CHALMERS
UNIVERSITY OF TECHNOLOGY

Distribution of Digital Content over Internet for Mobile End-Consumption

Analyzing: Actors, Value Chains and Business Trends

Master of Science Thesis in the Supply Chain Management Programme

ANNA-STINA FRYKHOLM
FANNEY GUNNARSDÓTTIR

Department of Technology, Management and Economics
CHALMERS UNIVERSITY OF TECHNOLOGY
Gothenburg, Sweden 2015
Report Number: E2015:053

MASTER'S THESIS E2015:053

Distribution of Digital Content over Internet for Mobile End-Consumption

Analyzing: Actors, Value Chains and Business Trends

Master's Thesis within the
Supply Chain Management Programme

ANNA-STINA FRYKHOLM
FANNEY GUNNARSDÓTTIR

The Department of Technology Management and Economics
CHALMERS UNIVERSITY OF TECHNOLOGY
Gothenburg, Sweden, 2015

Distribution of Digital Content over Internet for Mobile End-Consumption Analyzing; Actors, Value Chains and Business Trends

Anna-Stina Frykholm & Fanney Gunnarsdóttir

Master´s Thesis E2015:053

Department of Technology Management and Economics
CHALMERS UNIVERSITY OF TECHNOLOGY
Gothenburg, Sweden, 2015
SE-412 96 Göteborg, Sweden
Telephone + 46 (0)31-772 1000

Chalmers Reproservice
Gothenburg, Sweden 2015

Abstract

The consumption of mobile data has shown to be on the rise. Between 2013 and 2014, mobile data grew by 55%. Alongside this explosion of mobile data consumption, different industries such as the tv, telecom and computer industries have emerged. This is evidential when looking at services such as video and music streaming. When it comes to the value chain of digital content distribution, evolution has gone swiftly and researchers have not been able to keep up with this fast evolvement of mobile end-consumption. An understanding of the value chain characteristics is important for stakeholders, when identifying threats and opportunities within the industry.

The aim of this thesis is to provide valuable insights that will benefit both researchers and stakeholders within the ICT sector by analyzing the value chain of digital content distribution for mobile end-consumption. Thereto, this thesis intends to evaluate trends and expectations in order to identify future business opportunities within the industry. This aim was fulfilled by; (i) capturing how digital content is distributed for mobile end-consumption, (ii) analyzing the roles and interrelationships of the actors involved in the distribution and (iii) evaluating current trends and future expectations of digital content distribution for mobile end-consumption in relation to business opportunities.

Furthermore, this thesis includes three industry case studies within the industries of e-/m-commerce, music streaming and video streaming as well as the two market perspectives of Nordic and African markets. In addition, a feasibility analysis of business opportunities for sponsored data is presented, based on the aforementioned industry and market perspectives.

The results show that the value chain of digital content distribution is typically characterized by complexity. Findings also show that all three industries are on the rise when it comes to solutions for mobile end-consumption. In addition, the roles within the value chain are changing. New actors, which provide content distribution networks, are entering the picture and are expected to have a persistently important role when it comes to distribution of data-heavy services such as video streaming. Moreover, findings show that actors are seeking new ways of securing revenue streams and alternative business opportunities are introduced. Sponsored data is identified as one such alternative business model, where content providers pay for the data that their customers consume.

The analysis show that feasibility for sponsored data is dependent on three parameters; *Value of Free Data, Cost of Data Volume* and *Value of Increased Reach*. In turn, these three parameters are dependent on five supporting factors. Although it is concluded that the viability for sponsored data is case specific, findings show that out of the three industries studied, the most feasible business cases for sponsored data can be found within the m-commerce industry in African

markets. Thus, this thesis does not only provide useful insights for stakeholders within the industry but also provides a useful analytical tool for evaluating business opportunities for sponsored data. Furthermore, the tool can be applied for other industries and markets besides those identified in this thesis.

Keywords: Digital Content Distribution, ICT Ecosystem, Mobile Data, Sponsored Data, Value Chain Analysis.

Acknowledgements

This M.Sc thesis was conducted at Chalmers University of Technology as a part of the M.Sc. program in Supply Chain Management. It was done in collaboration with Ericsson AB, which provided us with an opportunity to apply our theoretical knowledge in a real life context.

This degree project was supervised by Erik Bohlin, Chalmers University of Technology and Lars Egeland, Ericsson AB, and to them we express our gratitude.

We would also like to thank the many Ericsson employees who assisted us during the process. We would especially like to give credit to; Aldo Bolle, Helen Örtenblad, Hans Mattsson, Per Johansson, Ulf Mattsson and Karl-Magnus Möller for taking the time to assist us.

In addition, we would like to thank the representatives from the three case companies that participated in the project. We are grateful for all the interviewees that were willing to inform us as much as possible to be able to assist us with the thesis.

Anna-Stina Frykholm and Fanney Gunnarsdóttir

Gothenburg, June 2015

Table of Contents

Lists of Abbreviations:

ARPU: Average Revenue Per User

CDN: Content Distribution Network

EPC: Evolved Packet Core

ICT: Information and Communications Technology

IFPI: The International Federation of the Phonographic Industry

IP: Internet Protocol

ISP: Internet Service Provider

IT: Information Technology

LTE: Long Term Evolution

MBB: Mobile Broadband

MBH: Mobile Backhaul

MNO: Mobile Network Operator

NEP: Network Element Provider

OTT: Over-the-top

PC: Packet Core

QoE: Quality of Experience

QoS: Quality of Service

VMNO: Virtual Mobile Network Operator

2G: Second-Generation (Mobile Network)

3G: Third-Generation (Mobile Network)

4G: Fourth-Generation (Mobile Network)

5G: Fifth-Generation (Mobile Network)

1 Introduction

To put this thesis into context, this chapter presents the background of the thesis, followed by the aim and the research questions formulated to fulfill the aim. In addition, the research approach is explained in brief as well as the limitations. Lastly, the thesis outline is explained for the reader to grasp the report structure.

1.1 Background

The evolution of ICT has gone by swiftly as technology breakthroughs has transformed the way people communicate with each other (Ericsson, 2015a). Alongside the evolution of network technology, an industry divergent has emerged. The lines between the telecom, computer and media industries are thereby no longer clear (Olsson 2004; Sanjoy, 2011). With each network generation, providing better capacity for faster data communication, the possibilities of communication have expanded (Ericsson & Telia, 1998; Olsson 2004; Sanjoy, 2011, Olsson and Mulligan, 2013). People are now using their mobile devices to a much larger extent than previously, with an heavy increase in mobile data consumption. For the Mobile World Congress in 2015, Ericsson published their most recent mobility report, showing a 55% growth in global mobile data traffic between 2013 and 2014 (Ericsson, 2015b). The explosive growth in global mobile data communication compared to mobile voice calls is breathtaking, as illustrated by Ericsson (2015b) in Figure 1.

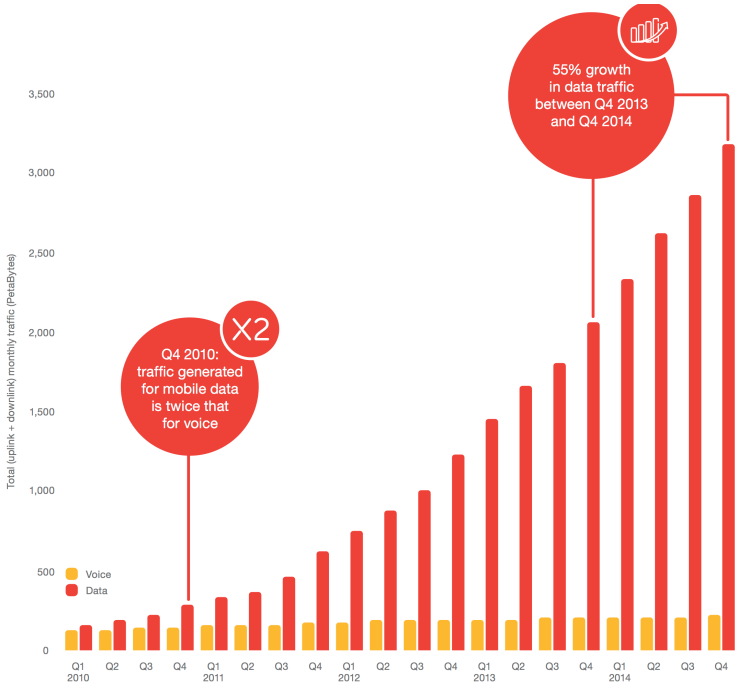

Figure 1: Growth of mobile consumption from Q1 2010 - Q4 2014, extracted from Ericsson Mobility Report 2015 (Ericsson, 2015b). Yellow staples indicate voice traffic and red stables indicate data traffic. Y-axis show total monthly traffic in Peta Bytes, scaled from 0 to 3.500 PB.

The growth in mobile data consumption is evidential when looking at industries such as music streaming, video streaming and e-commerce, which are all showing greatly increased popularity of their mobile solutions. Global revenues for music streaming surpassed physical distribution for the first time in 2014 (IFPI, 2015), mobile video traffic is expected to grow by 45% annually (Ericsson, 2015b) and over 30% of global e-commerce sales are now being performed on mobile devices (Criteo, 2015).

As mobile solutions are gaining popularity, consumers are demanding more sophisticated functions within every service (Olsson 2004; Sanjoy, 2011, Olsson and Mulligan, 2013). These functions are provided by actors within the supply chain for digital content distributions, which is rapidly evolving. Following to this rapid evolvement, the actors' roles are shifting, creating varying value chains for digital content distribution (ibid.).

Due to the dependence on ICT solutions, regulatory bodies and stakeholders have been discussing to what extent the ICT sector should be regulated (Crews, 2014). Depending on the outcome of such a debate, it could affect the way business is dealt with within the ICT industry and thus, potentially threaten current business solutions as well as create new opportunities.

As the evolution within the ICT sector has gone by swiftly in recent years, research have not been able to keep up with the development. Most research describing what actors and value chains there are in digital content distribution is either fairly old given the rapid development, or fairly narrow in their descriptions i.e mainly focusing on describing specific technical aspects such as a specific network architecture. To understand the value chain of digital content distribution for mobile end-consumption is however important when evaluating current, as well as future, threats and opportunities within the ICT industry. Thereby, this thesis is a valuable contribution to both academics and industry, by providing insights that benefits both researchers and stakeholders within the ICT value chain.

1.2 Purpose

As aforementioned, researchers have not been able to keep up with the fast evolving ICT market. Therefore, the purpose of this thesis is to provide an understanding of the current value chain of content distribution for mobile end-consumption. In addition, the value chain perspective is also important for industry stakeholders, in order to understand the business landscape. An additional purpose of this thesis is therefore to use the value chain analysis to evaluate opportunities within the industry. This thesis was conducted in cooperation with Ericsson, which is one stakeholder within the industry. Hence, the outcome should benefit the company, taking the aforementioned purposes into consideration.

1.3 Aim & Research Questions

The aim of this thesis is to provide valuable insights that will benefit both researchers and stakeholders within the ICT sector by analyzing the value chain of digital content distribution for mobile end-consumption. Thereto, this thesis intend to evaluate trends and expectations in order to identify future business opportunities within the industry.

To fulfill this aim, the three following sets of research questions were formulated;

The first set of research questions concerns how digital content is distributed over internet for mobile end-consumption, i.e more specifically, this thesis intend to answer:

> **RQ 1.1:** How is digital content distributed over Internet for mobile end-consumption?
>
> **RQ 1.2:** What actors are involved in the distribution process?

The second research question this thesis intend to answer concerns:

> **RQ 2:** How do the actors within the value chain interrelate to each other and how are they affected by external factors?

The third set of research questions concerns what trends and expectations there are for distribution of digital content for mobile end-consumption as well as how these can be interpreted as business opportunities, i.e more specifically, this thesis intend to answer:

> **RQ 3.1**: What are current trends and future expectations in regard to distribution of digital content for mobile end-consumption?
>
> **RQ 3.2:** How can potential business opportunities be derived from, and evaluated, based on these trends and expectations?

1.4 Scope & Limitations

The thesis is limited to an analysis of distribution of digital content for mobile end-consumption from a business perspective. Technical development have therefore not been considered in excess of how its functionality affect patterns of consumption and distribution of digital content. Technical solutions, architecture descriptions and design options are thereby not within the scope of this thesis.

In order to analyze actors, value chains and business opportunities for the distribution of digital content for mobile end-consumption, there needs to be a clear definition of the system boundaries. The value chain in the scope of this thesis is therefore defined as *the chain of generic activities involved in the delivery of digital content for mobile end-consumption, from the supplier of a content service (i.e the Content Provider) to the end-consumer of that service*.

Design and development processes for content services is therefore not included within the boundaries of this thesis.

Furthermore, the value chain analysis intends to identify the actors involved in the distribution, as well as their inherent relations, as the value of the content delivery is generated along flows of information, digital content and revenue streams on an aggregated level. To understand such dynamics within the value chain requires knowledge and understanding of the involved business models. However, the scope of this thesis do not include detailed information about information, content, and financial flows between actors in the value chain. Business understanding is therefore limited to basic understanding of business models focusing on relevant aspects of Value Propositions, Customer Segments, Revenue Streams, Channels and Key Partners, as further elaborated on in the method chapter.

Moreover, given the limitations of a master's degree project, the scope of this thesis is limited to investigate industrial implementations of theory within three content industries, which all show to be on the rise for mobile end-consumption, i.e e-commerce, music streaming and video streaming. In addition, as the thesis report will reveal, these three industries were also chosen as they demonstrate varying characteristics for digital distribution, both viewed from a service perspective as well as from a data requirements perspective. Another limitation in regards to industry coverage is that these industries are exemplified through case studies due to the complexity of covering all possible variations of mobile services within each industry.

Lastly, the subject of how to regulate digital distribution is currently a hot-topic that could have a diversified outcome and should therefore be discussed accordingly. Hence, this thesis only considers governmental policies and regulations in a broad manner, to identify relevant threats and opportunities that could affect future business opportunities.

1.5 Research Approach

The approach used for answering all three sets of research questions included a qualitative theoretical study, which was put in relation to qualitative empirical findings. The objective of this approach was to provide an in-depth understanding of the research issues such as the social, cultural and economical context of the research area, as suggested by Hennink, Hutter and Bailey (2011).

As illustrated in Figure 2, the applied research approach includes three main aspects, which all combined, provides a solid base to identify future business opportunities within the industry of digital content distribution over Internet for mobile end-consumption, i.e. fulfilling the main purpose of the thesis. Each research question was thus answered as described in the following;

Firstly, a simplified model describing how digital content is distributed over Internet for mobile end-consumption was created by combining how theory describes distribution of digital content over Internet and MBB with empirical findings, thus answering RQ 1.1 and RQ 1.2.

Secondly, RQ 2 was approached by identifying and defining relationships between the actors, according to the theoretical descriptions of Fransman (2007; 2008) as well as Basole and Rouse (2008). In addition, these relationships were further analyzed in relation to empirical findings.

Thirdly, RQ 3.1 was answered by considering theory of alternative business models and challenges with empirical findings of trends and expectations within the three studied case industries. In addition, empirical data describing different market prerequisites was used to provide further depth into the implications of the results for the first and second sets of research questions which thereby provided the base for answering RQ 3.2.

1.6 Thesis Outline

The remainder of this thesis is organized as follows; Firstly, chapter two gives a brief description of Ericsson and its strategy to clarify the prerequisites for this thesis research.

As illustrated on the left side in Figure 2, the theoretical framework, upon which this thesis is based, comprises of chapters three, four and five, i.e these three chapters form the theoretical frame of reference for the thesis. Firstly, *Chapter three* gives basic understanding of technical aspects involved in distribution of digital content for mobile end-consumption by explaining how Internet and mobile connectivity work in generic terms. In that way, chapter three also describes basic technical implications of functionality, thus setting the base for defining what key actors are involved in providing mobile connectivity. Secondly, *Chapter four* sets out to define the value chain in the context of this thesis. Chapter four thereby provides two academical models for describing the complex relations inherent in the ICT sector. The reader is thereby given a deeper understanding of the complex dynamics that affects the value chain for distribution of digital content for mobile consumption. Lastly, *Chapter five* provides insight into current business trends and challenges that the ICT sector is facing. An emphasis is put on so-called sponsored data solutions and the highly debated Net Neutrality Principle due to the topicality of these subjects.

The thesis then continues with *Chapter six*, which clarifies what methods have been used for securing theoretical and empirical data within the thesis project. Furthermore, chapter six also contains delimitations in regard to the methods used as well as comments on the reliability and validity of the methodology.

As illustrated on the right side in Figure 2, the following two chapters, i.e chapter seven and chapter eight, provides the empirical findings revealed in the thesis project. *Chapter seven* presents the results of the three industry cases and *Chapter eight* focus on the result of the case study of market distinctions.

As illustrated in the bottom of Figure 2, *Chapter nine* provides analytical deductions in relation to the respective research question by combining the theoretical framework presented in chapter three four and five, with the empirical findings presented in chapter seven and eight. All combined, chapter nine is thus providing the analytical base for fulfilling the aim of this thesis, i.e chapter nine *analyzes the value chain of digital content distribution for mobile end-consumption and evaluates trends and expectations in order to identify future business opportunities within the industry.*

Lastly, *Chapter ten* clarifies the main conclusions of the thesis and *Chapter eleven* provides recommendations.

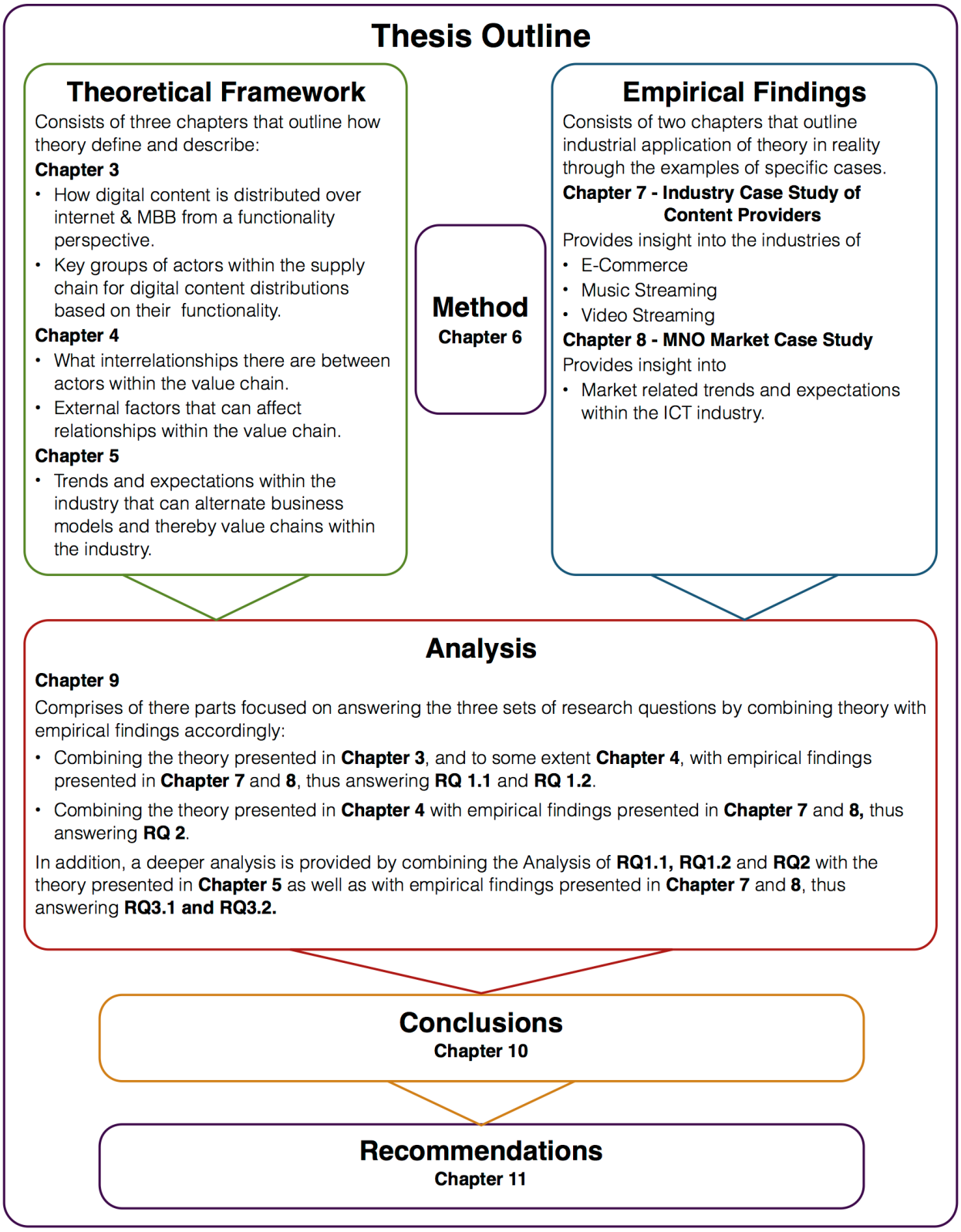

Figure 2: Illustration of the thesis outline, which show how theoretical framework, empirical findings and analysis is structured based on the three sets of research questions.

2 Brief Company Description of Ericsson

It is necessary to understand Ericsson's standpoint in relation to the context of this thesis in order to fully be able to grasp the context of this thesis. This chapter therefore provides a brief description of Ericsson and the main aspects of its operations.

In 1876, Lars Magnus Ericsson founded Ericsson in Stockholm, Sweden (Ericsson, 2014a). The company's initial business was to repair telegraph equipment but the company later became a telephone manufacturer. (Ericsson, 2014a). Today, Ericsson is a provider of communication networks, telecom services and support solutions with customers in more than 180 countries (Ericsson, 2014b). The company is the fifth largest software supplier in the world and it is estimated that 40% of the world's mobile traffic (2G, 3G and 4G) goes through Ericsson's network. (Ericsson, 2014b).

Ericsson is a self-proclaimed driving force of the so-called Networked Society, where everything that will benefit from a mobile connection is expected to be connected (Ericsson, 2014a). This term plays a large role within the company, and the company's vision begins as the following (Ericsson, 2014c):

> *"Our vision is a Networked Society, where every person and every industry is empowered to reach their full potential"*

According to Ericsson's current CEO, Hans Vestberg (2014), the company's strategy for the future concerns two core dimensions where they claim to be world leading, i.e in mobile infrastructure and services. Ericsson also have other areas on their strategic agenda that require high degree of software development and service. Those areas include business and operations support systems (BSS/OSS), cloud computing and support for wireless tv and media. Figure 3, illustrates this, based on time and the degree of commitment from Ericsson.

Figure 3: Ericsson's Strategy (Becheno, 2014).

3 How Does Internet and Mobile Broadband Work?

To understand the complex context of ICT and what actors are needed for distribution of digital content, a basic technical understanding of how Internet and mobile broadband functions is needed. This chapter therefore intends to give a basic description of how connectivity is provided for mobile devices. In addition, this chapter briefly describe how networks are constructed and managed in order to give understanding of the roles, functionality and objectives of the actors involved in providing connectivity for mobile devices.

3.1 How Mobile Devices Connect to Internet

Connectivity and Internet access is enabled by technology that connects devices through networks all over the world (Ericsson & Telia, 1998; Olsson, 2004). The term Internet is a short for Internetworking, implying that Internet is built up by multiple networks that communicate through a common language (ibid.). Network structures are built up by both fixed wires and radio signal emitting and receiving stations, as illustrated in Figure 4. Network connectivity can be achieved in many ways, a building could, as an example, have a DSL, fiber, or cable connection to the network that enables connectivity. Devices could however also connect wirelessly through a WiFi connection or via 2G, 3G or 4G networks.

