisions to do activates in-house or outsource, and should consider issues like cost-advantages and control over key strategic processes (Johnson et al., 2008a). The more a firm outsources, the more important the ability to influence other parts of the value network becomes.

As resources become more dematerialized, such as information and capital, the traditional view of value chains and value networks becomes obsolete, because value structures can take other forms and change fast (Normann, 2001). This means that parts of the value network can be demolished unexpectedly. Then it is no longer about who can position itself best in the value network, but rather who can find the most creative ways to create value. Many value networks have become more complex than ever, which has made disruption from unexpected players more common (Sargut & McGrath, 2011). Furthermore, complementors are firms that provide products or services that increase the value of each other’s offerings in the customers’ eyes (Yoffie & Kwak, 2006). The demand for one product can increase if the price or quality for the complement is improved.

### 3.5 Theoretical framework

We have developed our theoretical framework by examining theory on disruptive innovation, value migration, value networks and business models, see Table 1. In each theoretical field we have searched for potential factors that can be affected by disruptive innovation. Some of these factors belong to more than one of the theoretical fields, however we have placed them in the field were they are mainly discussed. The factors
have been examined in our analysis to see to what degree they comply with our case study.

The theoretical fields used in the theoretical framework are highly interconnected concepts, but our aim has been to make the factors as independent as possible. However some degree of overlapping has not been possible to avoid. Some of the theory referred to in the theoretical framework merely defines concepts and have not been used in the analysis. The purposes of those references are simply to orientate.
<table>
<thead>
<tr>
<th>Theoretical fields</th>
<th>Factors</th>
<th>Theoretical description of factors</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disruptive innovation</td>
<td>Basis of competition</td>
<td>The basis of competition can change to price, flexibility, convenience or customization.</td>
<td>Christensen, 2001</td>
</tr>
<tr>
<td></td>
<td>Market shares</td>
<td>Disruptive innovation can eventually replace established offerings and incumbents.</td>
<td>Christensen, 2013; Christensen &amp; Raynor, 2003; Govindarajan &amp; Kopalle, 2006</td>
</tr>
<tr>
<td></td>
<td>Market size</td>
<td>The industry can be enlarged when new customers are attracted and existing customers consume more.</td>
<td>Christensen &amp; Raynor, 2003; Markides, 2006</td>
</tr>
<tr>
<td></td>
<td>Customer behavior</td>
<td>The customers' behaviors and habits can significantly change.</td>
<td>Dan &amp; Chieh, 2008; Danneels, 2004; Christensen, 2006; Markides, 2006;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Slywotzky, 1996</td>
</tr>
<tr>
<td>Value migration</td>
<td>Value migration within a company</td>
<td>Value can move from outdated business designs to new ones within a company that better satisfy the customers’ priorities.</td>
<td>Christensen, 2013; Christensen &amp; Raynor, 2003; Christensen et al., 2001; Slywotzky, 1996; Slywotzky &amp; Baumgarter, 2006</td>
</tr>
<tr>
<td></td>
<td>Value migration between companies</td>
<td>Value can move from outdated business designs to new ones in other companies that better satisfy the customers’ priorities.</td>
<td>Christensen, 2013; Christensen &amp; Raynor, 2003; Christensen et al., 2001; Slywotzky, 1996; Slywotzky &amp; Baumgarter, 2006</td>
</tr>
<tr>
<td></td>
<td>Value migration between industries</td>
<td>Value can move from outdated business designs to new ones in other industries that better satisfy the customers’ priorities.</td>
<td>Christensen, 2013; Christensen &amp; Raynor, 2003; Christensen et al., 2001; Slywotzky, 1996; Slywotzky &amp; Baumgarter, 2006</td>
</tr>
<tr>
<td></td>
<td>Bargaining power</td>
<td>Bargaining power of relationships between firms can change.</td>
<td>Bowman &amp; Ambrosini, 2000; Cox, 2001; Porter, 2008</td>
</tr>
<tr>
<td>Business models</td>
<td>Customer value proposition</td>
<td>Value proposition, the sum of total benefits offered in in return for a payment, can change.</td>
<td>Amit &amp; Zott, 2001; Amit &amp; Zott, 2012; Johnson et al., 2008b; Markides, 2006; Margretta, 2002; Porter, 2001; Slywotzky, 1996; Slywotzky &amp; Baumgarter, 2006</td>
</tr>
<tr>
<td></td>
<td>Profit formula</td>
<td>Profit formula, the blueprint of how a company creates value for itself, can change.</td>
<td>Amit &amp; Zott, 2001; Amit &amp; Zott, 2012; Johnson et al., 2008b; Margretta, 2002; Porter, 2001; Slywotzky, 1996; Slywotzky &amp; Baumgarter, 2006</td>
</tr>
<tr>
<td></td>
<td>Key resources</td>
<td>Key resources, the assets that are crucial when delivering value, can change.</td>
<td>Amit &amp; Zott, 2001; Amit &amp; Zott, 2012; Johnson et al., 2008b; Margretta, 2002; Porter, 2001; Slywotzky, 1996; Slywotzky &amp; Baumgarter, 2006</td>
</tr>
<tr>
<td></td>
<td>Key processes</td>
<td>Key processes, the operational and managerial processes that allow companies to deliver value, can change.</td>
<td>Amit &amp; Zott, 2001; Amit &amp; Zott, 2012; Johnson et al., 2008b; Margretta, 2002; Porter, 2001; Slywotzky, 1996; Slywotzky &amp; Baumgarter, 2006</td>
</tr>
<tr>
<td>Value network</td>
<td>Value network structures</td>
<td>The value network structures, how the value-adding activities are linked, can change.</td>
<td>Christensen &amp; Raynor, 2003; Johnson et al., 2008a; Normann, 2001; Porter, 1985; Sargut &amp; McGrath, 2011; Yoffie &amp; Kwak, 2006</td>
</tr>
</tbody>
</table>

Table 1: The theoretical framework of this thesis.
4. Mobile network operators development

In the fourth chapter the development of mobile network operators is presented with a focus on the time period from 2007 until today. The headings are based on the factors in the theoretical framework to provide a clear view of how the mobile network operators have changed.

4.1 Basis of competition

The change from mobile telephony to mobile computing has transformed the basis of competition within the mobile telecom industry from reliability and scale of networks, to an environment where choice and flexibility is more valued by end-users (VisionMobile, 2012a).

A number of new players have been introduced in the mobile telecom industry such as platforms and OTT players. This has resulted in that the industry has become more competitive as well as more innovative according to GSMA (2013). Constantinou (interview, April 11, 2013) brings up the emergence of apps and says that the innovation in the mobile telecom industry is not inside the industry and the basis of competition is now the diversity and the number of applications that exist. “It is no longer whether your voice calls are good enough or if the data connection is good enough, the user does not care about that anymore. The value is having the right applications or the applications that you are interested in on your phone”. Greenwich Consulting (2011) confirms that new business ideas and services are mainly coming from the “Internet” by OTT players.

The change in the basis of competition has caused new business models within mobile telecom to go from proven and predictable to new and unpredictable (VisionMobile, 2012b), and it has put pressure on the mobile network operators (VisionMobile, 2012a).

4.2 Market shares

Mobile network operator portals, which completely dominated content distribution for mobile telecom before 2007, have decreased in importance compared to app stores.
In March 2013, the mobile network operator portals only accounted for 6% of the content downloads on mobile phones worldwide, while app stores accounted for the remaining 94% (Juniper Research, 2013).

Table 1 illustrates the mobile telecom value network and the parties’ percentage of the total revenue in the value network, which gives an understanding of the size of different players. The mobile network operators are the largest party in the value network and the platforms and OTT players are the smallest party. However, the platforms and OTT players have increased from almost 0.1% of the total market in 2008 to 4% in 2011 (Sharma, 2009; Sharma, 2012b).

<table>
<thead>
<tr>
<th>Year</th>
<th>Infrastructure providers</th>
<th>Mobile network operators</th>
<th>Handset OEMs</th>
<th>Platforms and OTT players</th>
<th>Total market</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>7%</td>
<td>74%</td>
<td>15%</td>
<td>4%</td>
<td>USD 1.4 trillion</td>
</tr>
<tr>
<td>2008</td>
<td>5%</td>
<td>77%</td>
<td>18%</td>
<td>0.1%</td>
<td>USD 1.1 trillion</td>
</tr>
</tbody>
</table>

Table 2: The global mobile telecom value network divided by revenue (Sharma, 2009; Sharma, 2012b).