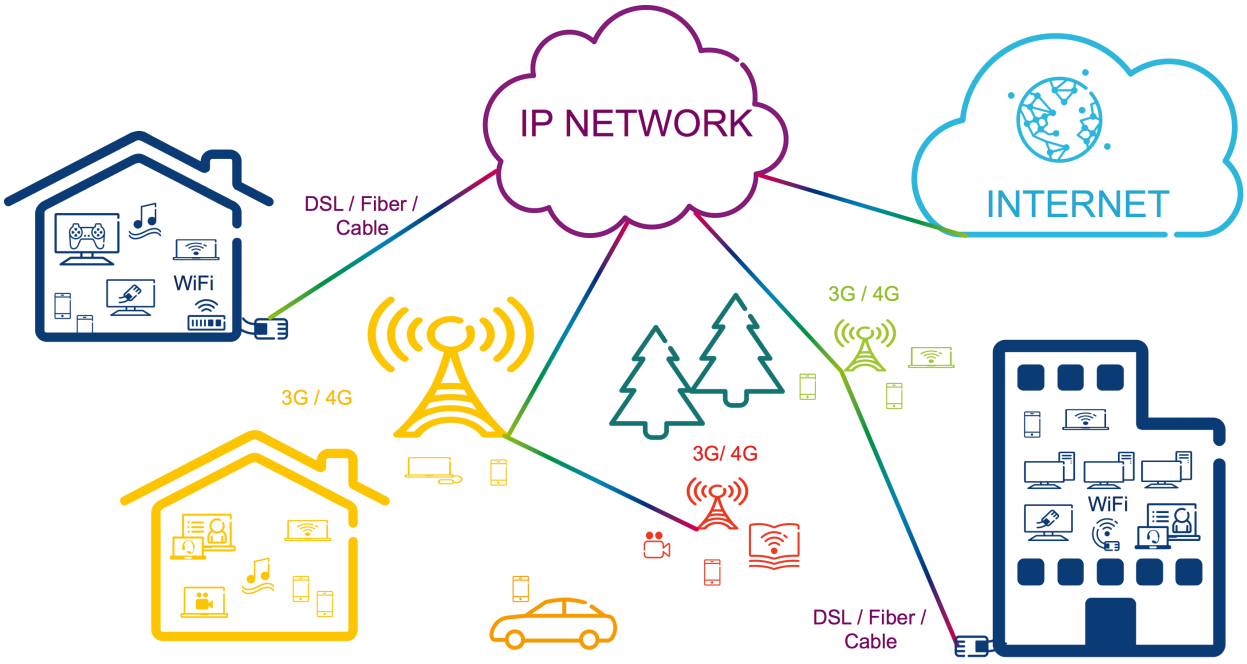

Figure 4: Illustration of the network structure that makes connectivity possible.

When a end-user picks up a mobile device to phone, listen to streamed music or browse the Internet, the device connects to a base station through airborne radio waves, as illustrated in Figure 5. The network of connected radio base stations is what makes up a Radio Access Network (RAN) (Olsson, 2004; Olsson & Mulligan, 2013). A mobile network typically comprises of several thousands of radio base stations, or access points, that are connected to one or several core networks (Metsälä and Salmelin, 2012). The backbone that links together RANs with their core network is called the Mobile Backhaul Network (MBH) (ibid.). The MBH is built on transport technologies that have been developed during the evolution of mobile communication technology from 1G to today's raising of 4G/LTE (ibid.). The Mobile Core Network is then what facilitates communication between mobile devices across networks, thus enabling connectivity across the world (Olsson, 2004; Metsälä and Salmelin, 2012; Olsson & Mulligan, 2013).

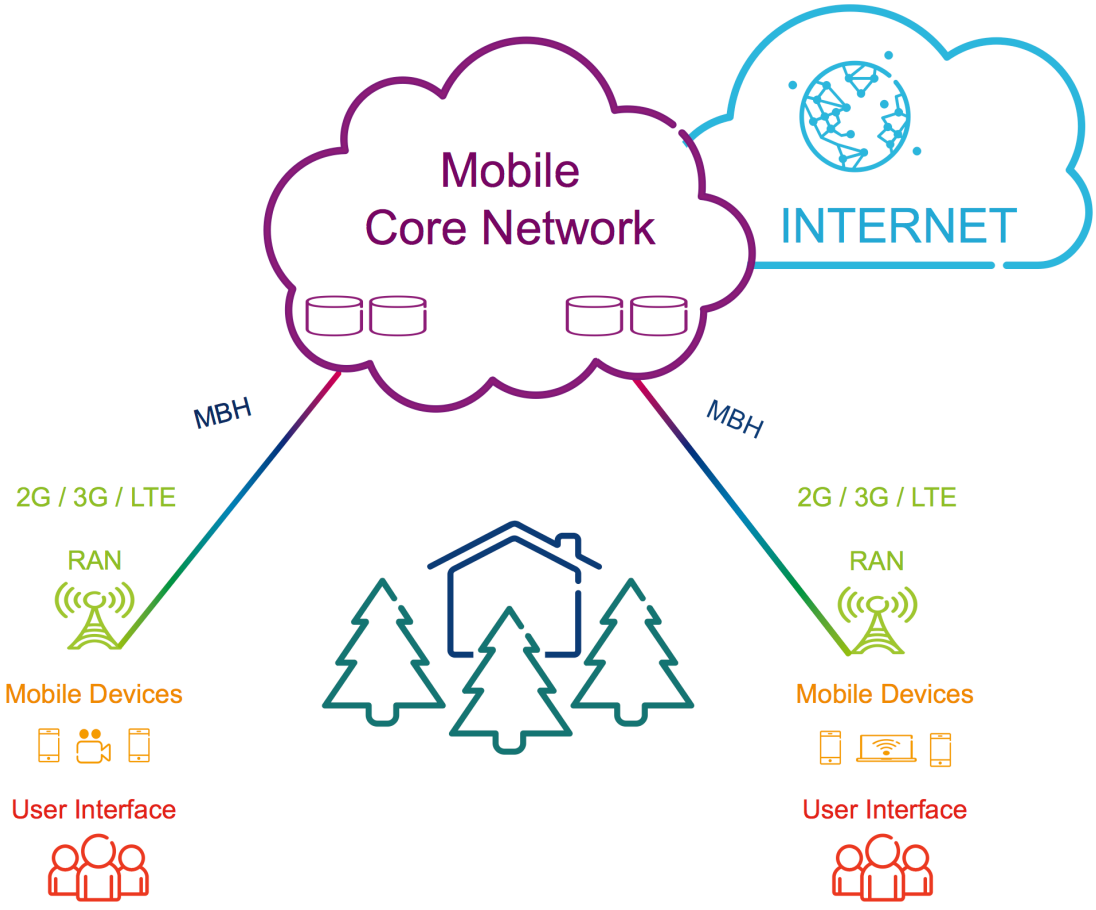

Figure 5: Illustration of how the Mobile Core Network connects Mobile Devices to each other and to Internet by connecting to Base Stations in the RAN.

3.2 Aggregated Network Architecture for Mobile Connectivity

Olsson and Mulligan (2013) describes the architecture of Core Networks for mobile broadband as depicted in Figure 6. A key feature in the evolution of networks is that newer solutions and newer technologies are introduced successively, therefore there is a need for compatibility between technologies in the transition between technology generations (ibid.). In the Mobile Core Network there are three domains that together enable connectivity across networks, i.e the Circuit Core, Packet Core and IMS domain (ibid.). All contemporary RAN technologies currently in use for mobile connection, from 2G to LTE (Long Time Evolution) technology used in 4G, interconnects with these domains as illustrated in Figure 6.

The Packet Core is the main network of control functions and gateways that keeps track of where mobile devices are, what policies that apply for connecting them and how to charge for data consumption by keeping track of data packets that travel through the network (Olsson, 2004; Olsson & Mulligan, 2013; Ericsson, 2014d). Older access technologies, such as 2G and 3G, that were developed in the middle of the melt together of the telephone and data industries, are both compatible with circuit-switched and packet-switched domains (Olsson & Mulligan, 2013). To fully be able to manage roaming and mobility in-between domains there is also need for a Subscriber data management function which is inherent in the interaction between the Circuit Core, Packet Core, IMS and subscriber databases (ibid.).

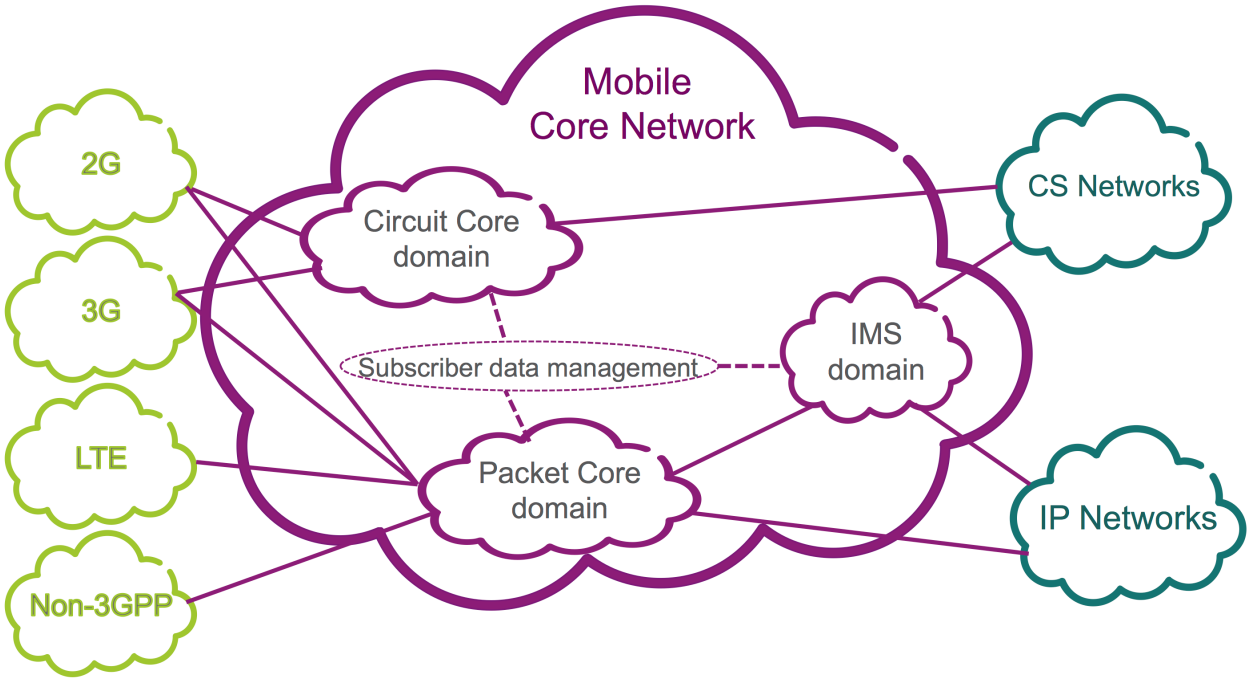

Figure 6: Illustration of the Mobile Core Network architecture based on Olsson and Mulligan, (2013).

To enable data packets to travel across networks destination points are given individual IP-address according to a set of globally standardized protocols for identification, the IP Suite (Ericsson & Telia, 1998). As illustrated in Figure 7, Olsson (2004) describes IP as "the network glue" that has a key role in connecting everything together as it allows internetworking across networks. This is possible as IP networks are autonomous routing networks of IP nodes that are able to learn the IP topology themselves, thereby allowing data packets to find their "own" way from sender to receiver (ibid.). Circuit-Switched Networks (CS Networks in Figure 6), on the other hand, are networks where the connection path between sender and receiver typically is predefined (Ericsson & Telia, 1998). Though CS networks were constructed for CS traffic, they are still utilized as travel paths for data packets by the use of IP technology as they are part of the backbone of networks that link everything together (Olsson 2004; Olsson & Mulligan, 2013).

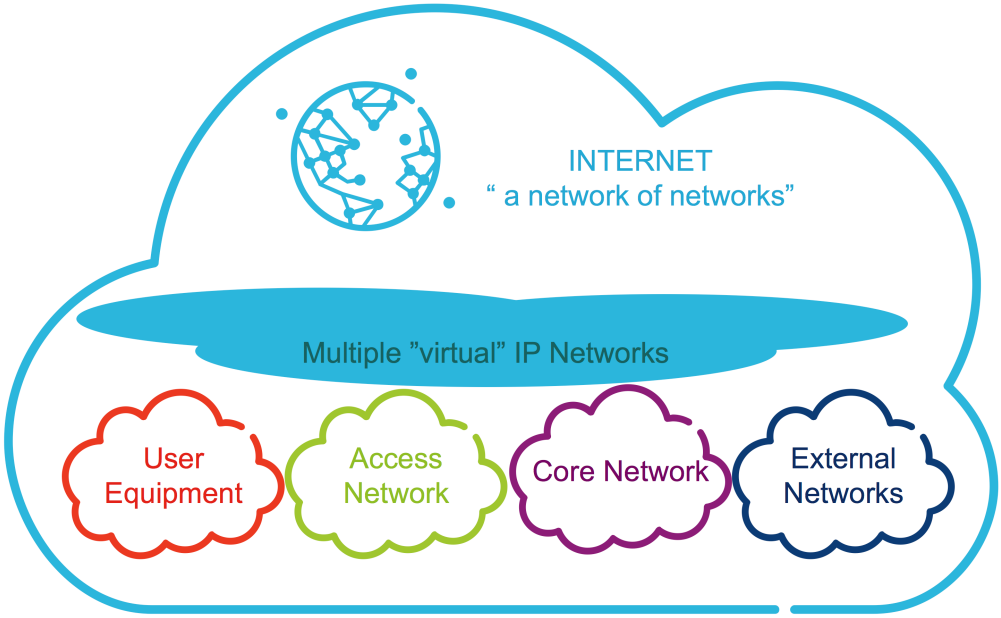

Figure 7: Modified illustration based on Olsson's (2004) description of "IP - the network glue".

Looking at Figure 7, the supply chain of digital content distribution is facilitated by the connection from external networks, through core networks and RANs, until the content reaches the end-users' equipment (Olsson, 2004). Comparing Figures 4, 5, 6 and 7, they all illustrate how mobile devices connect to each other, internet and external networks through RAN and core networks. For digital content distribution over a mobile broadband connection, the solution is built by LTE radio access points in connection to a flat Evolved Packet Core (EPC) (Ericsson, 2014d; Ericsson, 2014e; Olsson & Mulligan, 2013). The LTE/EPC architecture is designed to facilitate the uptake of mass-market IP-based services by optimizing network performance as well as improving cost efficiency for operators (ibid.).

3.3 Network Management

Typically when describing how networks are constructed, operated and managed they, are described as having three layers representing three key functions, i.e the Service, Control and Connectivity layers (Olsson, 2004). The Service layer represent the functionality towards the user interface, thus dealing with how to manage service, security and quality of service as content is delivered to the end-user. The Control layer handles the management of charging, routing, and mobility, i.e keeping track of where mobile devices are and what charging policies apply for their data traffic. The Connectivity layer represent the connection towards access networks and external networks. However, packet-switched networks are sometimes regarded as having no clear control plane as the control layer is difficult to distinguish when routing is performed autonomously for every packet (ibid.). Nevertheless, the layered view on networks is useful for understanding what functions are needed when considering construction, operation and management of networks, and thereby what functions are of concern to actors involved in distribution of digital content (ibid).

3.4 Actors in Digital Distribution

In the conventional model for distribution of digital content, there are four key actors to consider according to Ericsson and Telia (1998). Firstly, there are *End-users* that consumes the content or service offered by content or service providers. Secondly, there are *Information Service Providers* (ISPs) that sell information services to end-users. In addition, there are *Content Providers* that own or provides the digital content that service providers distribute. Lastly, there are *Network Operators* that provides end-users with connectivity. However, additional actors began to emerge due to the increasing demand for services and network functionality. Ericsson and Telia (1998) mentioned the entrance of actors such as *service and/or content brokers* as well as *system and network providers* that enable implementation and control of services and networks.

A few years later, Olsson (2004) elaborated the reasoning of changing roles amongst telecom actors. Olsson (2004) mention that *Mobile Network Operators*, focusing on mobile connectivity did not only emerge as mobile communication became more common, but they were also beginning to transform their organizations into separate entities for network and service provisioning as a result of companies focusing on their core competences and striving for better profitability. *Network Providers* were thus able to focus on cost control, efficiency and economy of scale whereas *Service Providers* were able focus on service offerings, differentiation and user interface management (ibid.).

Another feature of the changing telecom market, identified by Olsson (2004), is the emergence of new entrants as telecom operators expanded their business to other markets and other companies expanded their business by entering into the telecom business.

3.5 Digital Services and Requirements for Mobile Content Distribution

Radio, television, telephone, the Internet, and even newspapers, used to be separate channels for media distribution of separate types of content, each requiring a specialized infrastructure for distribution (Olsson, 2004; Sanjoy, 2011; Ericsson, 2015a). Today, these industries have merged, as a result of technological development and increased demand and expectations on services (ibid.). Digital content is thereby distributed over the same infrastructure regardless of the type of content. However the way in which the infrastructure and technology is utilized varies based on what requirements a service has on network capacity (Olsson 2004; ; Yoo, 2010; Sanjoy 2011; Olsson & Mulligan, 2013).

Content are typically distributed over mobile networks in three ways: full download, progressive download and streaming (Sanjoy, 2011). Full download services have the potential to give a high quality of experience as the content will be stored and played directly from the device (Olsson, 2004; Sanjoy, 2011). It will however take time to complete a full download, especially if the content is large. Large data volumes also requires large bandwidth capacity and storage capacity. Full download services in mobile networks are therefore more suitable for non-real time services or low volume services (Sanjoy, 2011). Streaming services, on the other hand, have the advantage of seemingly instant content delivery without requiring any local storing capacity on the receiving device (Olsson, 2004; Sanjoy, 2011). Streaming techniques are therefore attractive solutions for on-demand services and mobile end-consumption.

A challenge for Network Operators when providing network capacity for multiple mobile services (such as voice calls, Internet browsing and streaming) through the same core networks, is to deliver the service based on the consumer expectations (Olsson 2004; Yoo, 2010; Sanjoy 2011; Olsson & Mulligan, 2013). A consumer's expectation on the quality of a service (QoS), or quality of experience (QoE), can in technical terms be translated into acceptable levels for packet delays, jitter (delay variations), packet losses or bit rate errors, and bandwidth requirements (ibid.). Sanjoy (2011) points out that when the content is streamed from a server across a network to reach the end consumer, it will have such implications on the QoE, and more so for mobile end-consumption due to the nature of radio access technology. To improve the quality of experience are compromising solutions used, i.e progressive download solutions, in which the content is partly downloaded and partly streamed. Progressive download solutions are according to Sanjoy (2011) most suitable for real time services with high data volumes.

3.6 Solutions to Network Capacity Challenges

Securing network capacity for optimal quality of service by simply expanding the networks is not feasible, especially not for mobile networks as the radio spectrum is limited and the costs of transmission capacity is high (Sanjoy, 2011; Olsson & Mulligan, 2013). Two commonly used solutions to work around capacity issues are ISP peering agreements and involvement of Content Distribution Networks (Olsson 2004, Yoo 2010; Olsson & Mulligan, 2013; Yoo, 2014).

3.6.1 ISP Peering

According to Yoo (2010; 2014), one of the consequences of the evolving internet was that peering solutions emerged when ISP's tried to cope with increasing capacity requirements, as illustrated in Figure 8. ISP's engage in peering agreements with each other to share transport resources for interconnecting purposes (Olsson, 2004). Secondary peering ISPs are buying the right to utilize all peering agreements of the primary ISP. As peering is mutually beneficial for both parties it is usually a non payment agreement between ISP's of similar size (ibid.). Though, smaller ISPs benefit from peering agreements with larger ISPs giving them a negotiation advantage (ibid.). According to Yoo (2014), large ISPs have now thousand of transit providers and over fifty peering partners.

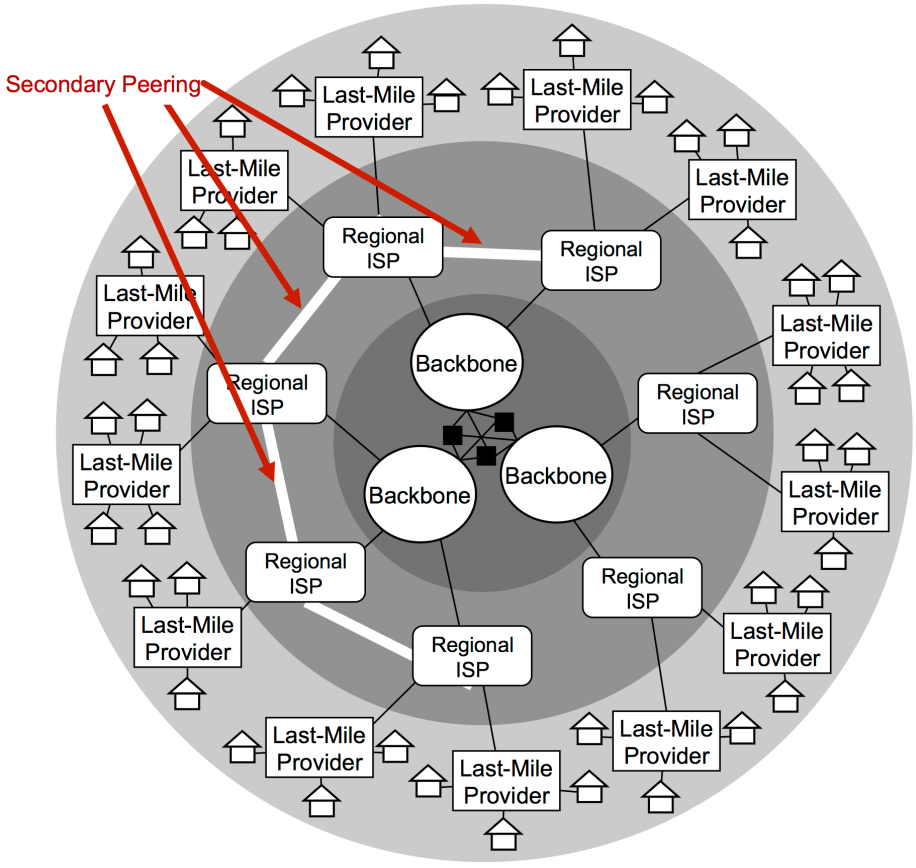

Figure 8: ISP peering illustrated by Yoo (2014).

3.6.2 Content Distribution Networks

A common solution for content distribution is to implement an infrastructure based, content distribution network (CDN) (Sanjoy, 2011). CDNs are usually provided by a third party. The objective of a CDN is to distribute the content more effectively to improve the user experience, (i.e QoE / QoS) and reduce the load on the core of the network (Casas et al., 2014).

A CDN's basic purpose is to operate cashe servers within various data centers and to connect peering points around the world (Grigorik, 2014). In other words, a CDN's function is to move the content, or the bytes, closer to the consumer and thus minimize latency when delivering data to the end-user (ibid.). This is illustrated by Yoo (2014), as depicted in Figure 9. In addition to the basic service of a CDN are additional services offered, such as providing statistics of their performance as well as security functions such as data encryption, e.g. for the banking sector (ARCEP, 2012). This is generally billed as a flat monthly fee and can generate up to 50% of the CDNs total income (ibid.).