4.3 Market size

There have been a number of changes in sizes of different markets within the mobile telecom industry. Content revenue for mobile phones has grown rapidly during the last couple of years, driven by the increased usage of apps (Juniper Research, 2013). When it comes to mobile subscriptions, the growth is now in the developing countries. The growth in the developing countries is driven by the increased penetration rates of smartphones, while the growth in the developed countries is powered by both increased penetration rates of smartphones and the increased speeds of data access (GSMA, 2013).

Figure 4 and Appendix 1 shows the number of mobile subscriptions in the developed and developing countries, and the total number of mobile subscriptions in the world. The number of mobile subscriptions in the developed countries has increased slightly between 2007-2011, while the number of mobile subscriptions in the developing countries has almost doubled during the same time period.
Figure 4: The mobile subscriptions in the world, developed and developing countries based on data from ITU (2013).

The 5,962 million mobile subscriptions does not represent 5,962 unique end-users since this count reflects the number of SIM-cards and thereby also reflect end-users with multiple mobile subscriptions. There are 4 billion unique end-users and 48% (1.9 billion) of them have more than one mobile subscription, which means that they have more than one SIM-card (Ahonen, 2012).

In the developing countries there are some parts of the population where mobile subscriptions are rare and shared within families or sometimes villages (Ahonen, 2012). Ahonen estimates that 200 million of the people in the developing countries share a phone, and since the shared usage is not accounted for in the statistics over unique users the total number of unique users with an owned or shared phone is 4.2 billion.

Figure 5 and Appendix 2 shows the mobile subscriptions per 100 inhabitants, the subscriber penetration rate, for the developed and developing countries, and the total mobile subscriber penetration rate for the world. Between 2007 and 2011 the mobile
subscriptions per 100 inhabitants in the developed countries increased from 102 to 119, which shows that there on average was 1.19 mobile subscriptions per inhabitant in 2011. In the developing countries the mobile subscriber penetration rate rose from 39.1 % to 78.9 % between the years 2007-2011. This displays that the mobile penetrations rate nearly doubled during that time period and that there is almost 80 mobile subscriptions per 100 inhabitants in the developing countries.

**Figure 5**: The mobile subscriptions per 100 inhabitants in the world, developed and developing countries based on data from ITU (2013).

### 4.4 Customer behavior

There have been some changes in how customers, in this case end-users, consume and use mobile phones. End-users’ mobile telecom habits do no longer only involve traditional voice and message services, but also a number of other areas like utilities, health and education. Many people cannot imagine life before the smartphone. The
average mobile data access speed has doubled between 2010 and 2012 and the increasing speed of mobile data access allows the end-users to consume more data (GSMA, 2013).

Constantinou (interview, March 21, 2013) argues that the choice of phone is more important today, rather than the choice of mobile network operator. Referring to mobile network operators he says: “Maybe one has a better customer experience or whatever, but it is a small difference. Whether a consumer buys voice from one telco or another does not make a difference, and the average user will not pay more for high quality voice”. Rådström (interview, April 29, 2013) argues that the most important purchase decision for an end-user today normally is which mobile phone to choose, rather than which mobile network operator.

Gashi (interview, May 7, 2013) says that the mobile telecom industry was more of a sales environment before the smartphones were launched, were customers would walk into stores not knowing which phone to buy and get advice in the store. Now the consumers are the smartest they have even been and most of the time they already know what they want when they walk into the stores.

The annual smartphone sales worldwide have gone from approximately 11 % of the mobile phone market in 2007 to an estimated 51 % in 2013, see Figure 6. However, the penetration is significantly higher in developed countries compared to developing countries, where less people can afford the smartphones (Cocotas, A., 2013).
4.5 Value migration within a company

Voice services had been the main source of revenue for almost all the mobile network operators in the preceding 30 years, but in 2013 voice revenues are expected to fall below 60 % of the total revenues (Sharma, 2012a). The declining revenues for voice services has this far been counterbalanced by increasing revenues for data access and messaging, but some operators have recently begun to experience decreasing revenues for messaging services.

According to Sharma (2012a) there are various revenue growth curves, and in order to understand them the mobile subscription growth should be correlated with the operators’ revenues. The operators’ revenues should be divided into the segments voice, messaging and data access, and when the subscriber penetration for a specific segment advance towards 70-90 % penetration the segment revenue reaches its peak. The revenues for the specific segment increase slowly when the subscriber penetration is beneath 25 %, and after that the revenue growth accelerates until it reaches its peak at 70-90 % subscriber penetration where the revenue growth stagnates and starts to decline (Sharma, 2012a). The revenue growth curves can be observed in Figure 7 below.
Figure 7: The revenue growth curves for voice, messaging, data access and VAS/OTT in accordance with Sharma (2012a).

The revenue growth curve for voice, the first curve, is declining for most of the developed countries and the revenue growth curve for messaging, the second curve, has started to decline for some developed countries as well (Sharma, 2012a). These two revenue growth curves are still rising in the developing countries where the mobile subscriber penetration is increasing rapidly. The revenue growth curve for data access, the third curve, is currently rising for both developed and developing countries and Sharma (2012a) expects this growth to continue for the next 3-4 years. In addition to the previously mentioned curves there is also a fourth curve which represents the revenue growth for value added services, VAS, and over-the-top services, OTTs. The fourth curve is made up by several new application and service areas, some which are not even though of yet. According to Sharma (2012a) the mobile network operators’ investments and strategies, mainly concerning the fourth revenue curve, will be critical for their future existence. Sharma (2012a, p19) also argues that “Mobile operators must look at ways to move beyond just providing access services and position themselves from being service providers to becoming service innovators”.

Rådström (interview, April 29, 2013) describes how the pricing has changed from 2007 until today, when the prices of services were based on the number of services, messages and minutes to a greater extent. Today the pricing in the industry is more about bundling the services and pricing the whole package, so called “Bucket pricing”. It is hard to specify how much profit voice, message and data access generates since it is more of a
theoretical question and a question of allocation since they are not selling pure voice, message or data packages.

Andersson (interview, May 3, 2013) also explains that the pricing in the industry has developed towards the selling of packages, “buckets”. According to him they naturally view the profit margins for each product in the package, but it is important to be aware of that it is a utilization of overhead costs since most of nods and components in the networks are not specific for one product.

4.6 Value migration between companies

Selén (interview, April 23, 2013) explains that the mobile telecom industry has some characteristics that differ from other industries since it demands infrastructure and licenses that require large investments. The mobile network operators have to purchase licenses to access specific radio spectrums, and this varies in different countries. Thus, mobile network operators are limited to offer mobile telecom services in countries were they have licenses, which means that many of these mobile network operators do not compete with each other straightforward.

To examine if value has migrated between mobile network operators 12 companies were studied to see how their profit margins, EBITDA margins and ARPU has changed among the companies between 2007 and 2011.

Profit margin in the companies’ net income divided by revenue and is a measure of profitability. The companies’ profit margins are presented in Appendix 3 and the result has also been presented with graphs below in Figure 8. When the profit margins are examined they show that there are large fluctuations to be found for many of the mobile network operators. Tele2 has for example gone from having a negative profit margin (-0.2%) to 12 % in 2011. Telenor on the other hand has decreased its profit margin from 20.8% in 2007 down to 7.3% in 2011.
The EBITDA margin is the companies’ earnings before interest, taxes, depreciation and amortization divided by the revenue, and is also a measure of profitability used to compare different companies. When the individual companies EBITDA margins are studied (see Appendix 4 and Figure 9) some fluctuations can be found but for most have remained a rather stable EBITDA margin through the observed period.
Figure 9: EBITDA margins for the observed companies based on data from the companies’ annual reports 2007-2011.

The average revenue per unit, APRU, is calculated as revenue divided by the number of subscriptions. This measure is used to provide a view of how much revenue each subscriber account costs. The changes of ARPU have been measured year-by-year between 2008 and 2011 as a percentage and are shown in Figure 10 and Appendix 5. 2007 has not been included in the analysis of ARPU since the year-by-year development has been measured. The ARPU has constantly declined for most of the observed mobile network operators during the observed time period. This can according to GSMA (2013)
be explained by the continued prices declines for mobile network operators since the
growth in revenues is slower than the growth in the number of subscriptions.

Figure 10: The percentage change per year of ARPU for the observed companies, based on data from the
companies’ annual reports 2007-2011.

4.7 Value migration between industries

According to Sharma (2012a) the most interesting aspect regarding the previously
mentioned fourth revenue curve is that the mobile network operators are competing with
new service and application providers in addition to the other mobile network operators.

Selén (interview, April 23, 2013) states that the problems that the mobile network
operators are facing today is a result of the high profitability they have previously
rendered on their traditional services. This is a question of incentives, since the incentives
for change are low and the barriers for innovation and new thinking are high when you
have a business which is that established.
The emergence of app stores has affected the mobile network operators in positive and negative terms. Rådström (interview, April 29, 2013) explains that one positive aspect of this development is that “The traffic through out networks increase and that is great since it is a way for us as an mobile network operators to make more money”. One negative aspect he states is that a larger number of parties is providing the similar communication services.

According to Constantinou (interview, April 11, 2013) ”Value is migration of out the mobile network operators, and for very good reasons since users are not willing to pay more for voice and for messaging”. He says that the main problem is the same for all the mobile network operators, and that is the fact that they have a traditional business, which is voice and messaging that has been challenged. Those services have been challenged because people have found out that there are other ways to communicate besides traditional voice and messaging, the users can now use OTT services as for example Whatsapp and Viber to communicate through voice and message (Constantinou, interview, March 21, 2013). Andersson (interview, May 3, 2013) believes that it is the messaging business that mobile network operators will loose first, because of Apple iMessage, Whatsapp and other messaging apps provided by the OTT players.

The mobile network operators are no longer in charge of distributing the services since that has shifted to the platform companies, which are the new distributors of services (Constantinou, interview, March 21, 2013). “The telcos are the collateral damage to the so-called OTT players, because the OTT players, for example Viber and Whatsapp, need the network but to them it provides no differentiation whether it is Wifi or 3G, it makes no difference to them”. So the main problems and threats for the mobile network operators are to reverse the decline of services revenue, in terms of average revenue per user.

The average profit margin, EBITDA margin and average change in ARPU for a sample of mobile network operators have been studied to determine how the mobile network operators are performing as an industry. Since 12 mobile network operators were studied this analysis may not be completely representative for the industry, but it can still be used
as an indicator of the mobile network operators’ performance and profitability.

The average profit margin for the observed mobile network operators has remained rather stable during 2007 through 2011, see Table 3. It has fluctuated slightly, but overall the studied mobile network operators have remained an average between 11% and 14 %.

<table>
<thead>
<tr>
<th>Year</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Profit Margin</td>
<td>12%</td>
<td>12%</td>
<td>13%</td>
<td>14%</td>
<td>11%</td>
</tr>
</tbody>
</table>

Table 3: The average profit margin for the observed companies based on data from the companies annual reports 2007-2011.

The average EBITDA margin (Table 4) for the observed mobile network operators has been solid during 2007 to 2011 and only varied 1 percentage. EBITDA is used to compare and study profitability between companies and industries since it removes some effects of financing and accounting decisions and is used to provide a “clearer view” of the profitability (Koller et al, 2010). EBITDA is basically net income were interest, taxes, depreciation and amortization has been added back. In this analysis the average EBITDA margin has varied less than the profit margin which indicates that the mobile network operators may have made changes concerning their interest, taxes, depreciation and amortization.

<table>
<thead>
<tr>
<th>Year</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average EBITDA Margin</td>
<td>35%</td>
<td>35%</td>
<td>36%</td>
<td>36%</td>
<td>35%</td>
</tr>
</tbody>
</table>

Table 4: The Average EBITDA margin for the observed companies based on data from the companies annual reports 2007-2011.

The overall Average Revenue per unit, ARPU, for the 12 observed mobile network operators have constantly declined from 2008 to 2011 (see Table 5). 2007 has not been included in the analysis of ARPU since the year-by-year development has been measured. The revenues for the studied mobile network operators have increased during the period, but the number of subscriptions has grown at a higher rate which has caused the ARPU to decline.
Table 5: The average change of ARPU per year for the observed companies based on data from the companies’ annual reports 2007-2011.

<table>
<thead>
<tr>
<th>Year</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average % change of ARPU per year</td>
<td>-2%</td>
<td>-3%</td>
<td>-2%</td>
<td>-1%</td>
</tr>
</tbody>
</table>

4.8 Bargaining power

Handset OEMs and mobile network operators each try to increase their power in the smartphone market. Handset OEMs can accomplish this partially by building brand images towards customers. The iPhone is an excellent recent example this, and it has made it possible for Apple to pressure mobile network operators to subsidize their phones. Also by adding complementary assets like the app stores, Handset OEMs and platforms have created customer lock-in effects, thus increased their influence (Dedrick et al., 2011).

Rådström (interview, April 29, 2013) states: “If we look back at 2007, then most mobile network operators had more to say, if one is to be honest”. He explains that in 2007 all the handset OEMs wanted the mobile network operators to embrace their products to such a degree, that they did not mind if the mobile network operators branded the mobile phones. Today there is not much branding of phones. He argues that the reason why there has been a shift in the power is that there has been a lot of innovation, especially when it comes to mobile phones and services. In that aspect the competition has increased, not among the mobile network operators, but a larger number of parties are competing for the end-user’s attention now compared to 2007. Some handset OEMs, especially Apple, can be a lot tougher in their negotiations with the mobile network operators today (Rådström, interview, April 29, 2013). The relation between Apple and some handset OEMs is tense, for example Apple can pressure the mobile network operators to allocate resources to promote the handset OEMs’ products. Shaughnessy (2013) confirms that Apple insist on that mobile network operators must keep certain sales targets, which can be hard for smaller network operators to handle.
Rådström (interview, April 29, 2013) describes that there has been a consolidation in of the infrastructure providers to a few companies, which he believes is positive from a mobile network operator perspective. Andersson (interview, May 3, 2013) states that many infrastructure providers have been put under a lot of price pressure from mobile network operators. He says that “Without this pressure, the development on the cost side of mobile network operators would be completely different.” When Selén (interview, April 23, 2013) argues: “The mobile network operators have been able to pressure the infrastructure providers prices a lot and keep the gains to themselves”.

4.9 Customer value proposition

The business models for mobile network operators were quite distinct before 2007, for example the purpose and functionality of offerings were well understood. When it came to voice, the goal for mobile network operators was to connect people though voice calls, and provide the best quality at the lowest cost. Similarly, messaging was about delivering messages from one node to another and data access was about connecting a mobile phone to a network and to provide the fastest speed at a minimum cost (Sharma, 2012a).

Constantinou (interview, April 11, 2013) explains that mobile network operators are still mainly addressing communication needs like voice, messaging and data access; however, it is only one part of the end-users mobile phone needs today. Mobile telecom has in the past few years become connected with a wide range of areas through OTT players, for example utilities, health, education and financial transactions. Mobile network operators are trying to take part of these areas (GSMA, 2013).

Constantinou (interview, March 21, 2013) explains that the mobile network operators are attempting to make new deals with OTT players. Constantinou (interview, April 11, 2013) states that “If you think in technology terms there is no way to figure out how you can add value, because technology does not add value.” The mobile network operators should think about how they add value to end-users since “Value is no longer in providing telephony and messaging, because value has migrated to other parts of the value network. This is what telcos need to realize, because unless you are adding value in
areas where values is migrating you cannot extract value /.../ you can only extract value by adding value”.

Prior to 2007 most customers paid for voice and messaging per unit of use, i.e. per minute or per message (Sharma, 2012a). In the early stages of the smartphone era many mobile network operators initially provided unlimited data access to boost demand, but this could not be sustained as demand rose. Unlimited voice and messaging can on the other hand be sustained, since they do not burden the mobile networks as much. Mobile network operators are increasingly offering integrated price plans that bundle voice, messaging and data access into one package (Salz, 2011).

The mobile network operators voice calls generally offer better quality than the voice apps (VisionMobile, 2012c). The voice apps do on the other hand enable new features that the mobile network operators’ voice does not offer, for example calling any type of device, like a computer or tablet. Rådström (interview, April 29, 2013) on the other hand, argues that the voice apps primarily are a substitute for the roaming and that they mainly are in competition for international calls.