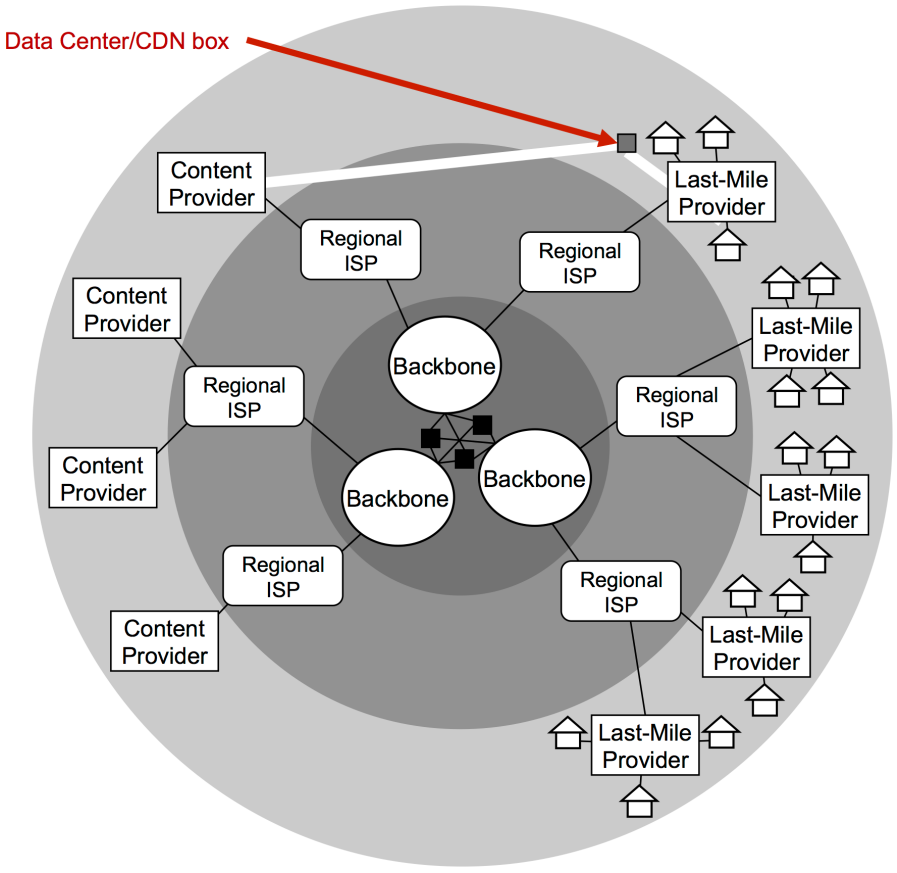

Figure 9: The CDN solution illustrated by Yoo (2014).

4 Models for Describing Relationships in the ICT Sector

As the ICT market is changing, so are the roles of the actors in the sector. Furthermore, as the modern ICT sector inherents a complexity of internal and external relations, this chapter outlines two models applicable for describing value chains in the ICT sector as dynamic and socioeconomic networks. The first model, developed by Basole and Rouse (2008), is a more general model for service value networks. It brings a good contribution to this framework for the reason that it takes both products and services into consideration. Furthermore, the authors have already applied it to the telecom market as a demonstration of its functionality. The second model is The New ICT Ecosystem by Fransman (2007). It is developed specifically for the ICT sector and the focus is set on the interrelationship between the group of actors. In addition, Fransman (2007) identifies four sets of external influences that affect these interrelationships.

4.1. A Conceptual Model of Service-Value Networks

Many researchers have described frameworks for the service value chain where services are separated from products by attributes such as intangibility, heterogeneity, perishability and inseparability of production and consumption (Zeithaml, Parasuraman & Berry, 1985). Vargo and Lusch (2004) highlight the blurry lines between products and services and Basole and Rouse (2008) use these arguments to model the service ecosystem as value networks, where products and services are both represented. Furthermore, is the service ecosystem applied to the telecom market as a demonstration of its functionality (ibid.).

Illustrated in Figure 10 is the general model presented by Basole and Rouse (2008), which shows five groups of actors and how they interconnect. The actors are; Consumers, Service Providers, Tier 1 Enablers, Tier 2 Enablers and Auxiliary Enablers. The nodes in Figure 10 represents the actors, while the arcs represents the relationships between the actors. Furthermore, it is argued that value is created between actor's relationships and "influenced by the social, technological, economic and political context" (Basole & Rouse, 2008). These influences are represented by the outer box which surrounds all five types of actors and their interrelationships. Basole and Rouse (2008) highlight that the value increases downstream the value chain and reaches climax when the service is consumed.

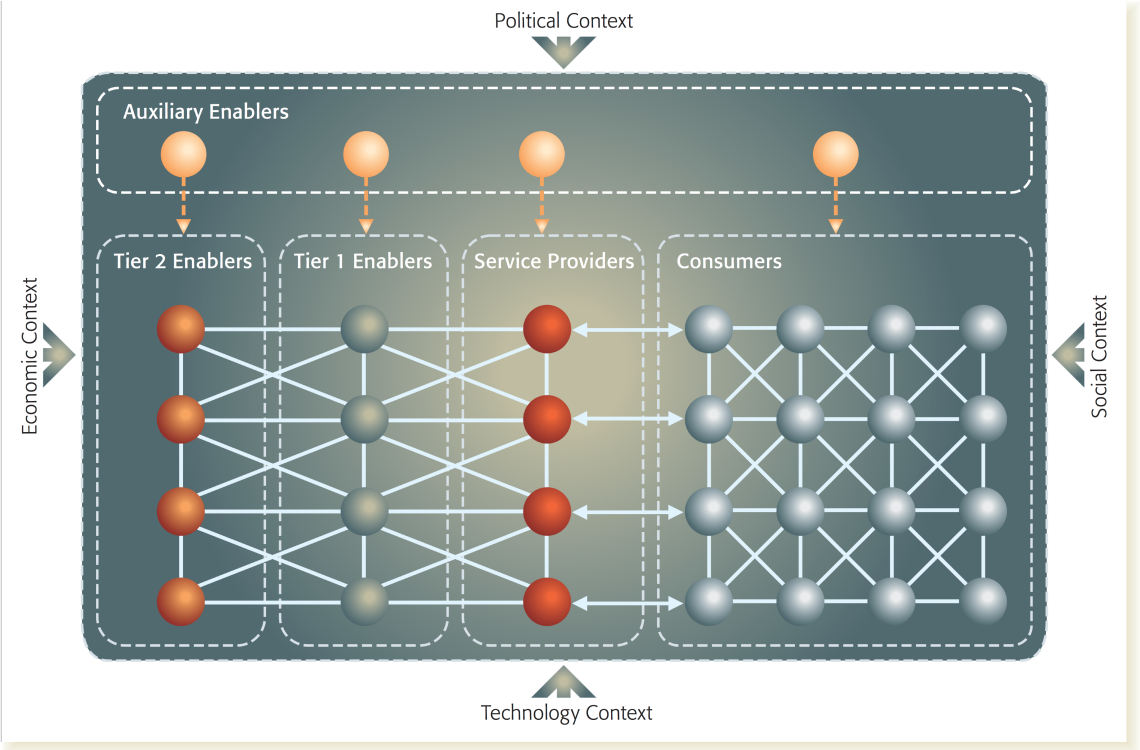

Figure 10: A Conceptual Model of Service-Value Networks (Basole and Rouse, 2008).

Basole's and Rouse's (2008) model, as applied to the telecom market, is presented in Figure 11. In this case the Service Provider are Telecom Service Provider or Mobile Network Operators. These Mobile Network Operators have a relationship with the Tier 1 enablers, such as Content Providers and a Service and Billing Provider, as well as suppliers for network infrastructure and equipment, computer devices and software services needed to operate. Those Tier 1 Enablers are then supplied by Tier 2 Enablers such as electronics suppliers. In this case of the telecom market, Auxiliary Enablers are defined as the Government.

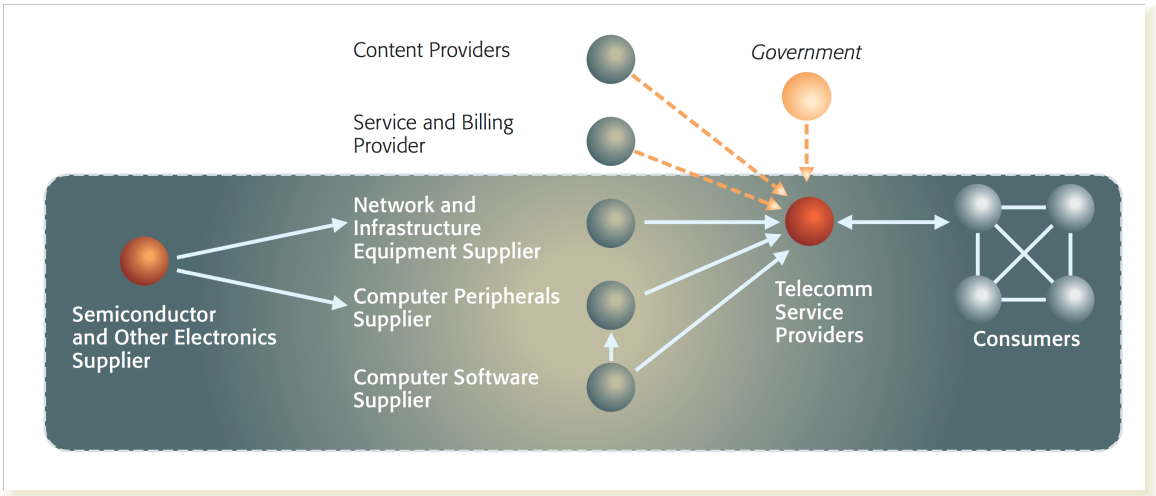

Figure 11: Value Network of the Telecom Market (Basole and Rouse, 2008).

4.2 The New ICT Ecosystem

Another model especially developed for the ICT sector is the so-called New ICT Ecosystem, developed by Fransman (2007). The New ICT Ecosystem is a dynamic and hierarchical model, that represents the different groups of players within the ICT industry and their interrelationship (ibid.). These players act in an environment that consist of institutions and organisations such as financial markets, standardization and regulators. The different group of players presented by Fransman (2007) are listed in a simplified model in Figure 12.

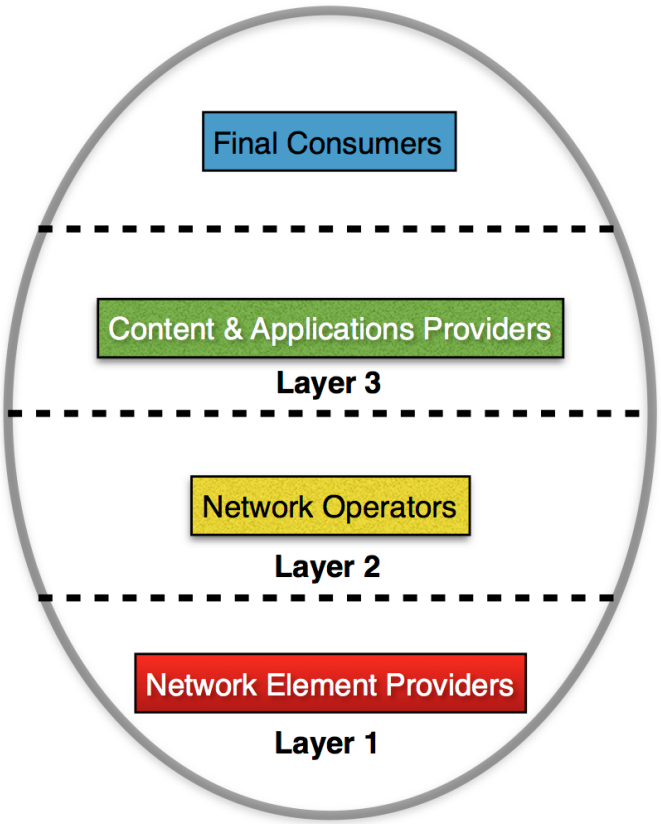

Figure 12: A simplified, hierarchical model of the different players (Fransman, 2007).

The first layer represents the network elements, or system producers, such as Ericsson, Cisco and Huawai (Bohlin, 2014). The second layer represent how these network elements form a converged network, "including telecoms, cable, satellite and broadcasting networks" (Fransman, 2007). Actors in the third layer use the second layer as a platform to distribute their content or applications, those are companies such as Facebook and Google (Fransman, 2007). The fourth layer represents the final customer that can be a person, household, companies, government etc.

The dotted lines in Figure 12 indicate that the borders between the layers are not absolute, as Fransman (2007) argues that a company might be acting in more than one layer. However, when

applying the framework, the focus should be on the actor's core business (Arlandis and Ciriani, 2010).

Fransman (2007) also illustrates a more evolved model, that includes the interrelationship between the layers and the direct interaction between the actors. These are referred to as the six symbiotic relationships, see Figure 13 and Table 1.

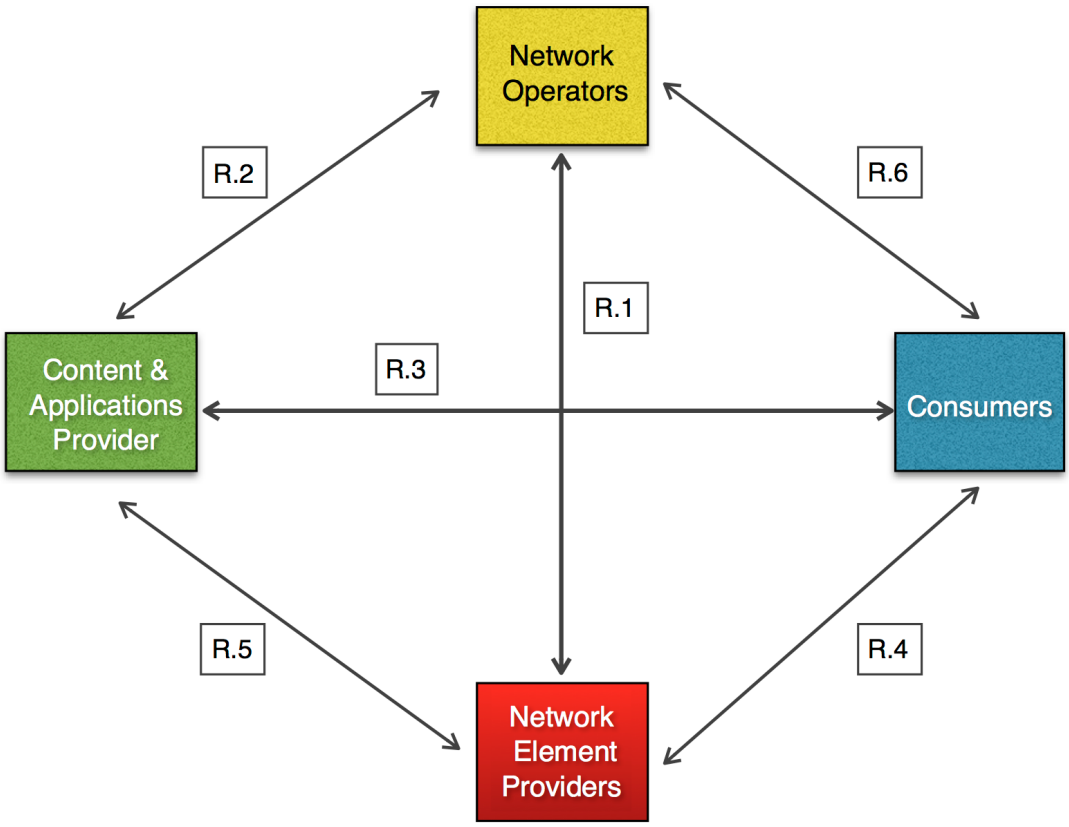

Figure 13: Symbiotic relationships between the four groups of players in the new ICT ecosystem (Fransman, 2007).

Table 1: Symbiotic Relationships in the New ICT Ecosystem (Fransman, 2007).

	Relationship between
R.1	Network Element Providers & Network Operators
R.2	Network Operators & Content and Applications Providers
R.3	Content and Applications Providers & Final Consumers.
R.4	Network Element Providers & Final Consumers.
R.5	Network Element Providers & Content and Applications Providers.
R.6	Network Operators & Final Consumers

Furthermore, each of these symbolic relationships can represent four dimensions or flows (Fransman, 2007; 2008):

i. Purchase sales (financial flow): Derived from the buyer-seller relationship. Creates financial incentives for creating knowledge.
ii. Input/output (material flow): the suppliers, supply bits or atoms for their users
iii. Information flow: The actors get to know more about each other.
iv. Input flow in the innovation process

The following paragraphs summarize the aspects of the different relationships, based on Fransman's (2007, 2008) framework.

R.1 is the relationship between the Network Element Providers and the Network operators. An example of the relationship dimensions is a direct buy where the Network Operators pay for equipment and services. However, this is more than an input-output and purchase-sales relationship. The relationship involves close cooperation and mutual dependence, where one could not survive without the other. When competition is high, the Network Operator will invest in a superior network element, either by selecting an option at a lower cost or at a high performance. This gives the incentive for innovation (dimension iv), which is one of the most important output of this relationship.

R.2 is the relationship between the Network Operators and Content and Applications Providers. Is is described as a very complex relationship as the Content and Applications Providers pay for using the service they directly consume, but not what their customer consume. This relationship creates the basis for the so-called Net Neutrality conflict. That is, should Content and Applications Providers be able to pay the Network Operators for a superior network service, e.g. prioritization of the content in the network

R.3 is the relationship between the Content and Applications Providers and Final Consumers. This is a "new symbiotic relationship" and is very different from R.6 with different patterns of interaction. An example is Web 2.0, where user generated content is at focus i.e. where the users involvement adds value to the site and the more users the more value. This is not easy for the Content Provider to accomplish as competition is high. The Final Consumers might pay directly or indirectly for the service, e.g. Youtube; where clicks on a video is used for selling advertisements.

R.4 is the relationship between Network Element Providers and Final Consumers. An example is the relationship between a hand-set manufacturer and final customers e.g. Apple, where product design for the customer is at focus.

R.5 is the relationship between the Network Element Providers and the Content and Applications Providers. The Network Element Providers provide a platform for innovation and production. The Content and Applications providers would not be able to offer their content to their customers without the Network Element Providers.. This is evidential in the hierarchical model, where Layer 3 sits on top of the platforms provided by Layer 1 and Layer 2.

R.6 is the relationship between the Network Operators and the Final Consumers. This is described as traditional telecom symbiotic relationship.

Additional aspects to consider within the different relationships is the historical aspect of these relationships (Fransman, 2008). R.1, R.4 and R.6 are defined as the 'Old' symbiotic relationships and R.2, R.3 and R.5 as the 'New' symbiotic relationships (ibid.). The 'Old' relationships have traditionally been in the telecom industry until around 1980. The 'New' relationships have developed after the introduction of the Internet and represent the "open innovation system with low-cost entry for new and existing firms" (Fransman, 2008).

In addition, Fransman (2007), identifies that all six relationships are affected by competition and institutions, such as financial institutions, regulations, standardizations and competition law. These four sets of influences that affect the relationships can be described as the environmental contexts, shown in Figure 14.

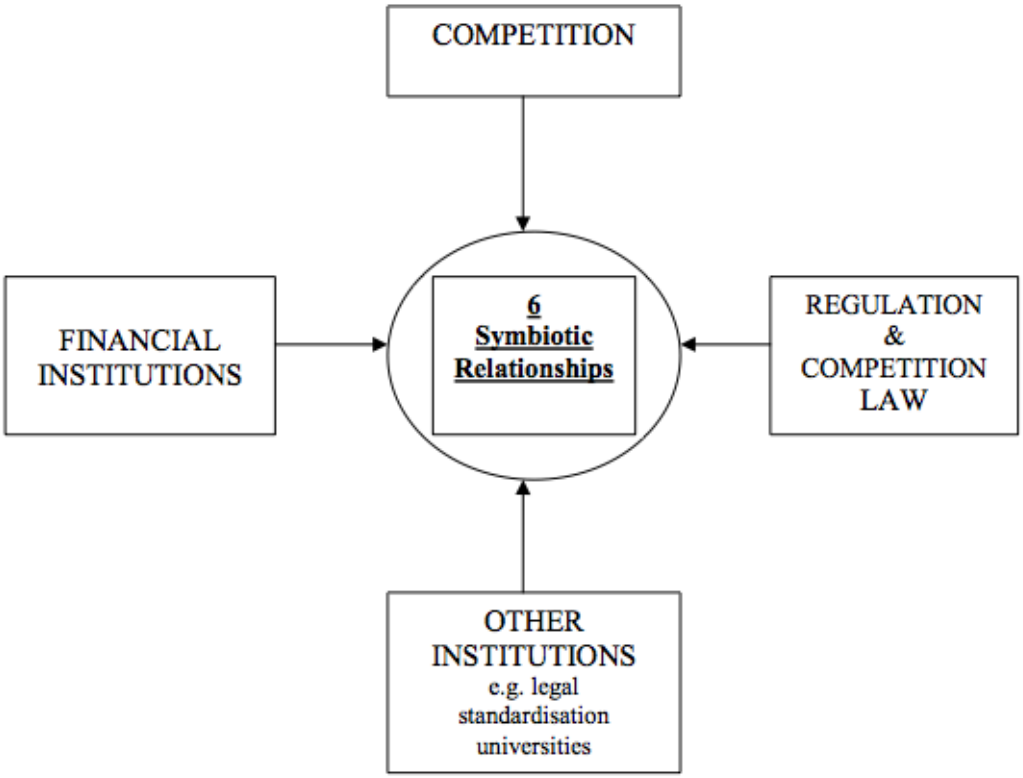

Figure 14: The environmental context of the symbiotic relationships (Fransman, 2007).

An example of how the environmental context can affect a relationship is how *competition* can affect the relationship between a Network Element Provider and a Network Operator. That particular relationship is highly affected by the competition which the Network Element Provider faces to competitors (Fransman, 2007). Innovation is claimed to be the output based on this competition as the NEPs are forced to be innovative to stay in the game (ibid.)

5 Alternative Business Model and Challenges

As the demand for mobile content consumption is on the rise, so is the demand for content distribution solutions that live up to the end-users expectations. Actors within the ICT and media industry are therefore redefining their business models in order to find new revenue streams. The business model for sponsored data and zero-rating is one option that Content providers and MNOs have been taking advantage of when distributing digital content for mobile end-consumption. This chapter therefore explains the concepts of sponsored data and zero-rating. Furthermore, as the industry are trying to find new and innovative business solutions, regulatory bodies are currently debating how to regulate the business and is considering a regulation called the Net Neutrality Principle. As an implementation of such a principle could change what solutions are viable, this chapter therefore also shed light into the Net Neutrality debate and its possible implications for the industry.

5.1. Sponsored Data Solutions and Zero-Rating

According to Strategy Analytics (2015), the so-called sponsored data solution is one part of the bigger shift from voice to data and is driven by the growth of OTT content and services. Sponsored data (also referred to as zero rating or toll free data) plans are mobile data plans that allow the subscriber to access certain content "for free", where the data of the content is not counted against their data plans (Eisenach, 2015). This type of service has been compared to calling toll-free phone numbers or receiving free shipping when purchasing merchandise online (AT&T, 2014). The services differ in two main aspect, firstly the type of content that is for free and secondly the business arrangement behind the service (Eisenach, 2015).

There is not a clear definition of what the difference between the terminology used for this type of service. Eisenach (2015) and Strategy Analytics (2015) define the difference between zero rating and sponsored data based on which actor pays for the data. Zero-rating is when the operator absorbs the cost of the data while the sponsored data plans is when a service or content provider pays for the access (ibid.).

Sponsored data services is one way for the operator to be more relevant to the over-the-top (OTT) applications and content services (Strategy Analytics, 2015). Strategy Analytics (2015) claim that there are two aspects of how sponsoring data can be of value to the end customer. Firstly, when the data is seen as value, this value can be brought to the customer. Secondly, when the data (or lack of data) is seen as a barrier for customer engagement. However, mobile operators should not consider sponsoring data as a large revenue generator but rather as a part of the larger picture such as for including other actors in the mobile ecosystem for customer engagement (Strategy Analytics, 2015).

Strategy Analytics (2015) claim that there “is less need” for sponsored data when subscribers have large data buckets or unlimited data plans. The sponsored data model is more attractive in markets where subscribers generally have low data plans, especially in emerging markets where prepaid plans are more common. However, there are use cases that can be found in between those areas of extremes (Strategy Analytics, 2015).

5.1.1 Examples of Solutions for Sponsored Data

Facebook Zero is one operator initiated solution, where operators offer Facebook for free (Strategy Analytics, 2015). de Denesse and Weidinger (2014) point out that the low ARPU for Facebook does not make a viable business model for them to offer sponsored data. According to Statista (2015) Facebook’s monthly ARPU was around 0.8 USD in 2014. The cost of sponsoring data could easily exceed that amount and de Denesse and Weidinger (2014) conclude that content providers with smaller user base and higher ARPU are more likely to be a party of interest.

Another example is AT&T’s solution which they made available for their 4G customers in the USA (AT&T, 2014). In this case AT&T provides the platform but the content is sponsored by the content provider's (Strategy Analytics, 2015). AT&T (2014) claim their sponsoring solution is a “win-win for availability”, where the solution allows the content provider can promote their content and solution encourages the customers to try out new services. However, the AT&T sponsored service has been under the radar as AT&T claim that they “waiting to see if the market pull is there” (Fried, 2015).