4.10 Profit formula

Before 2007 it was rather clear to the mobile network operators what investments were required and the expected returns (Sharma, 2012a). Rådström (interview, April 29, 2013) states that “When iPhone was launched in 2007, it enabled the mobile network operators to start selling a lot of data access, as it created an ecosystem with a great customer experience”. However, wireless networks alone cannot guarantee profitable growth for mobile network operators (VisionMobile, 2012a). Selén (interview, April 23, 2013) says “Since the mobile network operators have had high profitability on traditional services for a long time, the barriers for them to think differently are high, and the incitement to change is low.” Constantinou (interview, April 11, 2013) explains that all the mobile network operators are worried about how they are going to compete in the future and says that “The technologies themselves does not generate revenue, this it what telcos currently think, and this is why they are too slow to understand how they should react”, telcos
referring to the mobile network operators. Selén (interview, April 23, 2013) also states that “There are no revolutions in the mobile telecom industry, only transitions that take time since everything is standardized and regulated”.

VisionMobile (2012a) visualizes the mobile network operators by three layers:

1. Connectivity – data access
2. Services – telephony, messaging, portals and other value-adding services
3. Distribution – physical and digital retail, customer care, consumer intelligence and more

These have all been impacted differently by the disruptive innovation (VisionMobile, 2012a). Connectivity has grown rapidly because of the demand to connect the smartphones and apps to the Internet. Services on the other hand have been affected by a flood of innovative OTT alternatives which have cut into telephony and messaging revenues. OTT players can do this with very small budgets in mobile network operators’ terms. They have also made the mobile network operators’ portals outdated. Distribution on the other hand, is mainly seen as a cost center.

Many mobile network operators initially blocked apps that compete with voice or messaging, or deprioritized them in the mobile networks to undermine the quality (Salz, 2011). However, more and more bundled package price plans are sold now to make it difficult for customer to reduce what they spend on voice, messaging and data access individually, and it makes the OTT players less relevant. Selén (interview, April 23, 2013) states that the purpose for the mobile network operators’ bundling of the prices is to “conquer the OTT players because bundling removes the cost benefit of using for example the OTT players voice services instead of mobile network operators’ voice service”. According to Rådström (interview, April 29, 2013) the mobile network operators’ response to the increasing competition from companies that offer their communication services for free, the OTT players, have been to try to bundle the pricing. Mobile network operators are also fighting OTT players by launching voice and messaging apps of their own (Sharma, 2012b).
Selén (interview, April 23, 2013) explains that service providers have traditionally had to pay the mobile network operators to distribute services through mobile phones, in a similar way that platforms now charge for services to be in app stores. The app stores have resulted in that mobile telecom operators compete with a number of new business models (Sharma, 2012a). For example, when it comes to mobile payments and commerce, the mobile network operators are now forced to compete fiercely over customers. However, Andersson (interview, May 3, 2013) believes that mobile network operators may have an advantage when it comes to mobile payments, since they already have a billing relation with customers and are often ranked high when you ask customers whom they trust.

### 4.11 Key resources

Selén (interview, April 23, 2013) explains that the mobile network operators have certain characteristics when it comes to resources. They rely on enormous infrastructure of mobile networks and have licenses to access specific radio spectrums. Only certain radio spectrums are used for mobile network operators, which are regulated by governments in different countries. Some governments sell licenses for large amounts or force mobile network operators to provide coverage even in commercially less viable areas. Thus licenses are rare resources and in combination with high capital expenditure on infrastructure investments, it is very hard for new mobile network operators to enter the market (Selén, interview, April 23, 2013).

The content of apps stores have gradually replaced some of mobile network operators’ key assets like user identification, location, billing and authentication (VisionMobile, 2012a). If the mobile network operators loose too much interaction with end-users they will lose the ability to differentiate, and consequently run the risk that their services will become commodities.

Gashi (interview, May 7, 2013) says that the key resources for mobile network operators today are the employees, since they are the front line of the business and the ones who meet the customers. Constantinou (interview, May 8, 2013) argue that mobile network
operators are “Not very attractive to work for today, so top talent is flocking away from telcos, not into telcos. In fact, it is also one of the least attractive businesses for investors”. Andersson (interview, May 3, 2013) says: ”Mobile network operators have always been quite attractive to work for, but in the past we have attracted more employees from the universities. Nowadays it is more OTT-players such as Google and Spotify that score high on graduates ranking lists of potential employers.”

4.12 Key processes
Constantinou (interview, Mars 21, 2013) argues that while software business models have changed spectacularly since 2007, the mobile telecom operators’ business models have in comparison only had minor changes. Selén (interview, April 23, 2013) agrees that mobile network operators have not changed their business models much since 2007.

Constantinou (interview, Mars 21, 2013) argues that one reason is that mobile network operators find it hard to change processes due to culture and legacy thinking, they are very slow-moving organizations. He argues that mobile network operators have been trying to hire people from other industries than telecom, but still find it hard to change processes. He says that “I would not say that the introduction of smartphones has caused a major change in telcos organizational processes. Billing, distribution, CRM and more have all seen incremental changes”. Andersson (interview, May 3, 2013) cannot either identify any major changes within the mobile network operators processes due to smartphones.

4.13 Value network structures
There has been a shift in mobile telecom to move from mobile network operators as center of service distribution to the platforms as center of service distribution, due to the change of the basis of competition (VisionMobile, 2012a; Constantinou, interview, April 11, 2013). The mobile telecom value network in 2007 was integrated, closed for outsiders and controlled by mobile network operators, and they distributed services through their portals (VisionMobile, 2012b). The value network has changed to open and modular with
many parties, as a consequence of the app stores. Mobile network operators have lost dominance over the distribution of services and interaction with end-users.

According to Rådström (interview, April 29, 2013) the largest difference within the mobile telecom industry since 2007 is that the competition for the end-user has relationship has increased. OTT players have introduced competition over the key links of the mobile value network (VisionMobile, 2012a). Selén (interview, April 23, 2013) says that “mobile network operators are most of all scared that they will loose more and more of their customer interaction”. Andersson (interview, May 3, 2013) believes that even if mobile network operators have been partly cut of from the end-users, they still have a customer relations through support functions, control of billing and local presence to customers. He argues that the local presence is hard for OTT players to match.

Selén (interview, April 23, 2013) describes the mobile telecom value network in the following order: infrastructure providers, mobile network operators, handset OEMs, OTT players and end-users. He explains that mobile network operators also reach end-users through for example voice, data access, messaging and support. Andersson (interview, May 3, 2013) explains that with smartphones, handset OEMs and platforms have taken a larger role towards the end-users, as well as enabled OTT players to do so. Before 2007 the operators were the ones who interacted with the customers, but they have lost much of that position.

Based on the above discussion by VisionMobile (2012b), Constantinou (interview, April 11, 2013), Rådström (interview, April 29, 2013) VisionMobile (2012a), Selén (interview, April 23, 2013) and Andersson (interview, May 3, 2013) we have designed two figures to illustrate the difference between the mobile telecom value networks in 2007 and now, see Figure 11 and 12. These are simplified versions of the mobile telecom value network, numerous other linkages could certainly be added. However, the figures are efficient in comparing the differences in the value network from a mobile network operators’ perspective, and shows how they have lost dominance over the interaction with end-users. The figures represent the shift caused by smartphones, although Figure 11 can still be a relevant value network for conventional phones.
Figure 11: Illustration of the mobile telecom value network in 2007 based on VisionMobile (2012b), Constantinou (interview, April 11, 2013), Rådström (interview, April 29, 2013) VisionMobile (2012a), Selén (interview, April 23, 2013) and Andersson (interview, May 3, 2013).

Figure 12. Illustration of the contemporary mobile telecom value network based on VisionMobile (2012b), Constantinou (interview, April 11, 2013), Rådström (interview, April 29, 2013) VisionMobile (2012a), Selén (interview, April 23, 2013) and Andersson (interview, May 3, 2013).

VisionMobile (2012b) does portray the mobile telecom value network from another perspective, see Figure 13. Old and new players rival for control over the end-to-end value network (VisionMobile, 2012b). Mobile network operators have lost control over the value network and OTT players have gained control. OTT players even challenge mobile network operators’ core services like voice and messaging through apps like Skype, Viber and WhatsApp. The infrastructure providers are not included in this perspective.
Figure 13. The mobile telecom network in accordance with VisionMobile (2012b).

Mobile network operators could also reach end-users through their own stores, but this differs from different regions. Constantinou (interview, March 21, 2013) explains that in the United States many end-users buy their mobile phones from the mobile network operators’ own stores. In Europe about 50 % of the end-users buy their mobile phones from distributors, and the others from the mobile network operators’ own stores. In Asia many end-users buy their mobile phones from distributors, but in countries like China, Japan and North Korea, the mobile network operators’ own stores do have quite strong positions.

Constantinou (interview, March 21, 2013) explains that mobile network operators have been outsourcing more and more of their infrastructure to the infrastructure providers since 2007. For example Orange and Vodafone have both outsourced their mobile
network operations and maintenance, as a way to save costs (Outsource magazine, 2009). Andersson (interview, May 3, 2013) argues that this is a way for infrastructure providers to advance positions in hope for better margins. Mobile network operators see it as an opportunity to decrease fixed costs and lower total costs, since infrastructure providers who can specialize in running mobile networks and can benefit from economies of scale. However, he further argues that it could be a threat if mobile network operators outsource too much. But he explains that from a strategic point of view: “It is the end-user relationship that mobile network operators do not want to outsource”.
5. Analysis

The analysis chapter begins with an introduction of the analysis. The factors in the theoretical framework are then analyzed in relation to the case study in order to provide theoretical findings. Additional factors that were found though the case study are presented thereafter. The chapter ends with a revised theoretical framework and an assessment framework.

5.1 Introduction of analysis

5.1.1 What is the disruptive innovation?

One issue we faced when examining the mobile telecom industry is, what exactly is the disruptive innovation in this case? Is it the hardware smartphones with their touchscreens? Or is it rather the platforms or the apps that were introduced through them? The disruptive innovation was discussed in the background of this thesis, but we want to clarify the previous mentioned questions further. The reason is that we want to be able to pinpoint what the effects of disruptive innovation has been in this case, since it enables us to determine if different factors can be affected by disruptive innovation.

The smartphones initially introduced a performance package that was inferior to what mainstream customers valued and served a niche segment of business people instead, which is in accordance with Christensen’s (2013) definition of disruptive innovation. Both the smartphones and the conventional phones improved, and the smartphone improved enough to eventually start to replace the conventional phones, especially after the launch of iPhone in 2007 and its app store one year later. The annual smartphone sales worldwide have gone from 11% of the mobile phone market in 2007 to an estimated 51% in 2013 and the pattern is even stronger in the developed countries. Thus, we argue that the smartphone itself can be seen as a new performance package and a disruptive innovation.

The smartphones platforms have enabled OTT players, which have introduced a number of new services that could be seen as disruptive innovation. The OTT players have for
example introduced voice apps and messaging apps that challenge the mobile network operators’ traditional voice and messaging services. Furthermore, they have replaced much of the mobile network operator portals.

The smartphone can be considered high-end disruptive innovation in accordance with Govindarajan & Kopalle (2006), since they have higher per-unit margin than conventional phones. Many of the OTT services, can on the other hand be considered low-end disruptions since they offer lower quality, in accordance with Christensen & Raynor (2003) – for example lower quality of voice calling on apps.

To summarize the above, a disruptive product innovation can be identified, the smartphone, which has enabled a number of other disruptive service innovations through the platforms and OTT players. The platforms and OTT players have also enabled the smartphones to start replacing conventional phones, which means that they are complementors to each other, in accordance with Yoffie & Kwak’s (2006) definition of complementors. Since smartphones, platforms and OTT players have had vast influence on each other during their development and grown simultaneously, we continue to refer to them as one performance package when we mention the disruptive innovation in this analysis.

5.1.2 Other considerations for the analysis

The empirical analysis has focused on the effects due to disruptive innovation from a mobile network operators’ perspective. The focus has been on smartphones, but it is important to not forget that the mobile network operators still sell conventional phones, especially in the developing world. But to see the effects of the disruptive innovation, it has been relevant for us to focus on smartphones.

This thesis focus on the mobile network operators as one industry, but it is important to point out that the effects of the disruptive innovation can vary in different countries. The effects of disruptive innovation should be clearer in developed countries if you consider that the smartphone penetration is higher in developed countries than developing countries.
Christensen & Raynor (2003) describes disruptive innovation as a process rather than an event, which applies to the disruptive innovation in the mobile telecom industry. Selén (interview, April 23, 2013) states that there are no revolutions in the telecom industry but rather transformations that take time. This indicates that disruptive innovation in the mobile telecom industry takes time, and this is strengthened by the fact that the usage of smartphones has increased gradually over time. As a consequence we may not have seen the full effects of the disruptive innovation yet, and the effects can become more evident with time.

5.2 Structure and bargaining power in value networks

The mobile network operators have lost their dominance in the value network over the end-user relationship to the platforms and OTT players. The lost dominance can make it difficult for mobile network operators to differentiate themselves towards end-users. In addition the mobile network operators have also lost some influence over end-users to handset OEMs. Porter (2008) states that differentiation and switching costs can create bargaining power, and the handset OEMs have been able to differentiate themselves with smartphone branding and platforms have been able to create switching costs through lock-in effects.

Mobile network operators still have interaction with end-users, for example through their services, local presence, billing and support functions. Nevertheless, we argue that there is still a clear change due to the disruptive innovation – more players have been introduced into the value network and compete over power. Therefore, we claim that value networks and bargaining power can be affected by disruptive innovation.

Value chains can change fast by disruption from unexpected players according to Sargut & McGrath (2011). In 2007 the mobile network operators completely dominated content distribution, but now the platforms and the app stores account for 94 % of the content downloads on phones worldwide. Normann (2001) states that it is no longer about who can be positioned best in the value network, but rather who can find the most creative ways to create value. Thus we argue that the OTT players can respond to the end-users
needs better and create more value for them compared to the operator portals. Hence value networks and bargaining power can change because other players create more value as an effect of disruptive innovation.

Bowman & Ambrosini (2000) argues that the realization of value is determined by the bargaining relationships, and Cox (2001) says that value migrates in the direction of power. Johnson et al. (2008a) explain that different levels of profits are available to different parts of the value network, depending on the competitive intensity. Since the competitive intensity has increased over the end-user interaction for the mobile network operators it may influence their profitability. This means that changes in a value network or bargaining power due to a disruptive innovation can cause other factors to change, for example value migration. This is an example of how one factor is influenced by disruptive innovation and then is able to influence other factors.

Since 2007 many mobile network operators have been outsourcing more of their infrastructure to the infrastructure providers. It is possible that this is an effect of disruptive innovation, since the mobile network operators for example may have been pressured by the disruptive innovation and therefore searched for new ways to reduce costs. However, these connections are not clear, and we can therefore not conclude the outsourcing as an effect of the disruptive innovation.

5.3 Value migration

5.3.1 Introduction

According to Slywotzky (1996) there are three phases of value migration and these are the value inflow, value stability and value outflow phase. We have decided to examine if disruptive innovation affects value migration within a company, between companies and between industries. To do this we have applied the different parts of the mobile network operators’ business designs to the phases to see how well they create value and were value is migrating.
5.3.2 Value migration analysis

Value migration within a company can be described by studying the revenue growth curves. Sharma (2012a) describes how the mobile network operators’ revenue growth for different segments should be correlated with the subscription growth for the segments. The mobile network operators’ business should be divided into voice, message and data access and compared to the subscriber penetration for each examined segment.

The revenue growth curves for the different segments vary in different countries and especially between the developed and developed countries. If the first revenue growth curve, voice, is studied for the mobile network operators it is declining for most of the developed countries while it is on the rise for the developing countries (Sharma, 2012a). If this were put in relation to the value migrations phases, voice for the developed countries would be placed in the value outflow phase (see Figure 14). The value outflow phase is characterized by competitive intensity, declining sales and low profits (Slywotzky, 1996). Voice for the developed countries would be placed here based on the declining revenues and increasing competition the traditional voice services are experiencing from the OTT players voice apps. In the developing countries the subscriber penetration and the revenues are increasing, which would place voice in the value inflow phase which is characterized by high growth, high profitability and limited competition (see Figure 14).

The second revenue curve, messaging, is rising in the developing countries due to the previously mentioned increased subscriber penetration as well as increasing revenues for messaging (Sharma, 2012a). The messaging in the developing countries can therefore be considered to be in the same phase as voice, the value inflow phase, since the number of subscriptions and revenues are rising (see Figure 14). The revenue growth curve for messaging has started to decline in some of the developed countries and the competition is increasing due to the OTT players’ apps for messaging. Andersson (interview, May 3, 2013) believes that the messaging business will be the first thing lost by the mobile network operators in the competition with the OTT players. The value stability phase is characterized by stable margins, stable market share and competitive stability (Slywotzky, 1996). The declining revenue growth curve for some countries and the
increasing competition would place messaging for the developed countries in the transition between the value stability and the value outflow phase (see Figure 14).