Strategy Analytics (2015) emphasizes that sponsored services represent a broad market and can support multiple use cases but the suitability of the use case is highly affected by the regional market they are implemented in. The following paragraphs summarize Strategy Analytics’s (2015) findings on the suitability of sponsored services within different regional markets:

- The US market is perhaps not the most likely for sponsored services, as data penetration is high and receiving small amount of data as reward has little value to the end consumer. However, sponsored music streaming or high definition videos such as movie trailers could be seen as an attractive use case from the consumer side.
- China as one of the “most advanced market for sponsored data”, as consumer tend to have small data bundles. Services such as online-retail represents strong use cases as they have gained large popularity within the population.

- In the emerging markets, such as SE Asia and Africa, sponsoring can be a big driver for mobile Internet usage as data bundles are usually small and a few MB can be seen as a valuable reward for engaging with brands (ibid.).
- In Europe, sponsored services are seen as a good way for operators to differentiate.

5.1.2 Threats to Sponsored Data and Zero-Rated Data

Regulators in several countries have limited or banned zero-rating solutions. (Strategy Analytics, 2015). For example, the Norwegian Post and Telecommunications Authority have claimed that zero-rating is a violation of the net neutrality principle ("Norwegian agency", 2014). Governments in Chile, the Netherlands, Canada and Slovenia have all taken action to ban specific sponsored or zero-rating services, based on the possible violation of the same arguments (ibid.).

In 2015, India's largest online retailer, Flipkart Ltd, backed out of sponsored business arrangement with a large Indian operator ("Users batter telecom firms", 2015). The solution was seen as a violation of the net neutrality principle by social activists, although India has no Net Neutrality guidelines in the country's policy (ibid.).

Sponsored data services have been criticized by politicians and in the media (Gillet, 2014). The main argument against sponsored data is that it might create an unfair market situation, as larger companies can have more capacity to offer the service, compared to smaller firms that are not able to cover the cost of data (ibid.). However it has also been argued that sponsoring is one way for smaller companies or startups to gain customer reach by "buying" eyeballs (Strategy Analysis, 2015).

5.2 Net Neutrality

Net Neutrality is the principle that ISPs and governments should treat all data on the Internet equally, not discriminating or charging differentially by user, content, site, platform, application, type of attached equipment, or mode of communication (Wu, 2003). This means that an operator should not be able to throttle, or block, certain traffic in its network or give higher priority to others (ARCEP, 2012).

Today, ISPs are managing their traffic and using this capability for making business arrangement with content providers, so that their content will be prioritized for improved quality of service (QoS) (ARCEP, 2012). This has created a debate about how much control the Internet Service Provider and Network Operators should have to prioritize or throttle content and furthermore if content providers should be able to pay for prioritization in the network (ibid.)

For example, the video-on-demand website, Netflix, is one of the biggest advocate of net neutrality. The site uses around 30% of the bandwidth of the United States (Manne, 2014). Netflix's CEO believes that Internet service providers should guarantee "sufficient access to their network without charge" to the big content providers (ibid.).

Regulatory frameworks related to the Net Neutrality principle are already on the policy agenda for many countries in the world (ARCEP, 2012). In February 2015, the The U.S. Federal Communications Commission (FCC) voted in favor of a "strong net neutrality rule" by the argument that the Internet should be kept open and free (The White House, 2015).

Nooren et al. (2012) discuss the necessary value chain perspective, when it comes to Net Neutrality and video distribution. The current debates is mostly focused on network providers and Internet service providers (ISPs) where the highlighted topics are transparency, no blocking or throttling and no ISP tariffing of over-the-top providers (OTT). Nooren et al. (2012) findings are that the current topics are valid, but likely to lead to debate in other parts of the value chain as the players benefiting from the current state will try to make up for the loss on revenue streams if the Net Neutrality were to be implemented.

6 Method

This thesis research included a qualitative methodology for the development of both theoretical framework as well as for the empirical study. The objective of this approach was to provide an in-depth understanding of the fairly complex research issues as suggested by Hennink, Hutter and Bailey (2011). The following chapter further outlines the method used during the course of the project. The first section of this chapter accounts for the data collection methods used to create the theoretical framework. Thereafter follows a section that describes the methodology used for the empirical parts of the project, which in turn is followed by a section concerning the analytical methodology used. In addition this chapter provides a description of what delimitations have been made as well as comments on the validity of the applied methodology.

6.1 Data Collection Methods Used for the Theoretical Framework

To identify the many different aspects related to the distribution of digital content over internet for mobile end-consumption, sufficient data was gathered through a structured data collection methodology as described by Booth, Colomb and Williams (1995). The theoretical framework presented in this thesis was thereby built up on data collected through a qualitative literature search amongst secondary sources, i.e academic literature and trade articles available through the Chalmers library resources, in addition to, articles, reports and seminar material available through Ericsson resources. Three main source searching approaches were used for the secondary data collection, i.e:

i. Search by keywords, both amongst academic literature through the Chalmers library computerized resources and through online search engines for trade articles and news related to the area of interest. Keywords used for these searches include combinations of phrases such as: '*qualitative research methods'*, *'digital distribution', 'network distribution'*, '*service value networks', 'mobile networks', 'values in digital distribution', 'sponsored data', 'net-neutrality' etc.*
ii. Search for sources of interest through Ericsson provided resources, such as; *Ericsson Packet Core, Ericsson Consumerlab* and *Ericsson Networked Society Lab.*
iii. Search for additional relevant sources derived from already acquired data sources.

As suggested by Booth et al. (1995), sources of interest were singled out initially, by skimming through titles and abstracts, before studying the content in detail.

6.2 Methodology and Data Collection for the Empirical Study

Considering the many aspects of value chains within the ICT sector, as revealed in theory, it became clear that the subject is complex. According to Blomqvist and Hallin (2015), case studies

are good research approaches for exploratory and comparative reasons when the subject matter is highly complex. For the empirical parts of this thesis, a case study approach was therefore used to give an understanding of how the theory applies to reality within the industries of three specific types of content. The three industries, e-commerce, music streaming and video streaming, were chosen as they all are industries where mobile solutions are greatly increasing in popularity (Citero 2015; IFPI, 2015; Ericsson, 2015b).

Furthermore, three companies were selected as a representative for the three industries, one company for each industry. It was decided to go with three companies to fit the time limitations of this thesis. When selecting the companies, the maturity of their mobile solutions was taking in to consideration, as ideally the companies should be ambitious when it comes to their solutions for mobile end-consumption.

To secure primary empirical data, a qualitative series of face-to-face interviews was conducted with the content providers as well as with market experts from Ericsson. Each company, subject for the interviews, was contacted by e-mail and phone calls for scheduling interviews with a suitable interviewee. All interviewees received a generic interview guide of what questions to be asked, prior to each respective interview, see Appendix I. The majority of the interviews were performed in Swedish and then transcribed and translated into English, based on sound recordings that were made.

A semi-structured interview approach, i.e where the interviewees are given a chance to put themselves into context (Bryman & Bell, 2011), was thereby applied. A generic question base was prepared based on the presented theoretical framework and other topics previously researched, such as Osterwalder's and Pigneur's (2009) description of what makes a business model. The generic question base that was used can be found in Appendix I. Furthermore, the question base was color coded according to priority for all interviews though somewhat individually adjusted to fit each of the different businesses and companies. The semi-structured approach was chosen to assure a friendly conversational interview setting that allowed the interviewees to speak freely while securing that answers were given to key questions of interest. Moreover, it provided the flexibility to ask questions not listed in the interview guide, when the interviewee picked up a topic, as suggested by Bryman and Bell (2011).

Complementary to primary sources, secondary sources were also used to secure sufficient data for the empirical study. Both primary and secondary data were thus combined to give the empirical findings as presented in chapters 7 and 8. As suggested by Booth et al. (1995), A structured investigative search approach for secondary data was applied to gain understanding of

industry and company specific information, facts and reports for the empirical study. The following search methods were thereby used;

i. Search by browsing company webpages for information on their services, business models and approach to digital distribution.
ii. Search by keywords in online search engines for news, articles and reports related to the individual industries of video streaming, music streaming and e-commerce.
iii. Search through Ericsson internal resources, e.g through *Ericsson Business Intelligence, Ericsson Consumerlab* and *Ericsson Networked Society Lab.*

Furthermore, the empirical study was partly done by using an inductive approaches as described by Blomqvist and Hallin (2015). This is why the empirical findings are presented in two separate chapters as the thesis project included two distinctive empirical parts. The first part of the empirical study was conducted by studying the three industries and interviewing the Content Providers as well as Ericsson representative for the MNO market. The findings indicated that the Sponsored Data Solution was more likely to be of interest in another market than the Nordic market. An additional interview was therefore conducted with an Ericsson expert for a market exhibiting opposite traits to the Nordic market, i.e an expert for the Sub-Saharan African Region. Though, this interview was held in a later stage of the project, it was included to gain better understanding of how market prerequisites affects business opportunities, especially in relation to Sponsored Data.

6.3 Analytical Approach

As aforementioned, the analytical phase of the thesis project included an iterative process combining qualitative data obtained through the theoretical study, with that of the empirical findings. Mapping out and analyzing the value chains of products and services is key in understanding what actors there are and how their relationships could be optimized to create business opportunities through value generation. Furthermore, it is also essential to understand the dynamics and complexity provided by the context in which IT and telecommunication actors operate. Both these aspects were considered in the analytical phase as described in the following.

The technical description of mobile connectivity was connected to the models of Fransman (2007) and Basole and Rouse (2008), for understanding the ICT value chain and moreover, to identify the actors within the value chain for mobile end-consumption of digital content. A comparison with the empirical findings was thereafter done in order to fully understand each actor's role. Furthermore, regarding the relationships between actors, Fransman's (2007) identifications of relationships within the ICT ecosystem was applied and compared to the empirical findings. This relationship analysis was moreover used as a base for identifying and

evaluating what implications could be derived from trends and expectations by a comparison between industry as well as market prerequisites.

Lastly, the analysis was completed by applying key analytical findings in a feasibility analysis of the applicability of sponsored data solutions considering the three industries as well as generic market differences between Nordic and African markets. The feasibility analysis was conducted by evaluating each and every identified parameter, and their corresponding supporting factors, as being low/medium/high based on empirical and analytical findings, see chapter 9.4.

6.4 Delimitations

The concept of value chains originates from Michael E. Porter (1985) who argued that a company's competitive advantage is dependent on the way the company organize a series of primary and supportive activities that the company perform in order to generate value. The ultimate value a company can create is defined by Porter (1986) as what buyers are willing to pay for a product or service, in itself as well as for any ancillary services or benefits generated by the product. Profit is then what results if the created value exceeds the collective cost of performing all needed activities within the value chain. As for competitiveness, Porter (1986) argues that competitive advantages is a function of either providing the same value in a more cost efficient manner than competitors, or by differentiating and providing a more unique value, greater than what competitors offer, and thus be able to command a premium price.

All these ideas of Porter is applied in Porter's Five Forces Model (2008) which is a well known analytical approach for strategic business analytics. It was therefore first considered to use Porter's Five Forces Model as the main theoretical and analytical approach for this thesis. However, as the project began to map up the extensively complex relationships inherent in the ICT sector it became clear that Porter's approach would not be able to account for the dimension of correlation and dependency between actors that is necessary to consider when analyzing the value chain of digital content distribution for mobile end-consumption. The use of Porter's Five Forces was therefore removed from the theoretical framework though the original ides of Porter (2008; 1986; 1985) have been inspiring in the analytical interpretation of values and business opportunities.

Furthermore, the *Business Model Canvas* by Osterwalder and Pigneur (2009) is a good framework for describing business models for further analysis, and was therefore used for design of interview questions. However, the application of the framework had to be adapted to the purpose of conducting a basic business analysis, manly to gain a holistic understanding of the businesses involved. Osterwalder and Pigneur (2009) believe that there are nine aspects that describe a business model: *Customer Segments, Value Proposition, Channels, Customer*

Relationships, Revenue Streams, Key Resources, Key Activities, Key Partnerships and Cost Structure. To fit with the scope of this thesis, aspects such as Value Proposition, Customer Segments, Revenue Streams, Channels and Key Partners, were put into focus, whereas the other segments were considered in less detailed terms. In addition, as mentioned in the initial limitations of the project, the business analysis was limited to the a generic coverage of these aspects as going into depth of every aspects would constitute another type of research than what this thesis intended to cover.

6.5 Validation of Methodology

Hennink, Hutter and Bailey (2011) highlight the need for a reflexivity process in qualitative research. That is a process to mitigate subjectivity, as study participants will have subjective views that will influence the research process (ibid). This is especially important during data collection and interpretation (ibid). Reflexive issues and mitigation that occurred during the course of the project are therefore commented upon in the following.

Firstly, Blomqvist and Hallin (2015), state that although case studies are good research approaches for exploratory and comparative reasons when the subject matter is highly complex, it should be considered that a case study might not cover all aspects in relation to the subject matter. In addition, Blomqvist and Hallin (2015), stress the fact that findings in relation to a case study might not be transferrable and applicable in another context of the studied phenomena. It should therefore be acknowledged that the applied case study approach has been considered with caution and that the results have been discussed with the nature of case studies in mind.

Secondly, a large part of the theoretical framework is based on various industry reports, available from the Ericsson's business Intelligence Center. Ideally, published academic and peer reviewed reports would have been chosen but due to the nature of the context and the actuality of the subject, nothing or very little has been written about the subjects within the academic field. Furthermore, in order to understand the industrial perspective of the subjects, these industry reports were chosen for reference. However, it should be mentioned that the chosen material came from respected consultancy firms where many work in cooperation with academic researchers.

Lastly, every process and activity related to the thesis has been thoroughly documented in writing to be able to maintain a strong chain of evidence. Documentation responsibilities was managed jointly through the use of secure e-mails when needed, otherwise through Google Drive to provide online backup of non-sensitive material.

7 Empirical Findings - Part I
Industry Case Studies of Content Providers' Perspectives

Digital data consumption is heavily on the rise, with rapidly increasing demand for mobile services within several content industries. Values of a service will however vary between industries and to cover all possible services and industries would be very resource consuming. The first part of the empirical study therefore covers the perspective of content providers through three industry case studies within three rapidly growing segments for mobile end-consumption of digital content, i.e m-commerce, music streaming and video streaming. This chapter presents the results of the first part of the empirical study by combining secondary information of industry trends and expectations with findings from case study interviews with a content provider in each industry, as presented in Table 2. Furthermore, the chapter is divided so that each and every industry is dealt with separately in the subsections of 7.1, 7.2 and 7.3.

Table 2: Case studies within each industry and what interviewees were questioned.

Industry	Case	Interviewee, Title, Company	Interview Date
M-commerce	The Ellos Group	Henrik Ström, Web and Media Production Manager, Ellos Group	March 25, 2015
Music Streaming	Spotify	Pär Bohrarper, Software Engineer and Team Leader, Spotify	March 17, 2015
		Niklas Gustavsson, Software Engineer, Back-End Development and Content Distribution, Spotify	March 17, 2015
Video Streaming	SVT Interactive	Daniel Ekelöf, Chief Technology Officer, SVT Interactive	March 11, 2015
		Thomas Porsaeus, Strategist, SVT Interactive	March 11, 2015

7.1 M-commerce

According to the Merriam Webster dictionary (2015), e-commerce is defined as "activities that relate to the buying and selling of goods and services over the Internet". When mobile devices, such as mobile phones or tablets, are used to perform these transactions, the term m-commerce is however the correct term (ibid.). There are many aspects of mobile solutions within this context. Juniper Research (2013) have categorized m-commerce into three segments; mobile banking, mobile payments and mobile retail marketing. Each of these segments is divided into two categories, as shown in Figure 15. It is important to understand that the different segment are not completely separated, for example, mobile banking could be an integrated solution into mobile payments (Juniper Research, 2013).

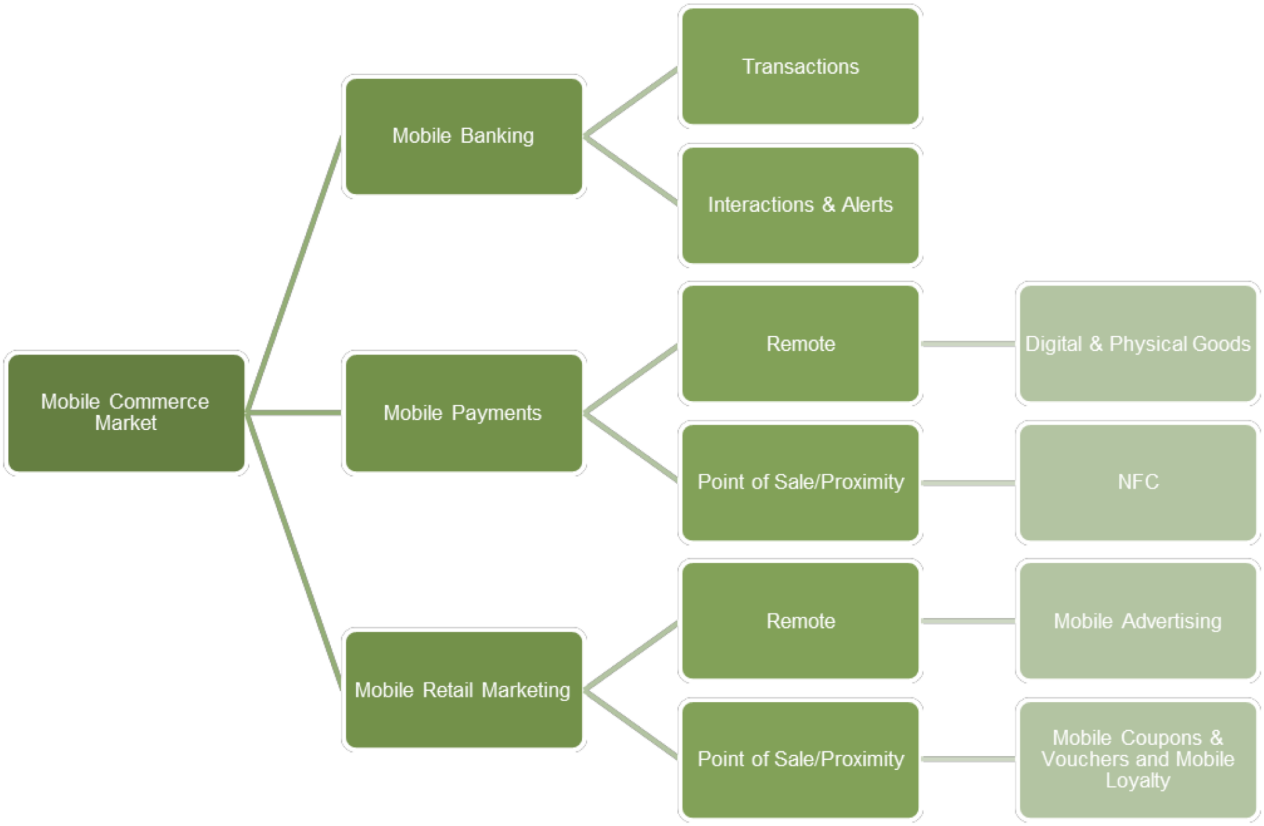

Figure 15: Mobile Commerce Market Segmentation (Juniper Research, 2013).

Recent research by Criteo (2015) highlight that mobile adoption within the e-commerce market has by far exceeded expectations. Criteo (2015) state that over 30% of global e-commerce sales are performed on mobile devices, as illustrated in Figure 16. In the US, there is a shift in user patterns from using mobile devices for browsing or searching to also purchasing items (ibid.).

This is in line with PostNord's (2015a) research on E-commerce sales in Sweden, which show an increase of online purchasing through mobile devices by 16% from 2013 to 2014. The same research highlight that 36% of those who purchased online in Q4, 2014, used a mobile device (18% used smartphones and 24% tablets). In addition, Criteo (2015) state that the average value of a mobile order is reaching desktop level and the conversion rate, i.e the ratio between number of site visitors compared to paying customers, are reaching desktop level as well.

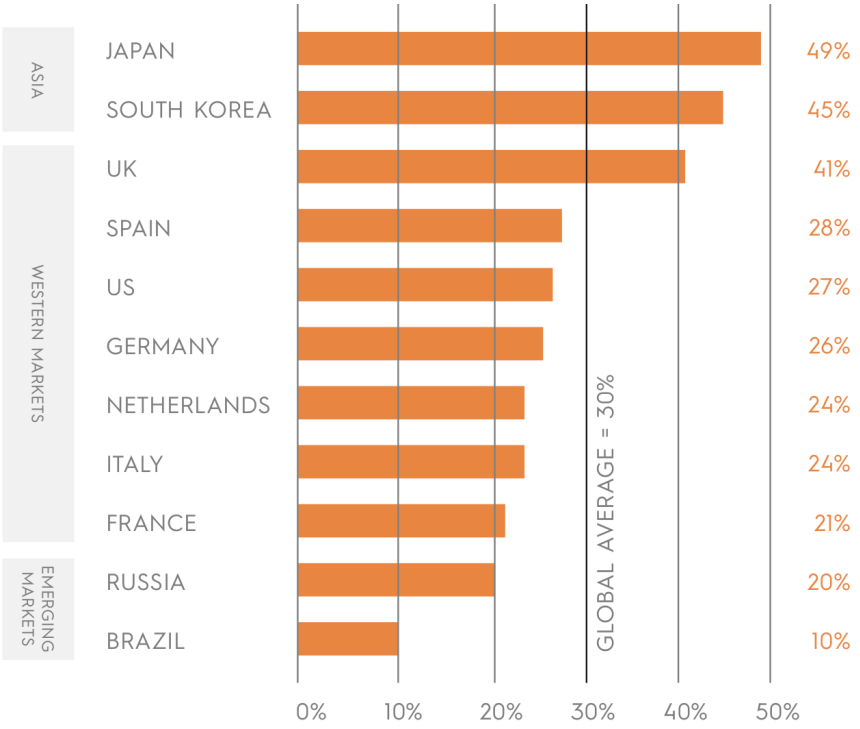

Figure 16: Mobile share of online retail transaction by country, in 2014 (Citero, 2015).

7.1.1 The Ellos Group Case

In the Nordic region, the Ellos Group is a leading actor in e-commerce (Ellos Group, 2015). Three companies are held by the Ellos Group; Ellos, Jotex and Stayhard, all within retail but with different product offerings and targeted customer segments (ibid.). Ellos provides fashion and home merchandise, Jotex is a leading provider within home textile and decoration and Stayhard is an online fashion store for men (ibid.).

The history of the Ellos Group was briefly discussed in an interview with Henrik Ström, Web and Media Production Manager at the Ellos Group (March 25, 2015). Traditionally, the Ellos Group has been in the order catalog business but today the main sales channel is e- and m-commerce, which represents around 80-85% of total sales according to Ström. Furthermore, Ström claims that the Ellos Group has a total of 2 million active customers in the Nordic

countries and that around 100.000 products are shipped on a daily basis from the Ellos Group warehouse in Borås (Sweden).

According to Ström (March 25, 2015), the different companies have very distinguished customer segments. Ellos and Jotex are the traditional companies within the group, mainly targeted at women (ibid.). According to PostNord (2015b), Ellos is mainly targeted at women in the age of 30-55, a target group in which the company has about 50% of the population as registered customers when looking at the markets in Sweden, Finland and Norway. Ström (March 25, 2015) claims that the Jotex brand is targeted at a slightly older category of women whereas Stayhard is mainly focused towards young males.

When asked about the most important value parameters to Ellos Group's customers, Ström (March 25, 2015) claims that price and easy accessibility are of most importance. The price sensitivity differs based on the brands, as customers buying external brands seem to be more sensitive to price differences (ibid.). However, Ström thinks that price sensitivity is eased as the group offers alternate payment solutions, such as the possibility to buy on credit and divide payments over time. Regarding accessibility, Ström believes that the customers should be able to access the stores whenever and wherever they feel like it.

According to Ström (March 25, 2015), the traffic through mobile sites is continually growing. Ellos, Jotex and Stayhard, all have mobile site versions, in addition to a site fitted for desktop use (ibid.). Furthermore, Ström highlighted that recent numbers show that 30% of the orders on Stayhard are made through mobile phones. Additionally, the Ellos Group sends out a lot of emails to their customers and around half of them are read the emails through their mobile phones (ibid.).

Regarding customer behavior, Ström (March 25, 2015) said that customers might start their shopping experience on their mobile phones, e.g. when taking the buss, and continue the process on a desktop computer when arriving home. Nevertheless, around 30% actually finish their purchase on their mobile devices (ibid.).

The Ellos Group is working on improving their digital platforms. As an example, Ström (March 25, 2015) mentioned that Stayhard was recently acquired by the group as a strategic step towards a focus on improved online performance. Ström claims that the main focus for the future will not be on mobile phones but on tablets, as the Ellos Group believe tablets is the device most people will use for online shopping. However, Ström stressed hat everything should still work well on mobile phones and computers as it is key that the customer gets a good experience. The Ellos Group is currently working on a project with a third party to make fitted solution based on the

device the customer uses, so the sites should be able to detect the size of the screen the customer is using (Ström, March 25, 2015).

Every item in the online stores is illustrated with several pictures, showing different angles of the products, to give the customers as good idea as possible of what the products looks like (Ström, March 25, 2015). For their own products, that can't be bought anywhere but on their sites, the Ellos Group is also working on producing videoclips to give customers an enhanced shopping experience. These videoclips are an important feature according to Ström, who furthermore stated that internally produced products are the major business for the Ellos Group. All products sold by Jotex and 70% of the products sold by Ellos are internally developed (ibid.). However, Ström also pointed out that the future of videoclips is unclear as the customers have yet to get used to watch and evaluate products based on video content, "video can never get as good as the real-deal".

Furthermore, Ström (March 25, 2015) commented that since videoclips are heavier on data volume, they thus requires more server capacity. Ström also stressed that access time issues has to be considered. In addition, the sites have a high turnaround in the product catalogue. Ström said that every day there are about 150 products that are sold out and 150 new products that are added to the Ellos site. Ström thereby highlighted that there is a lot of data to update on a daily basis as the product catalogue need to be updated with new images, descriptions and videos for 150 products on a daily basis.

Ström (March 25, 2015) said that the Ellos Group are currently hosting all their content themselves. As the Ellos Group is an actor within the Nordic region, Ström said that they can manage storage and distribution well enough on their own. However for the future, they are considering a mixed solution where they still host the sites themselves but use a CDN as host for pictures and film clips (ibid.). According to Ström, there are two reasons for the intended future solution. Firstly, pictures and film clips are data heavy content that require costly capacity resources. Secondly, CDNs have flexible end-to-end solutions with extra functionality, e.g that improve the quality of experience for images and video content. The kind of solutions that CDN's are offering are currently under development and Ström said that for the Ellos Group to be leading on that kind of development is hard. Later on, when the solutions have become mainstream, then Ellos might be more keen on managing image and video content themselves.

When asked about whether or not CDN solutions could be used as a strategic tool for competition, Ström (March 25, 2015) answered that he did not think so as CDN's are silent service providers in the value chain. Ström argued that he believes that the key competitive tool is what is in the content, not how it is stored and distributed.

According to Ström (March 25, 2015), the Ellos Group do not have any relations to MNOs. Furthermore, when asked about the sponsored data solution Ström was new to the concept. After explanation of what a sponsored data solution typically is, Ström recognized that it could be used by an e-commerce actor for marketing reasons. However, Ström did not believe it could have big potential in the Nordic market as he believes that the value for the end-user is too low. Ström argued that pretty much everyone in the Nordic countries have easy access to Internet and that data plans are quite cheap, free data itself would therefore be of little value compared to other types of reward the company typically uses, for example voucher checks for discount of products.

7.2 Music Streaming

The music industry has undergone tremendous change in the past two decades (IFPI, 2015; Ericsson, 2015a). Global industry revenues for digital distribution of music surpassed physical distribution for the first time in 2014 (IFPI, 2015). Amongst digital music services are streaming services gaining popularity and is expected to exceed downloads during 2015 (Music streaming: Secret harmonies, 2014; Ericsson, 2015b). According to IFPI (2015), music consumers are better served than ever before with instant access, anytime and anywhere.

Music subscription services are a major driver for the digital growth (IFPI, 2015). There are 400 licensed services, with 41 million paying subscriptions worldwide, and a globally available record collection of 43 million tracks (ibid.). However, Ericsson (2015b) state that although the mobile traffic growth rate is impressive, the data consumption is still limited by functions such as content caching and offline playlists. Still, the IFPI (2015) expect subscriptions to grow by tens of millions and Ericsson (2015) expect mobile audio traffic to increase in line with total mobile traffic growth.

According to IFPI (2015), the massive growth in music streaming/subscription services is accredited to two factors; the spread of smartphones and building partnerships. Firstly, smartphones have enabled mobile music consumption anywhere at anytime. IFPI (2015) state that two key events in 2014 were the launch of a mobile free tire service provided by Spotify, and a mobile personalized flow service provided by Deezer. Secondly, as for partnerships, IFPI (2015) say that bundled offers, i.e music streaming services bundled with telco subscriptions, is a powerful strategy for growth in mass markets. Such deals are spanning the world, from mature markets with deals signed by key music streaming companies such as Napster, Deezer and Spotify (ibid.).

Streaming services are commonly divided into subscription services and ad-supported streaming services (IFPI, 2015; Pro Music, 2015). Most music streaming actors offer both kinds of services as they both generate valuable revenue streams. According to IFPI, (2015) both segments are growing steadily although subscription services holds a larger portion of the overall global income from streamed music, see Figure 17.

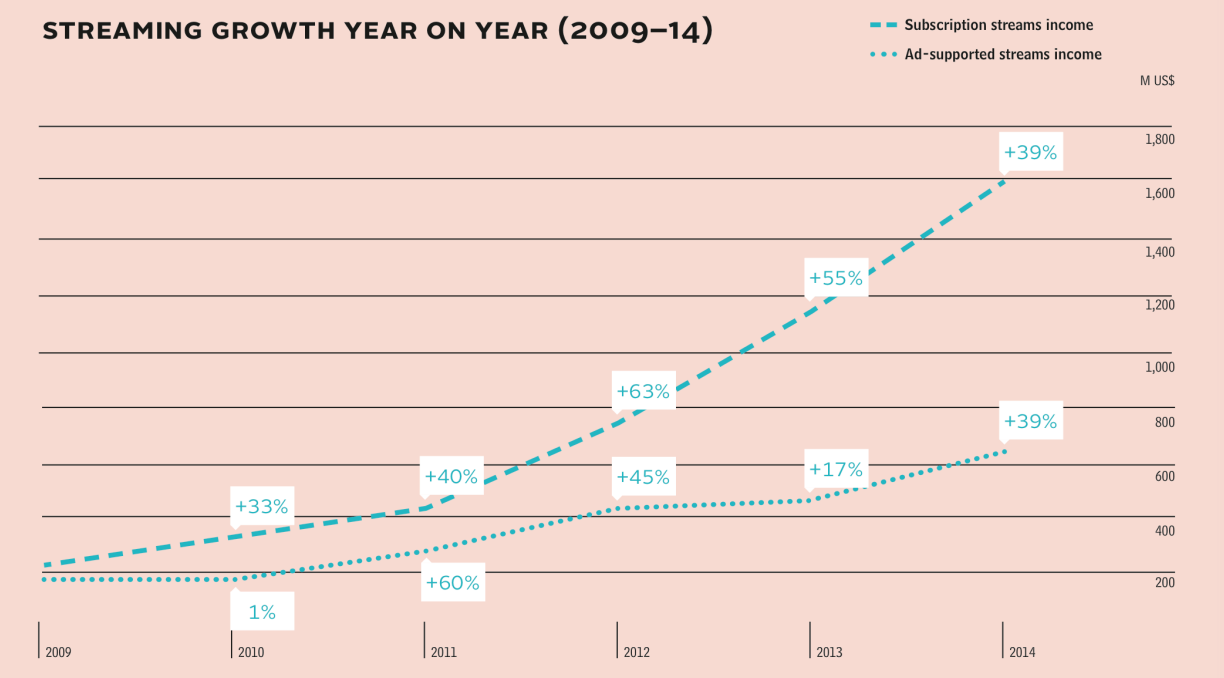

Figure 17: Music streaming growth: subscribers vs. ad supported services (IFPI, 2015)

Competition within the industry is immense, with currently over 400 licensed services worldwide (Pro Music, 2015). A few new services, backed by big global players such as YouTube and Apple, are expected to enter the market in 2015 (IFPI, 2015). At the same time major international music subscription services are continuing to expand into key markets, e.g Prime Music (Amazon) and Deezer in the US, Spotify in Canada, Guevera and Rdio in India (ibid.).

In addition, IFPI (2015) state that niched services, focusing on a premium quality of experience, is an important trend for the music industry, not the least as a means to reclaim the value of music as a product (IFPI, 2015). Tidal is an example of one such service that was launched in 2014 (Tidal, 2015). The service is advertised as a "high-fidelity" (i.e. high quality) service with both music and HD music video content (ibid.)

7.2.1 The Spotify Case

Spotify is a music streaming service that is available in 58 countries (Spotify, 2015a). Spotify's business model comprises of two basic services; one free to users but ad-supported subscription service and one premium, unlimited subscription service (Spotify, 2015e). Spotify Free is currently including a shuffle play mode of any artist or playlist on mobile with the ability to skip songs up to six times per hour on mobile. Spotify Premium is a ad-free, unlimited service currently including play on-demand on mobile, a listen offline feature where no connection is needed, premium sound quality and possibility to play on external speakers (ibid.).

First, Spotify bring listeners into the free, ad-supported service in order to later be able to convince users to become premium users (Spotify, 2015b). Spotify claim that their model regenerate the value-loss of music by converting non paying music fans from pirate distributed formats to their paid streaming format. Since 2009, Spotify have been able to pay over $2 Billion USD in royalties to artists and labels (ibid.).

In an interview with Spotify's employees; Pär Bohrarper, (Software Engineer and Team Leader), and Niklas Gustavsson, (Software Engineer within back-end development and content distribution), (March 17, 2015), they claim that Spotify's ambition is to be a service provider for everyone that wants to listen to music. Although the customer base is mapped and segmented, the focus is set on availability to all users.

Spotify measure their active user base monthly. In December 2014, they had over 60 million global users, of which more than 15 millions were paying a $9.99 / £9.99 / €9.99 monthly subscription (Spotify, 2015b). In Figure 18 is the rapid growth of Spotify users illustrated from 2009 until December 2014 (ibid.).

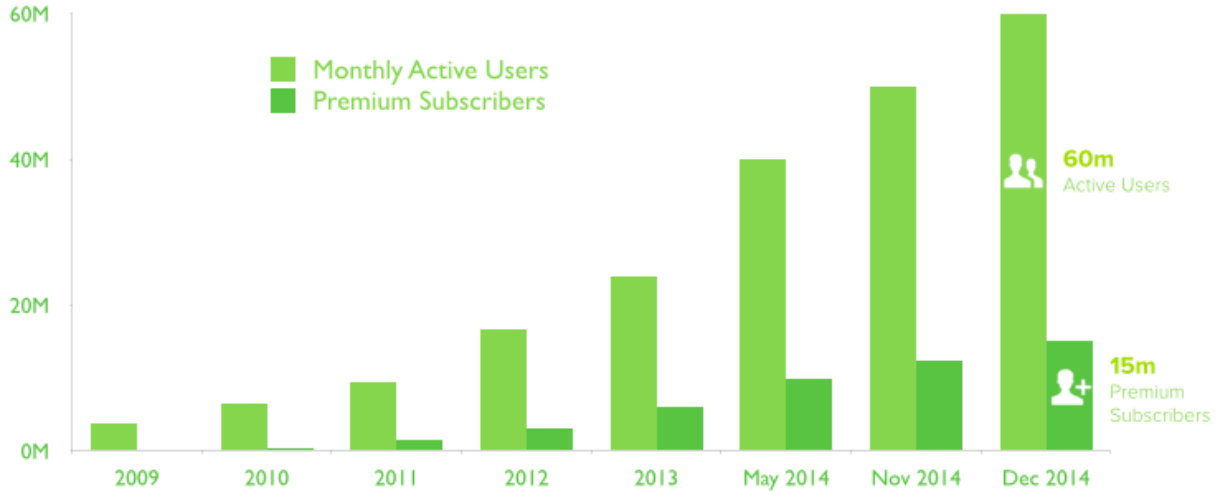

Figure 18: Monthly Active Users as well as Premium Subscribers of Spotify, from 2009 to 2014 (Spotify, 2015b).

An average Spotify user is in round figures worth $41/year for total revenue divided by number of users whereas the average amount of money spent on music by an US adult user is $25/year (Spotify, 2015b). Figure 19, show how usage is spread out over an average day from morning until midnight (ibid.). Usage is in general heaviest from noon until midnight. However, in mornings it is more common to use mobile devices than computers, whereas it is the opposite from noon until midnight.

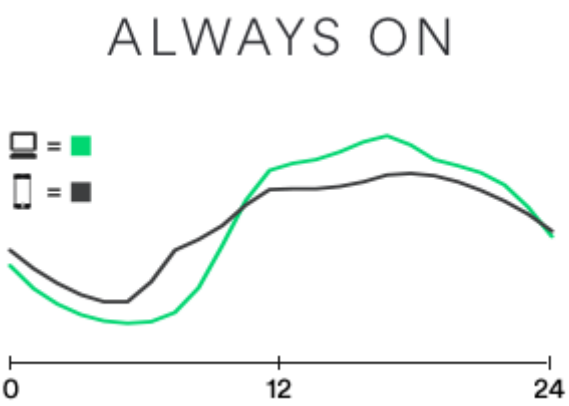

Figure 19: Usage of Spotify spread out over an average day, (Spotify, 2015b).

Bohrarper and Gustavsson (March 17, 2015) stressed that the mobile platform is the most important platform for Spotify, that is were the most working time is done and most users can be found. Comparing global usage between January 2015 and the same month in 2014 it is clear that the mobile Spotify audience has grown dramatically in the last year, as illustrated in Figure 20 (Spotify, 2015c).

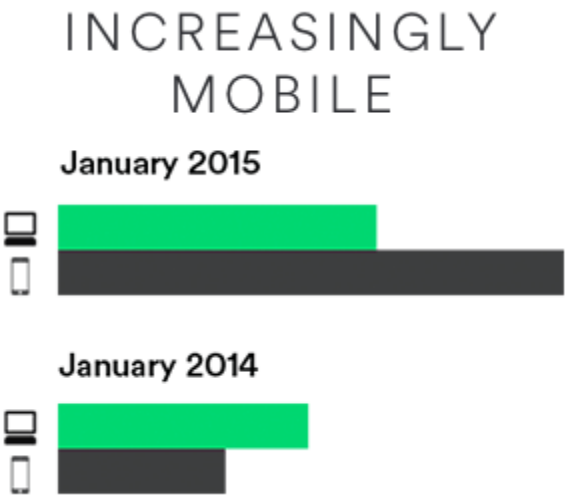

Figure 20: Spotify's (2015b) illustration of how the mobile usage of their services have increased from January 2014 to January 2015.

When discussing Spotify's distribution method, Bohrarper and Gustavsson (March 17, 2015) claimed that distribution is extremely important to Spotify and they are very dependent on having low latency for their service. The application was originally built around the desktop environment but with increasing mobile solutions, changes had to be made (ibid). An example is a shift from using peer-to-peer solutions, as those are not suitable in the mobile environment.

Traditionally, Spotify has relied on a good network connection such as WiFi or 3G for their services. However, when lunching in markets where infrastructure is poor, Spotify has to overcome the connection barriers. According to Bohrarper and Gustavsson (March 17 2015), Spotify puts a lot of effort into making sure to deliver good service in those markets.

As Spotify's servers don't have the capacity to distribute music to all their users, they are very dependent on 3rd party CDNs to distribute the music (Bohrarper & Gustavsson, March 17, 2015). Spotify has a different approach towards using CDNs, as they use many CDN companies simultaneously and benchmark against each other, based on their performances (ibid.). This is a very unusual approach as traditionally, content providers want to use CDNs as a holistic solution to a problem (ibid.). This means that Spotify has lower commitments to the CDNs and are not dependent on one CDN company,thus gaining flexibility to switch between CDNs, e.g. if technical problems occur (ibid.). By using this approach, Spotify can play the CDNs against each other for a better performance and they believe that this makes the CDNs work very actively to improve their services and optimize Spotify's traffic (ibid). The drawbacks of this approach is that it requires a lot of work from Spotify's side and isn't exactly for free (ibid.).

Pre-fetching is also an important method for Spotify to improve QoE, according to Bohrarper and Gustavsson (March 17, 2015). When the user plays a certain song, Spotify tries to load it on beforehand, e.g. the next song on a playlist (ibid.). One example is when people are driving a car and perhaps going through a tunnel. The song should continue to play although the internet access is limited (ibid.). The objective is to take away the barriers of where the user is located (ibid.).

Telecom operators are extremely important to Spotify's business, especially when launching in new markets (Bohrarper and Gustavsson, March 17 2015). Spotify sees two main advantages when working with telecom operators (ibid.). The first aspect is marketing and customer relationships as the telecom operators have availability to reach the local customers both with marketing and by having physical stores. The second aspect is getting around the sometimes limited data plans, e.g by giving users the availability to use Spotify, even if they have limited data plans (ibid.).

Furthermore, Bohrarper and Gustavsson (March 17, 2015) explained that people in the Western countries are used to perhaps 5GB per month but in other markets the normal is maybe 20 or 50 MB per month and that works very poorly for Spotify as 50 MB is around 10 songs (ibid.) This makes the ground for one kind of partnership with telecom operators, that is that the data traffic for using Spotify does not count against the customer's data plans (ibid.). A business deal with

telecom operators, where the access to use Spotify is for free, is by itself very complex. Spotify would therefore not comment on who pays for the traffic in such deals (ibid.).

According to Bohrarper and Gustavsson (March 2015), one drawback of these kind of solutions is that they are often exclusive during a time period after release. One example is when Spotify is released in a new market, they work exclusively with a telecom operator for a period of time (ibid.). This means that they have limited possibility to work with other telecom operators in the market and can only address a subset of users in the particular market (ibid.).

Regarding Net Neutrality, Bohrarper and Gustavsson (March 17 2015) were not able to speak on behalf of Spotify in that matter. However, the interviewees discussed the market perception as very naive since the public is not aware of the nature of negotiations that companies in the ICT sector have with each other. For example, Bohraper further comments that many companies have quite messy peering negotiations with each other to an extent that the public is not aware of.

One trend that Bohrarper and Gustavsson (March 17 2015) are seeing is that large companies, such as Netflix, Apple and Microsoft are starting to build their own distribution network, e.g by ISP peering and/or by having their own CDNs. The interviewees mention Netflix as a good example since Netflix know how their traffic will look like. Netflix know that if they are about to release a new episode of House of Cards, people are going to watch. Bohrarper and Gustavsson exemplified that if Netflix have control over the CDNs, they can push the content to the servers on beforehand , and make the distribution more efficient. Spotify, on the other hand does not have consumption patterns that are as easy to predict as the ones Netflix have, according to the interviewees.

7.3 Video Streaming

Current trends of network traffic include high growth of video consumption (Cisco, 2015; Ericsson, 2015). Cisco (2015) expects mobile data traffic to rise at a 57% compound annual growth rate (CAGR) from 2014 to 2019 and mobile video to grow by an even higher rate, i.e 66% CAGR until 2019. See Figure 21. Ericsson (2015b) has a more modest forecast, where total mobile traffic is expected to grow by 40% CAGR until 2020, whereas mobile video consumption is expected to grow by 45% annually.

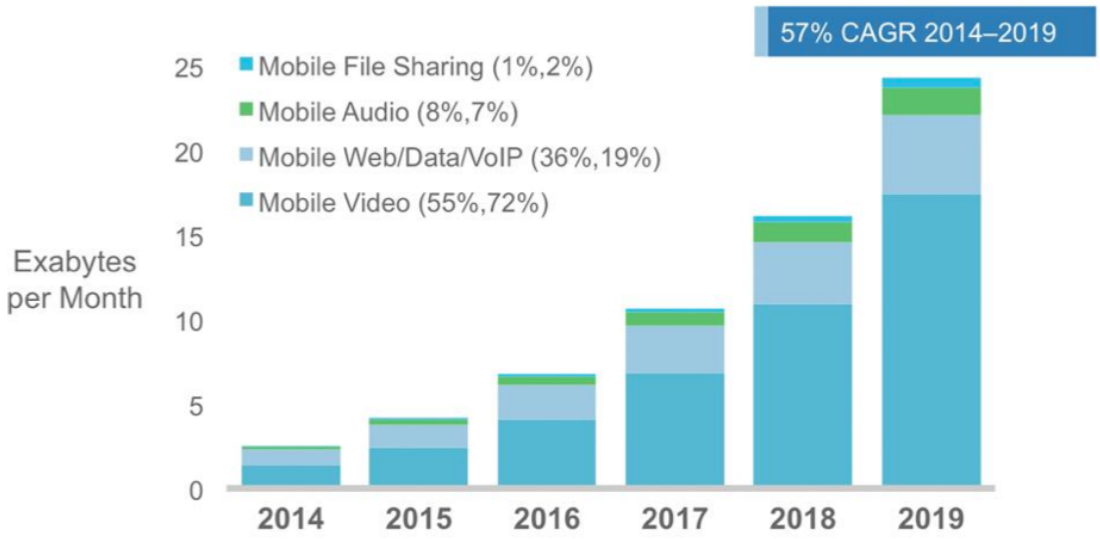

Figure 21: Expected growth of mobile data, 2014-2019 (Cisco, 2015). Figures in parentheses refer to 2014, 2019 traffic share.

Ericsson (2015b) identifies several drivers as the reason for the increasing proportion of video traffic within MBB. Firstly, the mobile devices are evolving to support video, e.g. with larger screens and better resolution. Secondly, video content is increasingly appearing as part of applications such as news, advertisements and social media. Thirdly, technical improvements such as faster networks and video compression techniques allows video to be distributed more efficiently.

In addition to the aforementioned drivers, consumer behaviors are changing. On-demand video is becoming more popular than broadcast TV. In 2014, on demand streaming exceeded broadcast viewing, for people in the age group of 16-45, who watched at least two times per week (Ericsson, 2015b). Streaming video is believed to be driven by a few OTT players, such as YouTube and Netflix. For example, YouTube is responsible for 40-60% of total video traffic volume in many mobile networks (Ericsson, 2015b).

Quality of experience is the most important aspect of video distribution and delivery to end-users according to Sanjoy (2011). Mobile end-consumption of video services are extra challenging due to the high data volumes involved that therefore put high demands on network capacity (Sanjoy, 2011; Olsson, 2004). The most common techniques to improve QoE for mobile video is to use a content distribution network (CDN), usually provided by a third party (Sanjoy, 2011). Netflix, which is one of the largest content providers within video distribution, have their own solution, called the Open Connect Appliance (OCA) (Netflix, 2015). Netflix's solution comprises of hundreds of global ISP peering agreements that are used with an infrastructure of OCA servers (ibid.). Content is pushed from Netflix to the OCA servers on a nightly basis (Netflix, 2015). The solution enables Netflix to move content closer to the end-user and the ISPs gain the value of not having their networks overloaded by excessive Netflix traffic, especially during peak hours (Lawler, 2012; Netflix, 2015). This means that Netflix reduces content delivery expenses while enhancing QoE of their services (ibid.).

7.3.1 The SVT Interactive Case

SVT Interactive is the division within SVT (the Swedish tv-producer in public service) that is in charge of SVT's domains for online services. An interview was performed with two SVT Interactive employees; Daniel Ekelöf, Chief Technology Officer and Thomas Porsaeus, Strategist (Interviewed, March 11 2015). Ekelöf and Porsaeus describe SVT's online services as summarized in Table 3. SVT Interactive is responsible for all technical and strategic issues regarding development and operations of the services in Table 3, but not the content as such.

Table 3: SVT's digital services.