The third revenue curve, data access, is currently rising in both the developed and developing countries and this growth is expected to continue for the next 3-4 years (Sharma, 2012a). This would place data access in the value inflow phase because of the increasing revenues and the growth potential (see Figure 14).

Value migration between companies has been studied through the 12 mobile network operators in our data analysis. We examined profit margins and EBITDA margins for the chosen mobile network operators between 2007 and 2011. Our results show that the individual companies margins have fluctuated, some more than others, but it is not possible to identify any clear patterns. The observed companies are operating in different regions and countries and our data analysis only provides a sample of the mobile network operators in the world, so it is not possible to determine if the cause of the fluctuations.

According to Selén (interview, April 23, 2013 the mobile telecom industry demands large investments for the required infrastructure and licenses. This gives the industry some characteristics that differ from other industries since the mobile network operators do not
compete with each other straightforward. The required licenses and investments make it difficult for mobile network operators to enter new markets and the threat of new competitors entering low. As a result the competition among the mobile network operators can be considered to be stable, as well as the market shares. In terms of value migration between companies we have therefore determined the mobile network operators to be in the value stability phase mainly because the competition and market shares remain stable (see Figure 15).

![Value migration between mobile network operators](image)

Figure 15: The mobile network operators placed in the model of the phases of value migration between companies.

When the value migration between industries is studied we consider the mobile network operators as a group to be in the transition of phases, positioned between the value stability and the value outflow phase (see Figure 16). According to our data analysis the mobile network operators average profit and EBITDA margins are rather stable, even if the individual companies have fluctuating margins. The mobile network operators market share in the mobile telecom industry has been reduced from 77% in 2008 to 74% in 2011 but it can still be considered to be fairly stable. The competition in the mobile telecom industry has completely changed and there are a larger number of parties that are competing for the end-user’s attention now compared to 2007 (Rådström, interview, April 29, 2013). According to Constantinou (interview, April 11, 2013) value is migrating of out the mobile network operators since end-users are not willing to pay more
for voice and for messaging. In addition the mobile network operators portals have faded in importance and only account for 6% of the content downloads on mobile phones worldwide today. This means that the mobile network operators are experiencing greater competition and not the competitive stability that the value stability phase represents. Therefore the mobile network operators can be considered to be in the transition of phases, which according to Slywotzky (1996) can be triggered by innovation. Furthermore both Constantinou (interview, May 8, 2013) and Andersson (interview, May 3, 2013) imply that talent and capital may be moving out of the mobile network operators, which is consistent with the value outflow phase.

The mobile network operators are experiencing an intensifying competition, which is consistent with the value outflow phase. However, the mobile network operators are not facing the other characteristics of the value outflow phase, low profits and declining sales. The revenues have increased for the majority of the 12 observed mobile network operators in our data analysis and the number of subscriptions have increased for all the studied companies. The average revenue per unit, ARPU, has however declined for all the mobile network operators in our analysis. This indicates that their revenues are not growing as fast as the number of subscribers, and as a consequence they are making less money for each additional subscription.

Figure 16: The mobile network operators placed in the model of the phases of value migration between industries.
5.3.3 Results

According to Slywotzky (1996) value migration occurs when value moves from outdated business designs to new ones that better satisfy the customers’ priorities. In our value migration analysis above we have been able to identify value migration within a company and between industries.

The customers perceptions of value has changed as the mobile network operators traditional services of voice and messaging have been challenged by the OTT players communication apps for voice and messaging. This is consistent with what Slywotzky (1996) defines as the driving force of value migration, which is how customers view the value of a business designs and how it matches their priorities in relation to the competitors.

We have not observed any clear signs of value migration between the mobile network operators in our data analysis. We have been able to identify some fluctuations between the companies, but we have not been able to draw any conclusions whether these are effects of disruptive innovation. The fluctuations shown by the companies in our data analysis may be a result of value migration caused by the disruptive innovation, but it might just as well be a result of for example macroeconomic effects or regulations.

To summarize our value migration analysis we have seen that value has migrated within the mobile network operators and between industries in mobile telecom as a result of the disruptive innovation. The value has begun to migrate from the mobile network operators to other parties in the value network such as OTT players. The value within the mobile network operators has started to migrate from voice and messaging to data access. Thus, we can conclude that disruptive innovation can cause value to migrate within companies and between industries.
5.4 Changes at an industry level

5.4.1 Basis of competition

Christensen et al. (2001) argue that disruptive competitors can start to replace established offerings due to a shift in the basis of competition to focus on price, flexibility, convenience or customization. The change from mobile telephony to mobile computing, i.e. the disruptive innovation, has transformed the basis of competition within the mobile telecom industry. It has gone from reliability and scale of networks, to an environment where choice and flexibility of services is more valued by end-users. Christensen et al. (2001) sees the shift in the basis of competition as an enabler for disruptive innovation, however in this case we see that the disruptive innovation has changed the basis of competition. Hence, we claim that disruptive innovation can affect basis of competition.

5.4.2 Market shares

Christiansen (2013) states that disruptive innovation eventually replaces established offerings. An example of this in our case is that the mobile network operator portals have been replaced by platforms to a large extent. However, when it comes to voice and messaging we can see that the mobile network operators have been threatened by OTT players’ voice and messaging apps, but not yet replaced. Christensen & Raynor (2003) explain that there are exceptions when leading companies manage to stay on top despite a disruptive innovation. We argue that the mobile network operators have been able to hinder some of the effects of the disruptive innovation by bundling their offers to make the OTT players less relevant. However, based on that the mobile network operators have lost most market shares of content for mobile phones and that other services have been threatened, we claim that market shares can affect due to disruptive innovation.

5.4.3 Market size

Markides (2006) and Christensen & Raynor (2003) agree that disruptive innovation can enlarge the market size. The total mobile telecom market has grown in size since 2007, but much of it may be a result of growth in subscriptions and not a consequence of disruptive innovation. Nevertheless, data access and content revenue for mobile phones
has grown rapidly during the last couple of years, as an effect of increased usage of apps. Therefore, market size has been affected by the disruptive innovation. Hence, disruptive innovation can affect market size.

5.4.4 Customer Behavior
Both Constantinou (interview, March 21, 2013) and Rådström (interview, April 29, 2013) argue that the choice of mobile phone is more important today, rather than the choice of mobile network operator. The end-users have started to use their mobile phones for a wide range of new areas and consume much more data access. Hence, this case supports Markides (2006) arguments that disruptive innovation can affect the behaviors and habits of customers.

5.5 Changes at a firm level

5.5.1 Profit formulas and customer value propositions
Magretta (2002), Amit & Zott (2001) and Johnson et al. (2008b) agree that business models should generate profit and deliver value to customers. Amit & Zott (2012) sees changes in business models as a way to create new value. Constantinou (interview, April 11, 2013) argues that mobile network operators are still mainly addressing communication needs like voice, messaging and data access. However, the mobile network operators have changed their offerings due to competition from OTT players. They bundle services instead of charging per unit, and focus more on selling data access. Furthermore, the mobile network operators try to offer new services, for example apps of their own. Hence, the mobile network operators have changed their customer value propositions, due to the disruptive innovation. Thus, disruptive innovation can effect customer value propositions.

The mobile network operators’ profit formulas have also been changed. Some changes are hard to link to the disruptive innovation since lower prices for an overall volume of services can for example be an effect of technological advances as well. Nevertheless, the mobile network operators’ revenue models of their profit formulas focus more on data
access as a stream of revenue, rather than voice and messaging. The costs of developing portals and the opportunities to charge for distributing services through them must also logically have decreased due to the decreased usage of them. Therefore we argue that disruptive innovation can influence profit formulas.

5.5.2 Key resources

It is hard to determine a precise connection between the mobile network operators’ infrastructure and licenses and the disruptive innovation. Since the value of data access has increased, while voice and messaging have been threatened, it is possible to argue that the disruptive innovation has changed the value of these resources. The mobile network operators’ key assets have also gradually been replaced due to the emergence apps, for example location and authentication. Furthermore, both Constantinou (interview, May 8, 2013) and Andersson (interview, May 3, 2013) imply that it may be less attractive to work for mobile network operators today.