SvtPlay	SvtFlow	SvtBarnkanalen	SvtBolibompaplay	Additional
• The main digital service • "About everyone, for everyone, everywhere and anytime" • Currently over 2 million unique viewers per week, closing in on 3 million. • Mainly watching movies. • Both online and app format	• Experiential format • Aimed for a target group that expect to be handed what they want rather than searching for it themselves. • Strive to give a Tv similar experience but through a personalized flow of programs. • Mainly shorter formats (15 minutes sows and 90 second News). • Only available online	• A concept for children • Aims to be a help in everyday life, with safe content and games "best invention for the family" • Targeted towards children between 4-11 yrs. • Specially adopted for tablets and smartphones • Both online and app format	• A new concept, for small children between 2-4yrs. • Accessed through SvtBarnkanalen. • Only image and icon navigation, no text • Adopted for tablet and smartphone use by small children • Childproof, i.e no risk for children to open inappropriate content.	• SvtNyheter, channel for news, available in app format. • Öppetarkiv, a large online catalogue containing all SVT productions that have been digitalised, only available online.

Furthermore, Ekelöf and Porsaeus (March 11, 2015) state that the main purpose of SVT is to produce and provide tv for all population in Sweden, as well as to keep up with technological evolution. Ekelöf and Porsaeus further claimed that the key value parameter for SVT Interactive services is to be available and accessible online for anyone, everywhere and anywhere at anytime. SVT are experiencing a dramatic increase in popularity of their digital services, which is expressed by Porsaeus (March 11, 2015) who said that "all our services are increasing fairly dramatically in popularity, no matter how you measure we are reading amazing numbers every year". In addition, Porsaeus stated the they have around 5,7 million unique visitors per week, which represents a large part of the Swedish population that is active on the Internet.

Porsaeus (March 11, 2015) said that as the market is starting to saturate, it becomes increasingly more important for SVT to monitor time spent in use of their services rather than number of users. According to Ekelöf (March 11, 2015) they have KPI measurements of time spent per user which shows an increase of over 100% per year since 2011 for all their digital services. End-consumption on mobile devices is increasing rapidly and stands for 50-60% of all consumption of SVTs services (ibid.). However, how much is actually consumed on mobile devices is hard to tell as Ekelöf mentioned that it is popular to stream content through a mobile or tablet but to view video content on a big screen.

A trend that both Ekelöf and Porsaeus (March 11, 2015) are witnessing is that younger people tend to choose to do other things when a show is aired on conventional TV and then watch the show on play when they have time. Ekelöf filled in that user statistics show a peak for SvtPlay is in the evenings around 9-10 o'clock, i.e at the same time as prime time for regular tv. However, Ekelöf also pointed out that though the peak hour seems to be the same, one of the key values for video play services is that they are not limited to a certain day, especially not when following series. Then it becomes even more important for SVT to offer a service that works well on big screen, and that is why they have a CromeCast solution and an app on the AppleTV (ibid.).

Porsaeus (March 11, 2015) also pointed out that one of the big technical challenges for SVT Interactive is the increasing volumes of data that they need to distribute through their data centers, to every individual end-user for any kind of device. It needs to be an equally good quality of experience whether you use an iphone, a tablet or a 65' flat screen tv. End-users are not supposed to notice any difference at all, nor should they have to purchase additional devices to make everything work. However, maintaining technical solutions for all kind of users and all kinds of devices are costly business, especially for a mainly governmentally funded actor like SVT (ibid.). Porsaeus (March 11, 2015) further stated "Thats where our real challenge lies, how to get our streaming services to work equally smoothly on mobile devices and big screen devices. It's a huge cost for us to top off all technology at the same time".

When asked about competition, Porsaeus (March 11, 2015) stated that SVT need competition to improve performance. In addition, Porsaeus claimed that SVT have always been leading in technology when it comes to radio and tv in Sweden and that SVT Interactive are supposed to be market leading. He further states that SVT were first to use the 'Play' name, and thus set the standard for an entire industry, when they launched SvtPlay in 2005. Both Ekelöf and Porsaeus (March 11, 2015) are proud of prior accomplishments of SVT interactive and expect to continue leading development for how streaming services in Sweden should look like and function. However, Porsaeus (March 11, 2015) also said that is where they have experience though competition in recent years. According to Porsaeus, Netflix and ViaPlay are examples of really strong competitors that has somewhat outrun SVT on technology but not yet on content, even if some might argue that.

Ekelöf (March 11, 2015) filled in to say that SVT are not yet up to level with the consumption trends though they can see where it is heading. According to Ekelöf, SVT can not drive the evolution in the same way as their competitors, even though they want to be market leading. The explanation lies in that SVT's business prerequisites undermines competition. SVT is an actor that is active within a certain regulatory framework, with no possibility to purchase anything with VAT reduction, resulting in higher expenses than their competitors. Furthermore, Ekelöf also stated that SVT will not be given more or less money dependent on where the market turns though they still are expected to be an active player in the market and deliver a certain value to the society. Porsaeus (March 11, 2015) said that business can therefore be tough to live up to as a public service company with the entire Swedish population as their key targeted customers.

When first asked about partnerships for digital content distribution, both Ekelöf and Porsaeus (March 11, 2015), were clear about that SVT do not engage in partnerships. However, SVT does not have the resources to manage their digital content distribution by them self and are therefore using a CDN solution. According to Ekelöf, all SVT content is streamed over the world's largest CDN, Akamai. Tough Porsaeus pointed out that what CDN solution they use could just as easily change tomorrow since SVT can not be allowed to engage in any exclusive partnerships.

Because SVT is a journalistic institution within Swedish public service, they have to maintain transparency and objectivity when considering any agreements. This became very clear during the interview as Ekelöf (March 11, 2015) stated that SVT is quite careful with advertising what relations they have. "We would not like them to advertise that we are their customers but we would never try to hide it. We are in journalistic business and need to maintain objectivity, therefore we hold our no-commercial grounds pretty high" (Daniel Ekelöf, March 11 2015).

Furthermore, Ekelöf and Porsaeus (March 11, 2015) stated that business arguments for entering partnerships doesn't bite on SVT. According to Porsaeus, proposals for partnership are usually argued similar by; 'Hey lets partner up and you would gain this many users', but for SVT that is simply not worth anything, as they do not receive any additional funding for additional users. More users therefore equals more cost, especially for content distribution and the charge for digital content distribution is not pleasant to deal with according to Porsaeus. SVT would instead be more interested in knowing what kind of users they could reach through a potential business agreement, in relation to their mission to be for anyone, everywhere and anywhere at anytime (ibid.).

In addition, Ekelöf (March 11, 2015) explained that other video streaming companies can engage in partnerships or buy solutions developed by commercial companies whereas SVT can not. Commercially developed solutions are, according to Ekelöf, developed with a very specific target group in mind and that all that matters is if you can pay for it or not. Ekelöf claimed that SVT have higher demands than so, especially since they need service solutions that are broader, e.g by taking disabled users in mind. Moreover, that is why SVT Interactive prefer to develop their own solutions.

Another difference between commercial video streaming services and SVT's services is that commercial actors need to target advertisements recipient customer segments with enough buying power as advertisements are the main source of revenue for such actors (Porsaeus, March 11 2015). Services aimed towards children (BarnPlay and BolibompaPlay) was mentioned by Ekelöf (March 11, 2015) as examples of services that SVT have but that are not available amongst commercial actors as advertisements are not allowed to be aimed at children in Sweden.

Both Ekelöf and Porsaeus (March 11, 2015), said that SVTs digital services are not very sensitive to disruptions and connectivity losses. Porsaeus argued that nowadays Swedes understand that buffering is needed and that issues mostly are caused by network congestion. The value of the service is therefore not damaged by such issues. However, Ekelöf commented that live sessions are of course more sensitive to disruptions. As for future challenges, this is also the area in which both Ekelöf and Porsaeus expressed their largest concerns in regards to how to secure network capacity to deal with future demand, especially during peak hours and special live events.

Ekelöf and Porsaeus (March 11, 2015) said that SVT would like to have more relationships with network operators and network providers to solve future network capacity issues. However, they both recognized that such relationships could be hard to realize given the kind of actor that SVT is. In addition, both Ekelöf and Porsaeus are concerned with the fact that they can see a trend in Europe where content providers are paying network operators for distribution of their content

over the network. If implemented in Sweden, it would become a real challenge for SVT according to Porsaeus. Ekelöf is very worried about how zero-rating might affect the Swedish market as it would be hard for SVT to adjust to a business model where competitors sponsor data for their own services. Ekelöf and Porsaeus see three main reasons as to why a sponsored solution would not be a viable solution for SVT. Firstly, it would simply be too costly for SVT. Secondly, SVT operate under a strict regulatory framework which would have to be changed by the government to allow for such agreements. Thirdly, SVT has a responsibility to the public and can therefore not engage in any exclusive agreements.

Another discussion, for which Ekelöf and Porsaeus (March 11, 2015) provided similar arguments, is in relation to the Net Neutrality debate. From their viewpoint, Net Neutrality should be highly valued as it should be problematic to enter rating agreements. Ekelöf, furthermore argued that prioritized traffic take up network capacity and therefore must be addressed to secure future network capacity for a world that requires more and more network capacity.

8 Empirical Findings - Part II
Market Case Studies of MNO Perspective

This chapter is divided in two parts and provides two different perspectives. The first section, 8.1 provides findings from an interview conducted with an Ericsson's account manager regarding Ericsson's relationship with their primary customers, the MNOs. The second section, 8.2. provides information about the African market which is supported by interview findings from an Ericsson expertise located in Nigeria.

8.1 An Account Manager's Perspective on the MNO Market

An interview with an Ericsson account manager within the Swedish market was performed. The account manager is responsible for Ericsson's relationship with a mobile network operator (MNO) and is therefore very knowledgable about the relationship between Network Element Providers and Mobile Network Operators as well as how the MNOs operate.

According to the account manager, the aspects of what the MNOs perceive as value is changing. Before it was only about the price but today, other areas such as performance are becoming more visible. However, history has shown that the price is always the most important parameter when evaluating suppliers for hardware or software.

The account manager's experience show that the MNOs evaluate Network Providers based on four parameters:

- Terms & conditions: How should the product/service be paid for and at what time, who is responsible for damages. This process is usually tough and it can be difficult to get all parties to agree on the terms and conditions.
- Delivery: concerns when and how the product should be delivered.
- Price: This is the most important parameter according to the Account Manager. Usually, the price is evaluated as total cost of ownership (TCO). The biggest competitors to Ericsson in this field are Huawei and Nokia. Huawei usually offers low price and is easy to negotiate in Terms and Conditions.
- Technical Solution: Ericsson has usually the best solution. However it can be problematic when the MNO is buying solutions from many different suppliers and a technical problems occurs. The account manager state that usually there are no problems with Ericsson's solutions.

When asked about if the same parameters will be applicable in the next 5 - 10 years, the account manager felt strongly that price would always be the most important parameter. Furthermore, the

technical solution goes hand in hand with the value and will be measured continuously and will therefore always be of importance. Terms & Conditions will always be present as will Delivery Specifications, these are, and will always be, important in business between companies. Regarding future aspects the account manager does not believe the aforementioned measurables will change much, but it is likely that the customer will add more specific measurables as history has shown that the customer is more likely to add measurables versus remove. However it is a question of how much information that will be processable in negotiations.

From the end-user perspective there is an increased awareness on value of the service and not only on lowest price available, as it has been historically. More people are asking; “what will I actually get”? Of course price is important but the end-customers want something that is good and that delivers what they want and need. Users nowadays expect things to work and are not as acceptant to connection loss and quality issues as they were before.

But it is hard to change the mindset and habits of subscribers, in Sweden specifically. Competition amongst MNOs are still colored by historical brand images, “the cheap actor” and the more expensive actor are actually offering the same connectivity today, over the same network, although the subscriber habits are still rooted deep in perceiving them as more different than they actually are.

The account manager was also asked about the network perspective, that is that the MNOs usually have a relationship with a third party, such as content providers. Moreover, the account manager was asked specifically how these relationships are considered when evaluating offering. According to the account manager, Ericsson has a lot of interest in the end-to-end thinking of the services that they provide. In that sense Ericsson works with content providers to be able to design solutions and be sure that they work. Although the connection with the Content Providers are not so many, Ericsson tries to promote the ones they got to the MNOs. This goes especially for the TV and video solutions, as they are very important to the MNOs.

Regarding future trends, the account manager believes network society perspective will influence the future a lot. Everything will eventually become mobile, not just as it is currently here in Europe and in the US but all over the world. It is therefore important to the MNOs to secure good capacity. Furthermore, the MNOs will still have a huge role in the future, there are no indications of other companies wanting to take over their role, yet.

8.2 The African Mobile Markets

Simon Ogwujiakwu is a subject matter expert at Ericsson, Region Sub-Saharan Africa (RSSA). Ogwujiakwu is located in the Nigerian Ericsson office and works with designing customer solutions, mostly towards the markets in the western parts of the Sub-Saharan African region.

According to Ogwujiakwu (May 6, 2015), the markets in Africa are similar except for South Africa, which stands out as the country has a built infrastructure of fixed lines and therefore is more similar to the western markets. The countries from Cameroon to Senegal share similarities as they have little or no infrastructure for fixed network and therefore mobile communications is the primary access in homes and offices as well as on the move.

Technology wise, Nigeria is the country that by far outruns the others according to Ogwujiakwu (May 6, 2015). Nigeria currently have a nationwide mobile infrastructure built on 2G/3G technology and have begun to deploy LTE. Most other countries only have 2G, e.g Cameroon, while others also use 3G technology to some degree (ibid.). Furthermore, Ogwujiakwu stressed that as the LTE is currently being deployed in countries such as Nigeria and Ghana, the right for operating LTE is not given to traditional providers. Instead, LTE licenses are only auctioned out to new entrants, that is why LTE is typically found around the larger cities whereas 2G and 3G is the main access technology used in the countryside.

The telecommunications infrastructure in Sub-Saharan Africa continues to grow and various sectors, such as lower and middle class consumer segments, are rapidly embracing ICT innovations (Ericsson, 2014g). Mobile data traffic is expected to grow by a factor of 20 from 2014 to 2019, compared to a factor of 10 for the whole world during the same time period (ibid.). According to Ogwujiakwu (May 6, 2015), around 30% of Nigerians (i.e about 44 million) have internet access today and the mobile penetration covers about 10% of Nigerians. As for mobile consumption, Ogwujiakwu (May 6, 2015) claimed that about 4 million mobile users stands for a consumption of about 10GB per month, however there are about 12 million active mobile subscriptions during a month.

A study by Ericsson (2015e) show that in Nigeria, mobile phones are the most popular device to access the internet as well as to use content services. The same study shows that mobile broadband is the most common connection type for devices, compared to Wi-Fi, See Figure 22.

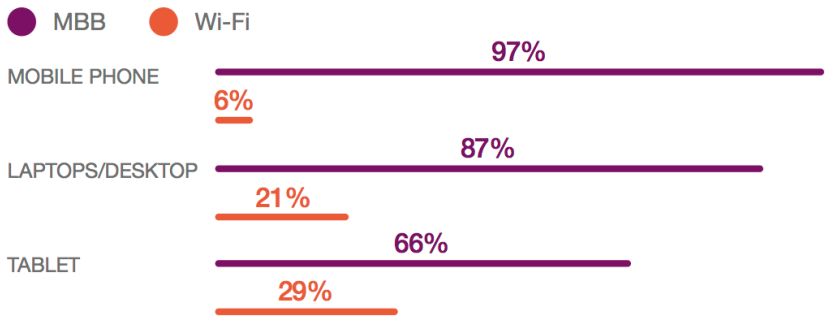

Figure 22: Internet users on respective devices in Nigeria (Ericsson, 2015e)

When looking at the usages patterns of the Nigerian market specifically and activities performed (on any device), music streaming is very popular (Ericsson, 2014f). See Figure 23 Other mentionable activities are; Internet browsing, social networking and online shopping (ibid.).

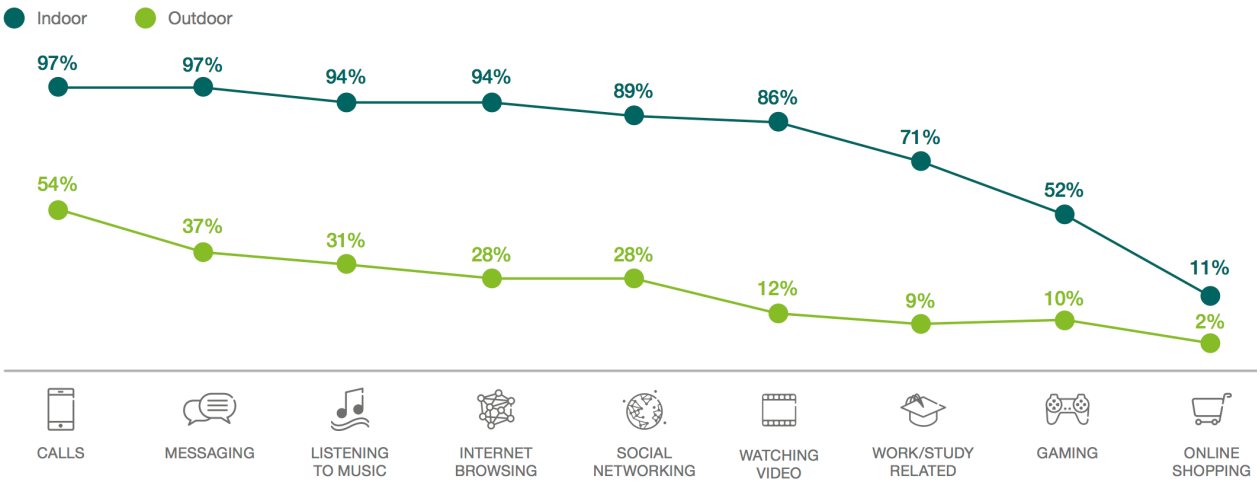

Figure 23: Nigerian statistics showing activities performed weekly on any devices. Indoor vs. outdoor (Ericsson, 2014f).

One of the major market challenges is to provide more affordable mobile services (Ericsson, 2014g). When asked about zero-rating and sponsored solutions, Ogwujiakwu (May 6, 2015) claimed that zero-rating has not been a popular concept within the African markets, whereas sponsored data solutions have been gaining interest from the industry as companies are willing to sponsor their content to increase their customer base. As to why zero-rating is unpopular Ogwujiakwu explained that due to previous experience with fraud, operators are unwilling to enter a business deal where they have no control of how much data is going to be consumed. As an example, Ogwujiakwu mentioned that there has been examples in both Nigeria, Ghana and

Cameroon, where people have been able to accumulate up to 50GB per month by creating URL tunnels when using services such as Facebook Zero.

On the other hand, Ogwujiakwu claimed that operators see sponsored data solutions as an opportunity to drive data usage in addition to having an additional source of revenue from the sponsors as the data traffic is then typically pre-paid by the sponsor. The content providers participating in sponsored solutions have mostly been African players, although some of the larger ones have investments from other parts of the world.

According to Ogwujiakwu (May 6, 2015), one specific use case that has become popular in the African markets is sponsored data in relation to m-commerce. e.g. for online shopping malls. With growing economy, the African middle class is increasingly purchasing merchandise online. This has been a major driver for offering sponsored mobile data solutions within e-commerce.

Pay-per-view video streaming is another case, for which Ogwujiakwu (May 6, 2015), have seen sponsored data solutions in the African markets he is covering. Ogwujiakwu stressed that video is a very big part of the culture in the countries within the region and that the African film industry is blooming. Online streaming services are therefore becoming popular, especially when the data is bundled with the purchase of the content, e.g 'Buy a movie for X dollars and the data for viewing the content will not be charged to your regular data plan'. Ogwujiakwu concluded that there most certainly is a market for sponsored data solutions within the african markets.

However, when asked about sponsored solutions for music streaming Ogwujiakwu (May 6, 2015) stressed that in the countries within the region, music is often given for free and therefore music has little value to the consumer. According Ogwujiakwu, it is instead the music videos that are the source of income for music providers e.g. trough advertisement. Ogwujiakwu therefore see little potential in sponsored solutions for music streaming and can not come to think of any example where there is a sponsored solution for music streaming.

Furthermore, Ogwujiakwu (May 6, 2015) commented briefly on the Net Neutrality principle and how the African market is reacting to it. Typically, regulators are driving the discussion but in Nigeria they are not pushing it hard. In 2014, there was a discussion about Net Neutrality in Nigeria and the regulators seemed to be towards it. However the operators are very powerful in Nigeria and lobbyists have not been fighting for implementing the policy. Ogwujiakwu (May 6, 2015) does not believe that the Net Neutrality principle will be implemented (in Nigeria) in the coming years.

9 Analysis

The following chapter analyses empirical findings in relation to the theoretical framework to provide answers to the three sets of research questions as initially defined in the introduction. To fulfill the aim of this thesis, the three sets of research questions are dealt with within the respective subsections 9.1, 9.2 and 9.3 which is then followed by a feasibility analysis for sponsored solutions in section 9.4.

9.1 Digital Content Distribution and Actors (RQ 1.1 and RQ 1.2)

The technical description of how mobile devices interconnect with each other, as presented in Chapter 3, provided a basic understanding of how digital content is distributed over Internet for mobile end-consumption. In addition, actors involved with the distribution of digital content were also introduced based on their basic function within the value chain. Furthermore, the models presented by Fransman (2007; 2008) and Basole and Rouse (2008) elaborated the definitions of these players, as well as introduced additional factors that affect their interrelations, such as environmental aspects. All combined, these three descriptions give a good base for explaining how digital content is distributed and what actors are involved in the distribution process, i.e to answer Research Questions 1.1 and 1.2. In the following, key points discovered in both theory and empirics are highlighted and discussed to provide answers to these questions.

9.1.1 How Digital Content is Distributed over Internet for Mobile End-Consumption

People have gone from reading newspapers and books by turning leaflets to just swipe a finger over a small screen. A person could tap a finger on that very same screen and instantly get the music he/she desires. Nowadays, it is simply expected that everything should be just an index finger swipe away, no matter where are or what time it is. As described in the theoretical framework of this thesis, all this is possible thanks to technical evolution of network infrastructures within the ICT industry. Before, content was distributed by the use of different technologies such as paper, analog wires and computer networks. Nowadays, everything is digital and digital content is distributed over the same infrastructure regardless of the type of content although the way technology and infrastructure is used varies within the industry. Combining the technical description in theory with empirical findings, it becomes clear that digital content is distributed over Internet from Content Providers, sometimes with solutions of their own and sometimes with the help of a CDNs, as illustrated to the left in Figure 24.

Furthermore, as illustrated to the right in Figure 24, mobile end-consumption is enabled by the help of mobile broadband technology that connect mobile devices through RANs and Mobile Core Networks. In this area there has been a tremendous evolution during the last two decades.

Technology wise, there are currently three main mobile access networks in use; i.e 2G, 3G and 4G (LTE). These three access technologies illustrate an evolution where backwards compatibility, through IP-based services and applications, have been key in securing and improving connectivity over time. However, what is now happening is that the ICT industry is improving mobile performance by abandoning older technology, focusing on deploying the new LTE access technology and the EPC solutions of tomorrow. LTE and EPC is in that sense setting the ground for a network revolution that has the possibility to further increase service performance, while making distribution of digital content over MBB more efficient and thereby reducing the cost of operations for MNOs.

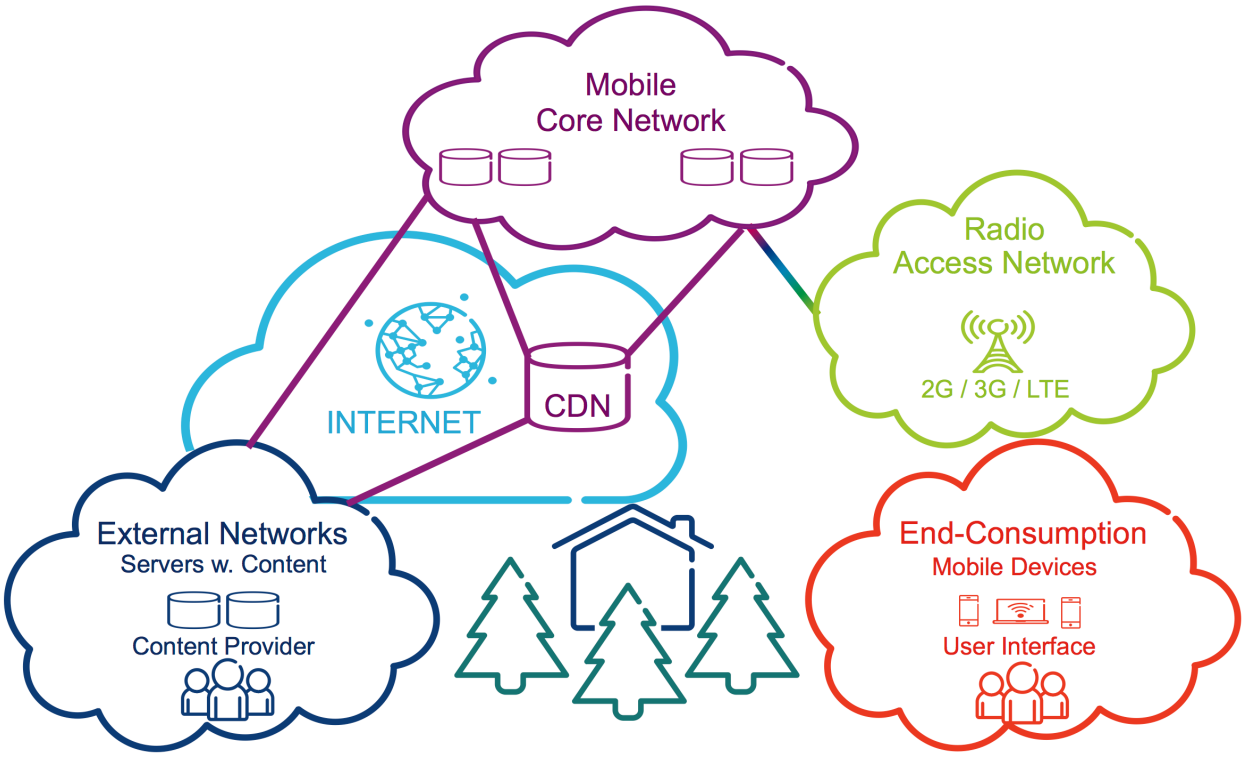

Figure 24: Illustration of how digital content is distributed over internet for mobile end-consumption.

9.1.2 A Simplified Model of How Digital Content is Distributed

The evolution that has occurred within the industry for the last two decades have erased the limits between the ICT and media industries. This change has brought about a complex value chain for the distribution of digital content over internet as described in the theoretical framework of this thesis. Furthermore, by taking the three case studies into consideration, it is clear that there is no standard way of distributing digital content over Internet for mobile end-consumption. However, combining both theoretical and empirical findings within the scope of

this thesis, results in a simplified model for digital distribution of mobile content which can typically be characterized by four key groups of actors;

- *End-Users* that consumes content services offered by content providers.
- *Content Providers* that own and/or provides digital content and/or the service (i.e application) for consuming digital content. Examples of companies in this category are: the Ellos Group, Spotify, SVT, Netflix, ViaPlay, Facebook, YouTube, Google, Amazon etc.
- *(Mobile) Network Operators* (MNOs) that owns the right to operate mobile networks and thus provides end-users with the service of connectivity. In that sense are Internet Service Providers and Virtual Mobile Network Operators also referred to as MNOs in this simplified model. Examples of companies in this category are: AT&T, TeliaSonera, T-mobile US (Deutsche Telekom), Vodafone, Orange, etc.
- *Network Element Providers* that offer technical solutions that enable network communication. Examples of actors in this category thus include: Ericsson, Huawei and various CDNs such as Akamai, CloudFront, and EdgeCast (TeliaSonera).

Nevertheless, the ICT business sector is indeed an evolving sector where roles are changing. It should therefore be noted that a company could be an actor within several categories depending on the specific business case, which further elaborated on in a later section dealing with Research Question 2.

The simplified model for distribution of digital content can be illustrated as depicted in Figure 25. The end-user's consumption of digital content is facilitated by a mobile network subscription that the end-user has with a MNO, as well as by a content subscription that the end-user has with a content provider. The end-user thus pays both the MNO and the content provider to get access to the content. The actual distribution of the digital content, from content provider to end-user, is facilitated by the MNOs that buy technical solutions from network element providers.

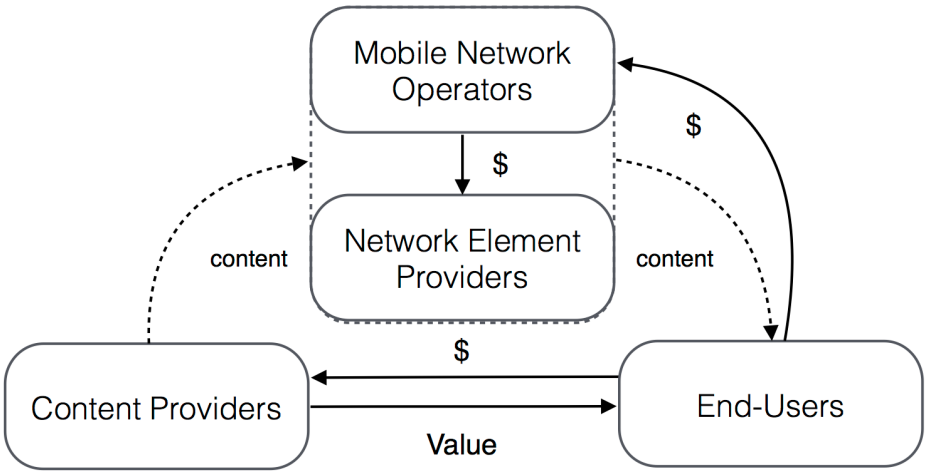

Figure 25: Schematic illustration of simplified relationships in the value chain for distribution of digital content over MBB where the end-user pays for both the digital content as such in addition for the delivery of the content.

Furthermore, MNOs and Network Element Providers are jointly responsible for how networks are constructed, operated and managed based on service, control and connectivity. As both theory and empirics have shown, consumers are expecting services to give them instant access to the content they want, whenever they want it and wherever they are. As a result, streaming services are becoming increasingly popular, especially for mobile end-consumption. However, popular content services such as music and video streaming are typically heavy in data volumes and therefore strain network capacity. Both theory and empirics show that this is typically solved by ISP peering and CDN solutions although empirical findings showed that in what way these solutions are implemented and dealt with varies, as further discussed in relation to the interrelationships between content providers and network element providers in Research Question 2.

9.1.3 Applying the Simplified Model to Sponsored Data & Zero Rated Data Solutions

Applying the simplified model to the business case of sponsored data and/or zero rated data solutions results in a simplified model of the value chain as illustrated in Figure 26. In a sponsored data distribution solution, the data is sponsored so that the end-user can access, download or stream content without being charged for the data consumption. The sponsor could be any other actor within the value chain that would gain from the end-user's consumption of the digital data, e.g a content provider that would gain from an increased uptake of end-user subscriptions or from increased advertising revenue due to increased reach. However, in a case where the MNO is the sponsor it is typically called zero-rating though these terms are sometimes confusingly used for describing the same thing.

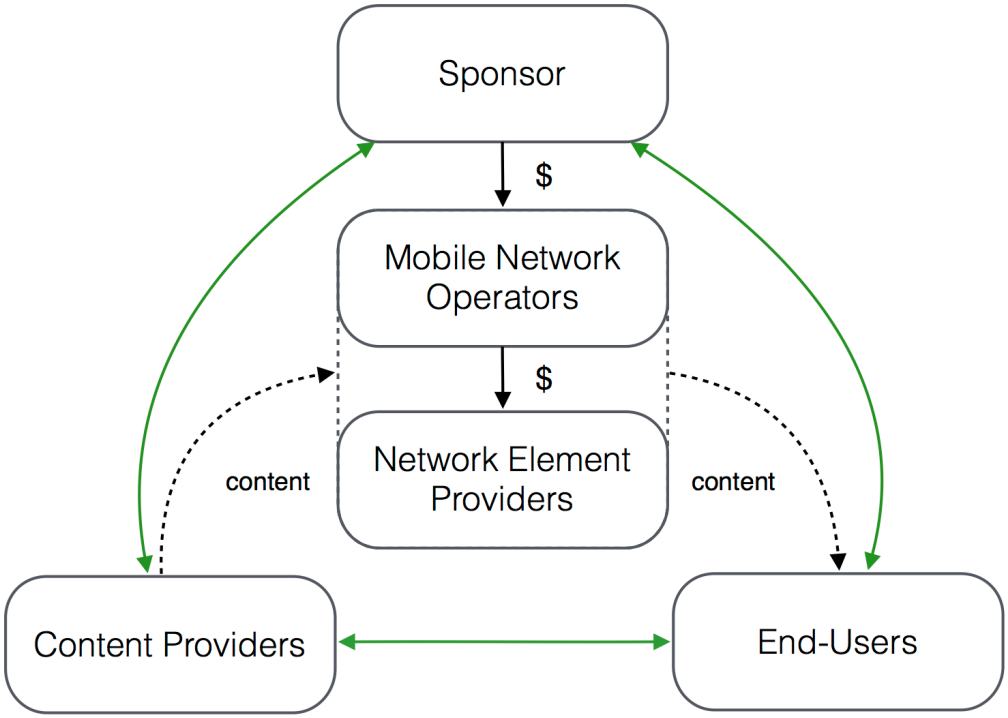

Figure 26: Schematic illustration of the relationships within the value chain for distribution of sponsored or zero rated data.

In the model illustrated in Figure 26, the physical flow for the content distribution is the same as in the generic model presented in Figure 25. However, in Figure 26, it is the sponsor that pays for the distribution and the green arrows indicate that the relationships between sponsor, content provider and end-user are dependent on the business case in question. In order to further develop this model, it is necessary to understand the relationship between the actors, which is dealt with in Research Question 2.

9.2 Interrelationships Between Actors (RQ 2)

As aforementioned, one key finding is that distribution of digital content for mobile end-consumption is characterized by a very complex value chain. Therefore, the following analysis deals with the relationships between the four identified key groups of actors within the value chain, one relationship at a time. Moreover, this approach is similar to the one used by Fransman (2007), which is why the terminology of R.1-R.6 is used for discussing key aspects of the interrelationships between End-Users, Content Providers, MNOs and Network Element Providers, based on both theoretical and empirical findings. All key findings from the following analysis are summarized in Appendix II.

Before moving into each and every relationship, it is important to remember that there are several environmental aspects that can affect the interrelationships within the ICT ecosystem, as mentioned in the theoretical framework. Combining the models presented by both Fransman (2007) and Basole and Rouse (2008) emphasizes the following environmental aspects;

- Political (regulation and competition laws, legal standardizations and other institutions)
- Economical (financial institutions)
- Technological
- Social
- Competitions

However, instead of going through the implications of each and every possible environmental aspect within every relationship, aspects highlighted in both theoretical and empirical findings are further analyzed in relation to the relationship in consideration.

9.2.1 Network Element Providers & Mobile Network Operators - Relationship 1

Both from a business perspective as well as from a technical perspective, it has been shown that the Network Element Providers and MNOs are highly dependent on each other. In the theoretical framework this is confirmed by the fact that they are jointly responsible for how networks are constructed, operated and managed. In addition, Fransman (2007) claims that “one could not survive without the other” when explaining how this relationship gives incentive for innovation, when higher performing networks are required by the MNOs for competitive advantage.

As stated by the Account manager, competition for securing network solutions for the Nordic Market is high amongst Network Element Providers such as Ericsson, Huawei and Nokia. The value perception for the MNOs is changing. Although the technical solution and value go hand in hand, the price is, and will always be, the most important parameter. However, with increased

value awareness from the end customer, they are demanding better QoE. This results in increased requirements for QoS, which is provided by the Network Element Providers.

In addition, new, more specialized types of Network Element Providers are entering the market. Examples of such entrants are the CDNs which provide competition to the traditional Network Element Providers. The role of CDNs is becoming more important for increasing distribution efficiency as well as to improve user experience, as claimed in the theoretical framework of this thesis, and further confirmed by empirical findings. Although both traditional Network Element Providers and Network Operators might offer a CDN solution as a part of their offering, a new entrant is on the market that focuses solely on more efficient end-to-end solutions for content distribution. In addition, the empirical findings show that CDN's are desirable partners to Content Providers for that reason. The findings from the theoretical frameworks compared to the empirical study in relation to this relationship are summarized in Table 4.

Table 4: Relationship 1: Dimensions from Empirical Study vs. Theoretical Framework

Actors Involved	Dimensions from Theoretical Framework		Dimensions from Empirical Study

Network Element Providers & Network Operators	'Old'	• Involves close cooperation and mutual dependance, where one could not survive without the other.
		• Incentives for innovation.
			• Technological sophistication growing from the consumer market.
			• Value perception for the MNO is changing.
			  • Price vs technology.
			  • Increased requirement for QoS.
			• CDNs: new, more specialized NEP entrants.
			  • Important role for distribution efficiency.
			• These CDNs are competitors to the traditional companies such as Ericsson.

9.2.2 Mobile Network Operators & Content Providers - Relationship 2

Relationships between MNOs and Content Providers are very complex. As explained by Fransman (2007) this is because, Content and Applications providers have traditionally paid the Network Operators for what they consume, that is the service, or data, needed for operating the business, but not what their customers consume. However, as both theory and empirics have shown, this is not always the case as so-called sponsored or zero-rating data solutions can be found on the market, where Content Providers pay for the data consumed by their customers.

It is worth mentioning that the terminology is not always clear when it comes to Sponsored and zero-rated solutions. Eisenach (2015) and Strategy Analytics (2015) identify sponsored data solutions and zero-rating solutions as two different things, based on which actor pays for the data. That is, a sponsored data solution is when a Content Provider pays for the data consumed by the end-user for utilizing the content service whereas in zero-rating, the MNOs takes on the financial burden for the data consumption. Although this definition is clear, there is a common misunderstanding of what is a sponsored data solution and what that is zero-rating. Both media and industry often interpret solutions of this kind as either the same thing or as the opposite.

To make things even more complex, it's a very difficult task to point out which solutions on the market can be categorized as sponsored solutions and which ones are zero-rating solutions, when financial agreements are confidential. An example is Spotify's solution which they use when entering new markets where data penetration is low. In these cases, Spotify makes an agreement with an MNO to pay for the data consumed by their customers. Spotify would not comment on which of the two actors actually pays for the data so it's therefore difficult to put a label on this agreement. However, it could be speculated that there is most likely a financial flow from Spotify to the MNOs in these arrangements. The stakes for Spotify are high as their whole business idea is built on having many users, both for their free ad-supported service as well as for their premium subscription service then channels and means to reach customers become vital. In relation to the Spotify interview, it was disclosed that the MNO has actually become an intermediate for Spotify to reach customers in new markets, as further discussed in relation to Relationship 3.

Governmental policies such as the Net Neutrality principle can largely affect the relationship between MNOs and Content Providers. Net Neutrality can both be seen as a threat or opportunity, depending on the actor's perspective. As the current, non regulated, situation is beneficial to the MNOs, since they get paid by Content Providers for offering superior quality of the service. Of course, Content Providers, such as Netflix, believe that the MNOs should just provide the sufficient service needed, without the Content Providers having to pay for that. However, if the Net Neutrality principle were to be implemented, the MNOs would have to compensate for the loss in revenue from the Content Providers by other means.

Netflix's ISP/CDN peering solution is also an interesting example of this relationship, although the solution is hard to fit solely within the one relationship. Nonetheless, Netflix has actually taken the step to work with the ISPs by allowing them to implement a Open Connect Appliances (OCA) server to the ISP network for a more efficient distribution. So instead of Netflix paying the ISPs/MNOs for a better QoS, the solution helps the ISPs/MNOs make Netflix's content distribution more efficient by giving them easy access to the Netflix content. This is also a very

interesting approach when looking at the Net Neutrality debate as it might just be that Netflix has found a way to go around the issue, since the ISPs/MNOs are not prioritizing Netflix's content nor discriminating users by using this approach.

Another interesting finding within this thesis is that the Net Neutrality principle can also have effect on this relationship without it being forced by a government, as the Flipkart Ltd. example demonstrates. The discussion about Net Neutrality killed a sponsored data deal that Flipkart Ltd. had previously made with an Indian MNO. This case demonstrates two things; Firstly, social pressure can be of influence in these kind of relationships, and secondly the Net Neutrality principle can affect the relationship without it actually being implemented as a governmental policy. What is also worth mentioning is that it's not even clear if the sponsored/zero-rating solution is a violation of the Net Neutrality principle or not, based on the original definition of the principle. The findings from the theoretical frameworks compared to the empirical study in relation to this relationship are summarized in Table 5.

Table 5: Relationship 2: Dimensions from Empirical Study vs. Theoretical Framework

Actors Involved	Dimensions from Theoretical Framework		Dimensions from Empirical Study
Network Operators & Content Providers	'New'	• Complex relationship. • Content Providers pay for using the service they directly consume but not what their customers consume. • Net Neutrality Principle.	• Today sponsored data solution can be found where the Content Providers sponsor the customers' data consumption. • Which actor pays is not so clear. • The MNO becomes an intermediary between the Content Provider and Final Customer. See Relationship 3. • Net Neutrality principle: threat or an opportunity? • Has Netflix gone around the issue? • Social pressure can kill business deals.

9.2.3 Content Providers & Final Consumers - Relationship 3

Fransman (2007) gives an example of this relationship with Web 2.0, where the users involvement adds value to the Content Provider's site and the more user the more value. This is especially evidential when it comes to advertising services, e.g. Spotify Free, where the user can use Spotify's service for free under the condition that the user listens to advertisement. In these types of arrangements, another exterior actor enters the picture, the advertiser, that finances the service for the end-user.

An additional aspect worth mentioning is that the MNOs have become an intermediary in this relationship. As Spotify mentioned, the MNOs play a very important role when they enter new markets. The MNOs have an existing relationship with the customers in the markets and often physical stores for customer service. However in these kind of relationships the role actually changes, so the MNO would be evaluated on the number of users, for feasibility of entering a partnership agreement.

Regarding the QoE, experienced by the customer when using content and application services, SVT mentioned that with increased customer knowledge, the end user does not necessarily blame the content provider when performance is inadequate, e.g when the video content is lagging. The customer could just as easily jump to the conclusion that it was due to poor network quality and thereby blame the MNO. However, the evidence show that video streaming services are becoming extremely popular and with this popularity, it can be assumed that the consumer's standards will rise even more. Both regarding the network quality and the content service quality. Furthermore, when customers are using many types of video streaming services they can easily compare them together based on the perceived QoE, as the services would most likely run on the same MNO network. The findings from the theoretical frameworks compared to the empirical study in relation to this relationship are summarized in Table 6.

Table 6: Relationship 3: Dimensions from Empirical Study vs. Theoretical Framework

Actors Involved	Dimensions from Theoretical Framework		Dimensions from Empirical Study

Content Providers & Final Consumers	'New'	• Users' involvement adds value to the site.
		• The more users the more value.
		• A challenge to gain users due to high competition.
		• Final Consumers might pay directly or indirectly for content.
		  • YouTube: Clicks on a video is used for selling advertisements.
			• Indirect payment is evidential in Spotify's Free subscription.
			  • Additional actor, the advertiser, enters the picture, and finances the Final Consumer's consumption (although not the data).
			• The MNOs can become and intermediary in this relationship.
			• Who will be blamed for poor QoE (Content Provider or MNO)?
			• Customers' standards are rising.

9.2.4 Network Element Providers & Final Consumers - Relationship 4

This relationship is probably the most challenging one to analyze, as the theoretical and empirical study show little evidence of how this might look like. An example is taken by Fransman (2007) of a handset manufacturer that produces their devices based on the Final Consumer's needs. This most people could relate to. However, when it comes to other Network

Element Providers such as Ericsson or CDN companies that the Final Consumers aren't even aware exists, it is hard to imagine the direct relationship. Although the final consumer seems to be at focus when providing the Network Services the relationship seem to be one sided. As stated by Ericsson's account manager, Ericsson aims to have an end-to-end perspective when it comes to designing their services. That means that the MNOs' customers are considered. However, the Final Consumer might have little knowledge of Ericsson's particular role is in this context. The findings from the theoretical frameworks compared to the empirical study in relation to this relationship are summarized in Table 7.

Table 7: Relationship 4: Dimensions from Empirical Study vs. Theoretical Framework

Actors Involved	Dimensions from Theoretical Framework		Dimensions from Empirical Study
Network Element Providers & Final Consumers	'Old'	• Hand-set manufacturer and Final Consumer taken as an example.	• Challenge to analyze when looking actors such as Ericsson or CDNs. • Ericsson has an end-to-end perspective • Final consumers are not aware of the NEPs' role

9.2.5 Network Element Providers & Content Providers - Relationship 5

Fransman's (2007) hierarchical model shows how the Network Element Providers provide a platform for the Content Providers to offer their services. The latter are very dependent on the former as the Content Provider would not be able to offer their content to their customers unless the Network Element would provide the infrastructure and services.

Ericsson's account manager claims that the Ericsson works with a few Content Providers for improving their services. These kind of relationships are also used to assure Network Operators that Ericsson's solutions work well with various content, e.g. tv or video streaming services. It can therefore be said that this relationship can act as a support to Relationship 1, at least from the Network Element Provider's perspective. The empirical findings show that the Content Providers interviewed had little relationship with Network Element Providers, such as Ericsson. SVT stressed that such relationships are hard for them to maintain due to the nature of their assignment as a public service provider as well as a journalistic institution. However, the interviewees also expressed that more cooperation with Network Element Providers would probably be beneficial or even necessary for addressing future network capacity challenges. Furthermore, Spotify have been working on a small project with Ericsson in Stockholm and expressed that such cooperation would be beneficial for both parties. In addition, the Ellos Group also showed interest in further cooperation.

With increased requirements for improved QoS, CDNs have become a popular actor within the value chain of digital content distribution. Both SVT and Spotify use CDN solutions to solve capacity issues and the Ellos Group is thinking about it, for solving possible future capacity issues. However, the Spotify case demonstrates that the use of CDNs does not only have to be a performance issue but can also strategic issue. E.g. by using many different CDN companies for network risk mitigation and to play them against each other, Spotify make them work actively on optimizing the traffic for Spotify at the lowest possible charge. However, there are perhaps not all content providers that have the power to use this approach as it takes a large player to negotiate with CDNs in this manner. The findings from the theoretical frameworks compared to the empirical study in relation to this relationship are summarized in Table 8.

Table 8: Relationship 5: Dimensions from Empirical Study vs. Theoretical Framework

Actors Involved	Dimensions from Theoretical Framework		Dimensions from Empirical Study
Network Element Providers & Content Providers	'New'	• The NEPs provide a platform for innovation and production. • Content Providers would not be able to offer their content to their customers without the NEPs.	• Ericsson works with a few Content Providers to improve their services and make sure they work. • Supports Relationship 1. • The Content Providers interviewed showed interest in more cooperation. • CDNs are becoming an important actor, both for technical reasons and strategic reasons

9.2.6 Network Operators & Final Consumers - Relationship 6

Although this is originally defined as a traditional telecom symbiotic relationship, the role of Network Operators is changing. In the analysis of Relationship 3 it is stressed that MNOs are now being used as an intermediary for distribution of digital content due to their relationship with the final consumers.

With the increasing demand on broadband services, the MNOs roles will become even more important, as they invest in, manage and operate the broadband. The discussion regarding Relationship 1 mentioned that with increased value awareness from the end customer, a better QoS is demanded. One aspect that was brought up during the SVT interview is which actor will be blamed from for poor QoS when accessing content, is it the Content Provider or the Network Operators? It could be argued that poor QoS will always damage the user's experience and therefore also negatively affect the user's perception of both Internet service and content service. However, how negatively the user will perceive it to be, highly depend on what type of service it is, the user's quality expectations and what type of relationships the user have to the MNO and

the Content Provider respectively. The damage should be greater for a premium service, for which the user have paid a relatively large price and therefore have high expectations, than what it would be for a relatively cheap service, no matter if it is a content or a Internet/connectivity service. Nevertheless, it could be safe to say that poor QoS can potentially damage the MNO brand and thereby the relationship between the MNO and the End-Consumer.