5.5.3 Key processes

We have not been able to identify any major changes in key processes within mobile network operators due to the disruptive innovation through interviews or other sources. Although minor changes in processes most likely have occurred and possibly larger ones that our sources cannot identify, it is not enough to clearly state that disruptive innovation can change key process based on this information.

5.5.4 Changes in business models

Christensen (2013) explains that disruptive innovations are introduced through business models with different performance packages. However, the changes for mobile network operators in profit formulas, customer value propositions and key resources demonstrate that disruptive innovation also can cause existing business models to change.
5.6 Additional findings

5.6.1 Complementor opportunities

Christensen & Raynor (2003) state that many disruptive innovations fail because they are part of a value network that cannot adapt to support the disruption. However, in this case the value network could adapt to support the disruptive innovation, since the mobile network operators could support it by providing data access.

Yoffie & Kwak (2006) argue that complementors provide products or services that increase the value of each other’s offerings in the customers’ eyes. Customers require data access in order to use OTT players’ apps; the better quality and price on data access, the more value OTT players can provide. Usage of data access is based on customers that are provided with content on their mobile phones. Mobile network operators are therefore to a large extent dependent on OTT players in order to sell data access. This makes the OTT players and mobile network operators’ data access complementors.

According to Yoffie & Kwak (2006) the demand for one product can increase if the price or quality for the complement is improved. This can be seen in the enormous increase of data access usage as a result of the platforms and apps. Although the OTT players have had negative effects on the mobile network operators’ voice, messaging and portals, they have increased the demand for the mobile operators data access. We have therefore identified that disruptive innovation can increase or change the opportunities for complementors through this case study.

5.6.2 Perceptions about the future

Before the smartphones were introduced in 2007 the mobile network operators were the dominating party in the mobile telecom industry value network. This has changed since the iPhone was introduced in 2007 and a larger number of players have entered the value network. According to Rådström (interview, April 29, 2013) the competition has increased and a larger number of parties are competing for the end-user’s attention. The mobile network operators’ business environment has changed and they need to adapt to the new surroundings to be able to maintain their profitability.
Constantinou (interview, April 11, 2013) explains that all the mobile network operators are worried about how they are going to compete in the future. Selén (interview, April 23, 2013) argues that the mobile network operators primarily are scared that they will lose their customer interaction. This indicates that the mobile network operators are concerned about the changes caused by the disruptive innovation and that they have realized that the mobile telecom industry has changed. Therefore we claim that perceptions about the future can be affected by the disruptive innovation.

5.7 Revised theoretical framework

We have created a revised theoretical framework based on the analysis, see Table 6. It includes the additional findings, which are complementor opportunities and perceptions about the future. It also summarizes our findings about the mobile network operators to see in which degree our theoretical descriptions of the factors comply with the case study. The descriptions in the column description of factors are based on the theoretical framework, except the two additional factors which are based on the analysis.
<table>
<thead>
<tr>
<th>Factors</th>
<th>Description of factors</th>
<th>Found effects on mobile network operators</th>
<th>Degree of compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basis of competition</td>
<td>The basis of competition can change to price, flexibility, convenience or customization.</td>
<td>From reliability and scale of network, to an environment where choice and flexibility of services is more prominent.</td>
<td>Strong</td>
</tr>
<tr>
<td>Market shares</td>
<td>Disruptive innovation can eventually replace established offerings and incumbents.</td>
<td>The mobile network operator portals have been replaced by platforms to a large extent, while other services have been threatened but not yet replaced.</td>
<td>Strong</td>
</tr>
<tr>
<td>Market size</td>
<td>The industry can be enlarged when new customers are attracted and existing customers consume more.</td>
<td>Service content revenue for mobile phones and data access and has grown rapidly.</td>
<td>Strong</td>
</tr>
<tr>
<td>Customer behavior</td>
<td>The customers' behaviors and habits can significantly change.</td>
<td>The end-users have started to use their mobile phones for a wide range of new areas and consume much more data access.</td>
<td>Strong</td>
</tr>
<tr>
<td>Value migration within a company</td>
<td>Value can move from outdated business designs to new ones within a company that better satisfy the customers' priorities.</td>
<td>Value has stated to migrate from voice and messaging to data access.</td>
<td>Strong</td>
</tr>
<tr>
<td>Value migration between companies</td>
<td>Value can move from outdated business designs to new ones in other companies that better satisfy the customers' priorities.</td>
<td>Our analysis could not prove a clear pattern of value migration between mobile network operators caused by the disruptive innovation.</td>
<td>Weak</td>
</tr>
<tr>
<td>Value migration between industries</td>
<td>Value can move from outdated business designs to new ones in other industries that better satisfy the customers' priorities.</td>
<td>Value has started to migrate from the mobile network operators to other players such as OTT players.</td>
<td>Strong</td>
</tr>
<tr>
<td>Bargaining power</td>
<td>Bargaining power of relationships between firms can change.</td>
<td>Platforms and OTT players have started to compete over power with the mobile network operators. The mobile network operators have also lost bargaining power to handset OEMs.</td>
<td>Strong</td>
</tr>
<tr>
<td>Customer value proposition</td>
<td>Value proposition, the sum of total benefits offered in in return for a payment, can change.</td>
<td>The mobile network operators bundle services, focus more on selling data access and try to offer new services.</td>
<td>Strong</td>
</tr>
<tr>
<td>Profit formula</td>
<td>Profit formula, the blueprint of how a company creates value for itself, can change.</td>
<td>The mobile network operators focus more on data access and their portal costs and revenues have decreased.</td>
<td>Strong</td>
</tr>
<tr>
<td>Key resources</td>
<td>Key resources, the assets that are crucial when delivering value, can change.</td>
<td>The mobile network operators’ resources have been affected, for example the value of infrastructure, licenses and authentication has changed.</td>
<td>Strong</td>
</tr>
<tr>
<td>Key processes</td>
<td>Key processes, the operational and managerial processes that allow companies to deliver value, can change.</td>
<td>No major changes within mobile network operators’ key processes due to the disruptive innovation can be identified.</td>
<td>Weak</td>
</tr>
<tr>
<td>Value network structures</td>
<td>The value network structures, how the value-adding activities are linked, can change.</td>
<td>More players have been introduced in the value network that compete over interaction and control over the end-users.</td>
<td>Strong</td>
</tr>
<tr>
<td>Complementor opportunities (additional finding)</td>
<td>Opportunities for complementors can increase or change.</td>
<td>The mobile network operators’ data access has increased due to the emergence of OTT players.</td>
<td>Strong</td>
</tr>
<tr>
<td>Perceptions about the future (additional finding)</td>
<td>Perceptions about the future can change.</td>
<td>The mobile network operators have become more concerned about their future.</td>
<td>Strong</td>
</tr>
</tbody>
</table>

Table 6: Revised theoretical framework based on the findings in the analysis.
5.8 Assessment framework

We have revised the theoretical framework of this thesis based on the findings in our analysis in relation to the mobile telecom industry. By doing so we have created an assessment framework, see Figure 17.

Figure 17: Assessment framework based on the findings in the analysis.

All factors in Figure 17 do not have to be affected by all disruptive innovations, as we have seen in the mobile telecom industry. We could not identify any major changes in key processes within the mobile network operators nor any value migration between mobile network operators based on the disruptive innovation. However, we see no reason to why these factors could not be affected by disruptive innovation, thus the analysis of the mobile telecom industry is not enough to refute them. This means that the assessment framework is a list of potential factors, and not factors that are affected in all disruptive innovations. This is in accordance with the purpose of this thesis. We have also found
two new factors in the analysis, which are complementor opportunities and perceptions about the future.

In the analysis we have discussed how changes in the value networks or bargaining power which is caused by disruptive innovation, can effect value migration. Another example is that Slywotzky (1996) argues that one of the driving forces of value migration is what customers want, need and are willing to pay for. This means that changes in customer behavior caused by disruptive innovation can cause value migration. It could also be argued that for example changes in customer value proposition could affect market size, bargaining power or market shares. In fact, we argue through logical reasoning that all of these factors can indirectly be influenced by disruptive innovation through changes in other factors.

An important point that we have examined in our analysis is that a disruptive innovation processes vary in length. This means that it may vary in time when a factor is influenced in different disruptive innovation processes.
6. Conclusions

The conclusions chapter presents the results of the analysis and discusses how they match the purpose of this thesis. At the end of the chapter proposals for future research are presented.

6.1 Research results

The primary purpose of this thesis was to provide an assessment framework of potential effects of disruptive innovation at an industry level. We have presented 13 factors that can be affected by disruptive innovations through our theoretical framework. We found two additional factors in our analysis of the case study. The result is the assessment framework that is presented in Figure 17, which achieves our purpose.

This thesis has examined disruptive innovation by focusing on its effects, which differs from the focus of previous authors of disruptive innovation. There has been no previous extensive research on the overall effects of disruptive innovation at an industry level according to our literature review. The assessment framework summarizes potential factors that can be affected by disruptive innovation to meet the theoretical problem of this thesis.

6.2 Results discussion and implications for managers

Disruptive innovation has reshaped numerous industries, and has drawn the attention of both scholars and practitioners. Christensen (2006) recognizes that the building of theory on disruptive innovation is an ongoing process, and our findings add to this process. Our research extends theory on disruptive innovation and therefore contributes to the field of business research.

Our assessment framework can be used either ex-ante to analyze possible future effects of an upcoming disruptive innovation at an industry level, or ex-post to understand how an industry has changed. It can be used for academic purposes or by practitioners such as managers that make strategic decisions. Christensen (2006) and Govindarajan & Kopalle
(2006) state that it is possible to make predictions if a disruptive innovations will occur. This should be determined before the assessment framework can be applied. When managers have used the assessment framework, we recommend that they determine if the effects of the disruptive innovations create risks or opportunities for the managers’ organization before they make strategic decisions.

The assessment framework can for example help managers identify potential opportunities for complementors that may occur through the disruptive innovation. According to Christensen (2013) disruptive innovation can replace established players, so the opportunities to produce complementing services or products could be immense. Thus, managers can decide to invest in production of complementary products by understanding the effects of a disruptive innovation, and generate profits by doing so in time. Even though the situation has to be thoroughly assessed before a decision is made, the assessment framework gives good guidance of which factors to assess.

The assessment framework can also show managers that a disruptive innovation can change the basis of competition at an industry level. Thus, managers can try to understand how and search for opportunities to realize profits or minimize risks from the disruptive innovation. In addition to the above mentioned examples, the assessment framework can also be used for a number of other situations to manage disruptive innovation.

Theories on disruptive innovation argue that disruptive innovation decrease opportunities for existing players. We have however been able to confirm that it also can increase opportunities for some existing players, as for example complementors or others who understand the effects of a disruptive innovation and make correct strategic decisions as a consequence. We have studied the effects of disruptive innovation at an industry level and that increases the relevance for individual companies since managers need to understand the entire industry in order to make the correct strategic decisions.

The mobile network operators can be characterized by extensive infrastructure, licenses and slow-moving organizations. These circumstances may have influenced which factors
we found to be affected by disruptive innovation, but our assessment framework does not include any parameters that are specific to the mobile telecom industry. This makes our assessment framework applicable to other industries were it can be used to assess potential effects of disruptive innovation. All industries are not affected the same, but we argue that the assessment can be used to identify new disruptions in a number of industries as for example media and clean technology.

### 6.3 Mobile network operators

The secondary purpose of this thesis was to describe how the mobile network operators have been affected due to the disruptive innovation in the mobile telecom industry. The purpose has been achieved through our theoretical framework, case study of the mobile network operators and analysis. The effects are summarized in Table 6 in the analysis chapter.

The findings of our secondary purpose contribute empirically to research on the mobile telecom industry since it shows how the industry has been affected by the disruptive innovation. The importance of our findings can be accentuated by that the mobile telecom industry represent 2% of world GDP, and the mobile network operators comprise 74% of the revenue. Practitioners can use the findings to gain further knowledge of how the mobile telecom industry has changed due to disruptive innovation. The mobile network operators can use our assessment framework when new disruptive innovations occur to understand the effects, and thus realize their opportunities and possibilities to minimize risk.

### 6.4 Reflection of results

While we acknowledge the value of the assessment framework we also recognize its shortcomings. Firstly, our study has thoroughly covered research on the field and examined effects of disruptive innovation at an industry level, but there may still be a number of factors that the case study and previous research have not uncovered yet. Therefore, the assessment framework cannot assure that all potential effects are examined when it is used, but it still provides good assistance to which factors to examine.
Secondly, the assessment framework provides factors that can be affected, but it does not specify in detail how the factors may be affected. Although such details would improve the assessment framework, it would be difficult to provide more detailed information since disruptive innovation can create such wide effects. Thirdly, the assessment framework does not explain how long it will take before the effects occur, which would be beneficial to the assessment framework, but the length of disruptive processes vary.

6.5 Proposals for future research

Through our theoretical framework we have provided potential effects of disruptive innovation at an industry level, which has been tested and elaborated through our case study. The case study revealed further factors that were added to our assessment framework and this shows that case studies can uncover potential effects of disruptive innovation. We therefore suggest that more case studies can be conducted to see if any additional potential effects of disruptive innovation are to be revealed. These case studies should be conducted in a variety of industries in order to provide more diverse results.

The effects of disruptive innovation on the factors in our assessment framework occur at different times during processes of disruptive innovation. It may be possible to classify different factors depending on their order of appearance rather than when in time they occur. This could possibly help managers to understand which factors they should focus on first, therefore create better decisions. It could also help them to see early signals of an upcoming disruptive innovation. Therefore we suggest further research on classification of the potential effects depending on which order they occur.
References


Greenwich Consulting (2011). *Thoughts, reflections and analysis for the telecom, media and Internet industry*.


Annual Reports


Nippon Telegraph & Tel: Annual Reports 2007-2011.


Appendices

<table>
<thead>
<tr>
<th>Mobile subscriptions (Million)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year</strong></td>
</tr>
<tr>
<td>Developed</td>
</tr>
<tr>
<td>Developing</td>
</tr>
<tr>
<td>World</td>
</tr>
</tbody>
</table>

Appendix 1: The number of mobile subscriptions in the world, developed and developing countries, based on data from ITU (2013).

<table>
<thead>
<tr>
<th>Mobile subscriptions per 100 inhabitants</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year</strong></td>
</tr>
<tr>
<td>Developed</td>
</tr>
<tr>
<td>Developing</td>
</tr>
<tr>
<td>World</td>
</tr>
</tbody>
</table>

Appendix 2: The number of mobile subscriptions per 100 inhabitants for the world, developed and developing countries, based on data from ITU (2013).

<table>
<thead>
<tr>
<th>Profit Margin (Net income/ Revenue)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year</strong></td>
</tr>
<tr>
<td>AT&amp;T</td>
</tr>
<tr>
<td>Nippon</td>
</tr>
<tr>
<td>Verizon</td>
</tr>
<tr>
<td>China Mobile</td>
</tr>
<tr>
<td>KDDI</td>
</tr>
<tr>
<td>Softbank</td>
</tr>
<tr>
<td>Telstra</td>
</tr>
<tr>
<td>China Unicom</td>
</tr>
<tr>
<td>BCE</td>
</tr>
<tr>
<td>Telia Sonera</td>
</tr>
<tr>
<td>Telenor</td>
</tr>
<tr>
<td>Tele 2</td>
</tr>
</tbody>
</table>

Appendix 3: Profit margins for the observed companies based on the companies’ annual report 2007-2011.
Appendix 4: EBITDA margins for the observed companies, based on the companies’ annual report 2007-2011.

<table>
<thead>
<tr>
<th>EBITDA Margin (EBITDA/Revenue)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
</tr>
<tr>
<td>AT&amp;T</td>
</tr>
<tr>
<td>Nippon Telegraph &amp; Tel</td>
</tr>
<tr>
<td>Verizon Communications</td>
</tr>
<tr>
<td>China Mobile</td>
</tr>
<tr>
<td>KDDI</td>
</tr>
<tr>
<td>Softbank</td>
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<tr>
<td>Telstra</td>
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<tr>
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<tr>
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<td>Telia Sonera</td>
</tr>
<tr>
<td>Telenor</td>
</tr>
<tr>
<td>Tele2</td>
</tr>
</tbody>
</table>

Appendix 5: Percentage change of ARPU per year for the observed companies, based on the companies’ annual report 2007-2011.

<table>
<thead>
<tr>
<th>Percentage change of ARPU year-by-year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
</tr>
<tr>
<td>AT&amp;T</td>
</tr>
<tr>
<td>Nippon Telegraph &amp; Tel</td>
</tr>
<tr>
<td>Verizon Communications</td>
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