The MNO's brand is an important factor here from the end-customer perspective. As discussed in the interview with the Account Manager, two MNOs within the same country could be operating on the exact same network but the market would perceive the one as having a more superior network over the other, based on previous branding and experiences. The findings from the theoretical frameworks compared to the empirical study in relation to this relationship are summarized in Table 9.

Table 9: Relationship 6: Dimensions from Empirical Study vs. Theoretical Framework

Actors Involved	Dimensions from Theoretical Framework		Dimensions from Empirical Study
Network Operators & Final Consumers	'Old'	• Traditional telecom symbiotic relationship.	• MNOs get a new role as an intermediary for Content Providers. See Relationship 3. • Pressure for the MNO to deliver high QoS. • MNOs brand is important.

9.3 Current Trends & Future Expectations (RQ 3.1)

As consumption patterns are changing, with increasing need for larger amounts of data volumes and mobile accessibility, so are demands for better mobile network capacity increasing. The society is moving towards a point where even things are expected to be connected rather than just people or places. Firstly, the analysis of RQ 1 and RQ 2 provide the ground for answering RQ 3. The following analysis cover current trends and future expectations in relations to key findings from the three industry studies. In addition, these industries are commented upon in relation to the empirical findings of market differences.

9.3.1 General Trends From the Industry Perspective

It has been shown that m-commerce, music streaming and video streaming services are all industries on the rise when it comes to digital content distribution for mobile consumption, although they all exhibit different trends.

Firstly, m-commerce is becoming an increasingly popular way for people to indulge in shopping, as mentioned already in the introduction, and further confirmed by both secondary and primary empirical findings. The Ellos Group case illustrate that people are nowadays not only using their mobile devices for browsing but also for placing orders and completing their purchases with payments. Furthermore, this trend is expected to continue, as estimated by Citero (2015) and confirmed during the case interview.

Secondly, the global trend for music services is towards streaming solutions. This is evidential when looking at the growth of individual services, that together form a global subscriber base of 41 million paying users. Music streaming services such as Spotify are setting their focus on the mobile platform, as the mobile service holds the largest and fastest growing customer base. Consumers are requiring more sophisticated services and it is evidential that competition is high with many players on the market.

Lastly, mobile video streaming is clearly also a popular content service. As shown, both Cisco and Ericsson expect the annual growth rate for mobile data consumption, specifically for video content, to exceed the expected growth rate for mobile traffic in general. In addition, the SVT case demonstrated that people are reluctant to follow a tv guide and instead expect their video content of choice to be available anywhere at anytime. Thereto, it was stated that 50-60% of the end-consumption of SVT's digital services is consumed on mobile devices.

9.3.2 Technical Prerequisites Content Services

All three industries exhibits the common denominator of being on the rise for their mobile consumption as well as acknowledge the value in their mobile services being available anywhere at anytime. However, as the three studied content industries differ both in the type of content as well as in the type service, they all have different technical requirements that alters the implication of being mobile and available anywhere at anytime. Video content is a typically data-heavy content whereas music content requires far less data volumes and services for m-commerce even far lesser data volumes in comparison, as illustrated in Figure 27. Distribution issues is thereby typically more challenging to solve for video and music streaming services which is evident when looking at the empirical findings as both SVT and Spotify expressed more concern about capacity requirements issues. In addition, streaming services are especially sensitive to latencies. Obviously, music or video streaming service where the content lags are not appreciated by the end-consumer and therefore not an option for the content provider. Whereas the Ellos Group were more concerned about the latency issues for future video clips.

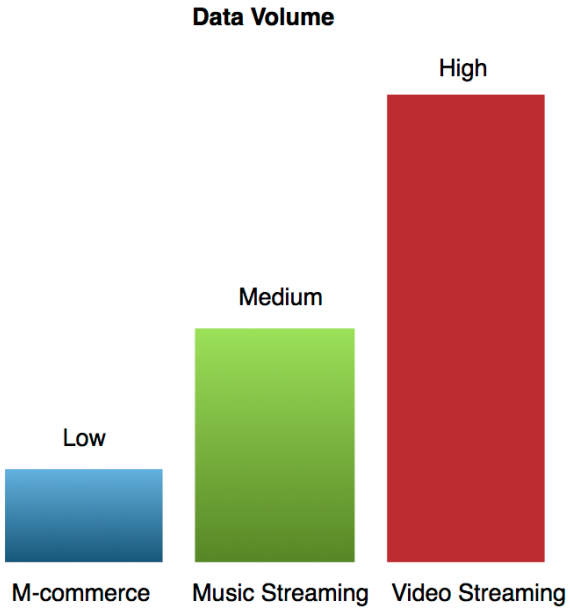

Figure 27: Illustration of relative difference in data volume requirements for the three types of content services.

9.3.3 Consumption Patterns from the Industry Perspective

As aforementioned, a common denominator for all three industries is the customer requirement for availability anywhere at anytime. All three industries show trends of increasing consumption over mobile platforms and the trend is expected to continue within all three industries. However, consumption patterns do differ between the various types of content services and therefore the different services impose different requirements on how digital content is distributed.

M-commerce can still be considered to be a novel industry for mobile consumption although around 30% of orders in e-commerce are placed through mobile devices. In the Ellos case it was discussed that customers might start their shopping experience on their mobile phones when on the move, but then continue the purchase on a computer when arriving home. However, as the Ellos Group recognize the fast growing trend of mobile consumption they are focusing on solutions for mobile consumption. Furthermore, the Ellos case highlighted that mobile consumption is also being considered in relation to other aspects of the m-commerce service, such as for advertising and marketing. As stated in the empirical findings, up to 50% of the e-mails that the Ellos Group sends to their customers are read on mobile phones.

In the empirical findings for the SVT case, it was disclosed that prime-time for linear tv coalignes with the peak hour for SVT's play service. Empirical findings also showed that in Nigeria, digital video consumption of video content is mainly indoors which could confirm the suspicion that video streaming services are mainly consumed when people are at home and relaxed. It can thus be assumed that video streaming services does not have radically different consumption patterns than linear tv services and that the main value of a video streaming service lies in the user's ability to choose what day, to watch the desired content more so than where to watch the content.

As Spotify's employees pointed out, music is consumed differently from other media services such as video. Music is enjoyed throughout the day whereas video content have very clear consumption peaks during prime-time. In addition, music lovers are likely to listen to the same song often while people tend to watch video content only once. These consumption patterns allows the music streaming provider to cache or prefetch content which the user is likely to listen to, as well as allowing the users to have access to offline playlists. Consumption patterns are thereby also an influential factor for the technical requirements of the service. Although the data for music streaming is relatively low when compared to video streaming, individual players such as Spotify can thus be responsible for a large amount of data and need to make adequate arrangement to secure that the data is delivered to the users, based on the user's expectations.

9.3.4 Implications for Future Trends and Consumption Patterns

As a result of changing consumption patterns, people are expecting enhanced experiences and additional functionalities of the services they consume. To tackle competition within an industry and to meet the demand, content providers are trying to differentiate their services within the three industries.

As an example, empirical findings show that with patterns of increasing mobile consumption, supplementary services are emerging within the e-/m-commerce industry, such as advertising, marketing, banking and payment solutions. Thereto, empirical findings also show that m-commerce service providers are focusing on improving the experience of their services by adding picture and video content to their service, thus making the content more "data-heavy". Another example is within the music streaming industry where established players such as Spotify are promoting the quality of their premium service and new entrants such as Tidal are incorporating additional innovative features such as high quality music videos into their music streaming service.

Combined, these features could be assumed to illustrate a further convergence of content industries within the ICT sector as content providers are trying to satisfy the consumer's demand for enhanced experiences and additional services. The implication that can be derived from an advent further convergence of this kind is that it will not only be important to secure the capacity to meet future expectations of growth of mobile consumption, but also to secure capacity for a higher QoS/QoE for content services.

9.3.5 Distribution Strategies from the Industry Perspective

Furthermore, mobile consumption are tackled within the three industries with varying solutions for how digital content is distributed not only on a technical level but also on a strategical level. The need for CDNs has been discussed, but when comparing the different industries it is clear that the need for CDNs is critical when it comes to high data volume services such as video streaming whereas the need decreases with the data volumes of the services.

9.3.6 A Business Perspective on Market Prerequisites for Mobile Consumption

What mobile access technology that is used in different markets varies. Furthermore, what technology that can be considered is dependent on the existing infrastructure, what investments MNOs and network providers are willing to put into the market as well as how the market is regulated.

Firstly, although 50-60% of the end-consumption of SVT's digital services is on mobile devices, it could be assumed that all is probably not distributed over mobile broadband as Sweden has an

almost complete penetration of fixed wire access with WiFis in virtually every home. Furthermore, empirical findings showed that in Nigeria, digital video consumption is mainly indoors. It could then be suggested that the same assumption would be applicable for the Nigerian market. However, for the Nigerian market it needs to be kept in mind that network access is mainly mobile, even in homes and at offices. Therefore is all video content that is consumed on mobile devices, in Nigeria, consumed over mobile infrastructures. Of course, this goes for all three considered industries although the implications will be larger for a more data consuming content service.

Secondly, network investment decisions are made based on business opportunities within the market. In the context of this thesis, it has become clear that what industry the content provider is in plays a big role in what business opportunities there are. Though more importantly, what content services the end-users perceive as valuable within a specific market is not necessary the same as for another market. In the European markets, and especially in the Nordic countries, both fixed broadband and mobile network penetration is high, whereas in African countries, fixed wire network infrastructures are typically not as penetrating and mobile access is therefore the main access type.

Combining these two chain of thoughts, the implications their insights becomes important when considering viable business opportunities in relation to different markets. As a simplified example, if the objective is to drive a video streaming service in a country such as Nigeria, it must be considered that the services will most likely be consumed over mobile connections that will limit the consumption of the service due to relatively expensive data plans with low data volumes. In section 9.4 these chain of thought is further developed in the context of a feasibility analysis for sponsored data solutions.

9.4 Feasibility for Sponsored Data Solutions (RQ 3.2)

The feasibility of sponsored data solutions are analyzed in the following chapter as sponsored data services have been identified as an alternative business solution for how to distribute digital content for mobile end-consumption. Furthermore, the feasibility analysis is derived from key findings in all previously answered Research Questions with the purpose to identify what parameters upon which viable business cases can be evaluated, and thus provides answers to Research Question 3.2

9.4.1 Applying the Simplified Model to Sponsored Data

When applying the simplified model in Figure 25 and 26, to a business case where the Content Provider is the Sponsor, results in a value chain as illustrated in Figure 28. Combining theoretical and empirical findings, as well as deductions from analysis, it is clear that the end-user sees value in getting data for free and a value in gaining access to a desired content service wherever the user is and at anytime. For the Content Provider, the main value in a sponsored data solution lies in increased reach of customers. For the MNO, identified values are a new revenue stream as well as positive brand image from association with a free of charge service. For the Network Element Provider there is no direct value identified, though it should be mentioned that as the Network Element Provider is highly dependent on the relationship with the MNO, the Network Element Provider will benefit from supplying the technical solutions that enable sponsored data solutions.

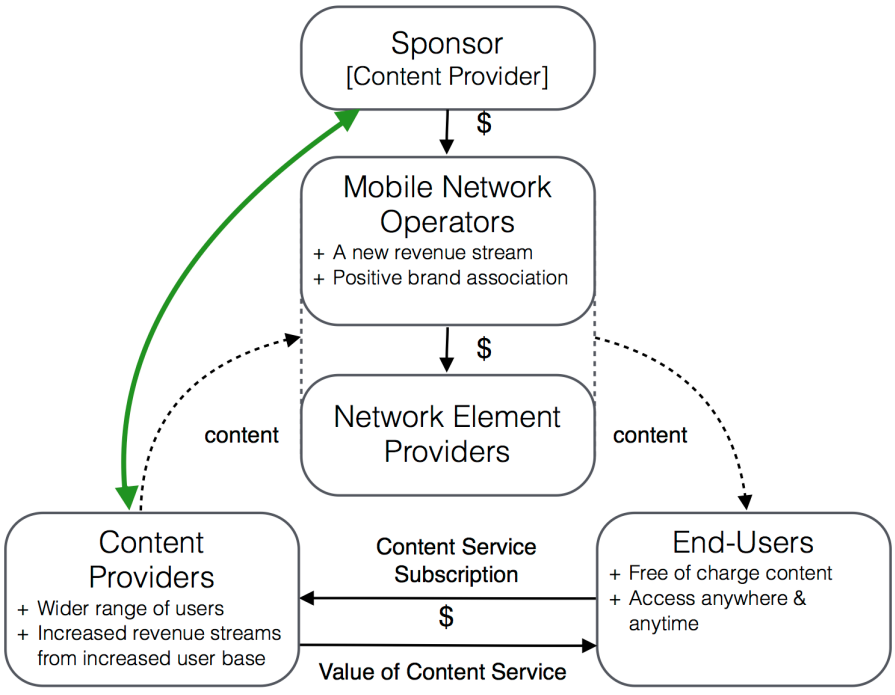

Figure 28: The Simplified model of the value chain for distribution of digital content for mobile end-consumption when applied to a business case for sponsored data with the Content Provider as Sponsor.

However, empirics also show that for a solution of Sponsored Data / Zero-Rated data to be an option, the solution needs to be well thought trough. Neither MNOs, Content Providers nor End-Users would trust in a sponsored solution if it is not clear who is paying, what is paid for and for what purpose. MNOs express fear of being exposed to fraud if the solution is not predefined in terms of how much data is going to be consumed and who that will pay for it. Content Providers need to be reassured that the data they are paying for is actually the data that is consumed for the purpose of their sponsoring. Lastly, the End-User needs to trust that the consumption is not going to be charged to them. All these three aspects makes solutions for Sponsored Data and Zero-Rating very business case specific.

9.4.2 Data Volumes in Relation to Value of Data and Value of Service

At first sight, m-commerce seems to be an optimal content service for sponsored data solutions, since the data requirements for the service is relatively small and therefore it is not as expensive for the content provider to sponsor the data consumption as it would be for music or video streaming. However, when the content is a typically low-data content, it might not be as attractive for an end-user, especially not if data plans are relatively cheap in the market. In the Ellos interview, it was discussed that in the Nordic region, mobile penetration is typically high, and data is typically cheap for the end-user. Therefore the interviewee saw little value in sponsored solutions as they might not be attractive for end-consumers. If a more data-heavy content service, such as music or video streaming, is considered in the same market, the value as perceived by the end-user would be higher but the cost for the sponsor would also increase, which could be derived to the assumption that sponsored solutions might not be viable option in Nordic markets and markets alike.

On the other hand, sponsored data solutions show higher potential in markets where mobile penetration might not be as high as in the Nordic countries, but where mobile access is the main form of network access, and where data plans are relatively expensive. It was concluded in the empirical findings that one major challenge in African markets is to provide more affordable services as data plans are relatively expensive for end-users. In the interview with Ogwujiakwu, m-commerce was identified as a very potential business case for sponsored solutions in African markets, explained by the overall economic growth, driven by a growing segment of consumption hungry middle class that demands such mobile solutions. In addition, as m-commerce require small data volumes, it is therefore affordable for the Content Provider to sponsor the data while the free data still brings value to the End-User.

Continuing to consider the African markets from an end-user perspective, in the empirical findings it was stated by the market expert that music services would simply not be viable

business case in African markets as music has little value when it is already expected to be given for free. In African markets, Video streaming services are however popular content services that require large data volumes and therefore sponsored video streaming services are highly attractive for end-users. This is supported by the fact that pay-per view video streaming already is a viable business case for sponsored solutions in the African markets, as explained by Ogwujiakwu. However, it could still be argued that sponsored data solutions for video streaming could be considered unprofitable due to the large data volumes as it would be expensive for the Content Provider to sponsor large data volumes. When discussing feasibility for sponsored data solutions for video streaming, it then comes down to the format of the video content, as the longer the format the larger the volume.

In conclusion, to get larger data volumes for free is of course more valuable to the end-consumer than to get smaller volumes for free, but it is also more costly for the content provider to sponsor larger volumes, no matter what market is considered. However, it is hard to tell where the line goes for how large data volumes that are viable to sponsor as the feasibility of sponsored solutions is dependent on the value of data which in turn varies between markets. In addition, if the end-user perceive the content service to be of no value in the first place there will most likely not be a viable business case to consider. It can thus be said that how the end-user values the content service in itself also affects how the end-user values the free data.

9.4.3 The Value of Increased Reach

Typically, music streaming services can be categorized in subscription services and ad-supported services. Revenue for subscription services is much higher than ad-supported services, at least when looking at the Spotify case. Spotify's average revenue is $41/year for user. This is calculated by taking the total revenue divided by the total number of users. As the revenue for Premium user is about 12 x $10/year, the monthly ARPU for a Free user is around $1.2/month. Thus, the ARPU for Premium users is around 10 times higher compared to Free users. Spotify's objective is to get all users to become Premium users, whereas the ad-supported services is being offered to attract the customers for trying-out the services.

de Denesse and Weidinger (2014) stated that Facebook would not make a viable business case for sponsored data as the monthly ARPU is around $0.8/user. When comparing this to the Spotify ARPU, sponsoring data would not be a viable business for the long run, especially not when considering that Spotify has high royalty expenses. However, in order to grow in new markets, Spotify need to promote the service, and furthermore overcome limited data plans in many parts of the world. The sponsored use case can be justified for music streaming services that are able to generate higher ARPU with fee paying users. That is, by sponsoring data for a

limited period of time, Spotify is promoting their service for possible future Fee paying users, which generate around 10x higher ARPU.

Regarding the benefits of reaching new markets through sponsored solutions, the same principle goes for m-commerce and video streaming. However, there is no general ARPU for m-commerce services as it is very dependent on the merchandise being sold. Although, it can be assumed that the m-commerce market has the possibility to generate higher revenues than music streaming, as the music streaming service is bounded to the subscription fee. As for video streaming, because SVT is a public service player within the video streaming industry that particular case is not valid for an ARPU evaluation. An alternative video content provider, such as Netflix, might be considered since they have a premium service available and therefore better competence for sponsoring data. However, it should be noted that Netflix has stated that they are not interested in sponsoring their content.

9.4.4 Threats to Sponsored Data Solutions

Arguments for and against Sponsored Data solutions can be found. As shown in the theoretical framework, the Net Neutrality principle is a serious threat to the Sponsored Data business case. Although the focus is usually set on zero-rating solutions, where the operators pays for the content, the fuzzy definition of sponsored data vs. zero-rating makes it difficult to the public understand the concept. Therefore, social pressure, built on the Net Neutrality debate can damage Sponsored data business deals between MNOs and Content Providers.

9.4.5 Summary: Feasibility for Sponsored Data Solutions

To summarize, the feasibility for implementing a sponsored data business case is based on aspects such as the type of content and the market that the business case will be implemented in. The following parameters, and supporting factors that impact the feasibility of a sponsored data business case were identified.

The first parameter is the *value of free data*, as evaluated from the end-customer. This parameter is affected by three supporting factors;

i. The type of service and/or company brand. That is, how relevant this service is to the market and if it is a service for which the user desire mobile access anywhere and at anytime. If the service is not likely to be of interest to the consumer of the particular market, sponsoring the service is of little use.

ii. Volume of the content and cost of data. If the data volume of the service as well as the cost of data is low, then the customer is unlikely to see the value of a sponsored data service.

iii. The market where the business case will be implemented. This can be related to the other two supporting factors, such as the market value of a service as well as the market price of data.

The second parameter is identified as the *cost of data* from the content provider's perspective. This parameter is affected by three supporting factors;

i. The data volume of the content service. The amount of data of the particular service will affect how much it will cost, e.g. sponsoring video service will be more expensive than sponsoring music service.

ii. The market where the business case will be implemented. This aspect represent the cost of data in the particular market.

iii. Number of users expected to use the sponsored data service. Obviously, the number of customer that are expected to take use of the sponsored service affect how much the cost of data will be.

The third parameter identified is the *value of reaching new customers*, that is how beneficial is it for the content provider in monetary terms to reach a larger customer base. This parameter is affected by three supporting factors;

i. The type of service, e.g. if it is a free or a premium service.

ii. Potential ARPU of new customers.

iii. Number of users expected to use the sponsored data service. The more users, the higher revenue can be derived from the expected ARPU.

Ideally, as illustrated in Figure 29, a feasible sponsored business case will have high *value of free data* from the end-customer perspective as well as low cost of data for the content provider that is sponsoring. In addition, the content provider must see a value in reaching new customers in monetary terms, to compensate for the cost of sponsoring data.

An additional factor when considering the feasibility of sponsored data business case is the Net Neutrality principle. The Net Neutrality Principle has shown to be a threat to sponsored data deals, both from governmental pressure and social aspects.

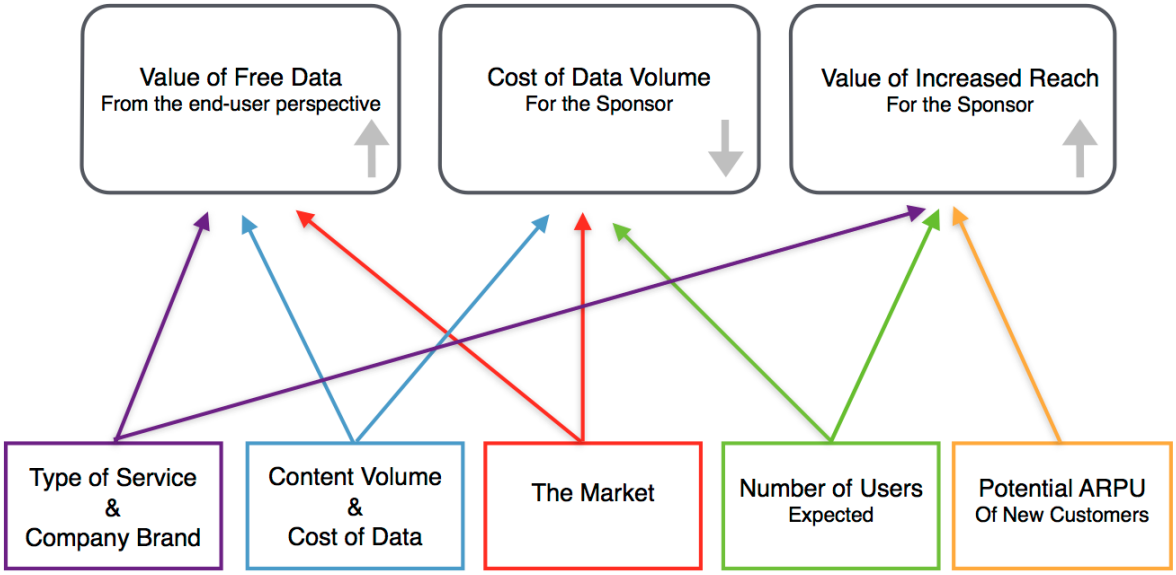

Figure 29: Parameters identified that affect the feasibility of a Sponsored Data business case.

To compare the three industries of this research, in relation to their feasibility for sponsored data, each content service is rated based on two of the aforementioned parameters; value of free data and cost of data volume. This is illustrated in Table 10 and Figure 30. The third parameter is not considered as it is very dependent on the particular content service and this analysis covers the industrial perspective. However the parameters that are considered go a long way in comparing the different business cases.

For the two parameters, the services were rated Low / Medium / High, in relation to how the generic attributes of the Nordic and African markets affect the corresponding supporting factors. Some services got rated based on two of the aforementioned ratings. An example is the value of free data for m-commerce for the African market. This was done since the supported marketing analysis for the African market was not at a very deep level.

Table 10: Comparison of the different content industries in relation to markets.

	M-Commerce		Music Streaming		Video Streaming	
	Nordic Market [1]	African Market [2]	Nordic Market [3]	African Market [4]	Nordic Market [5]	African Market [6]
Value of Free Data	Low	Medium / High	Medium	Medium	Medium / High	High
Cost of Data Volume	Low	Low	Medium	Medium	High	High

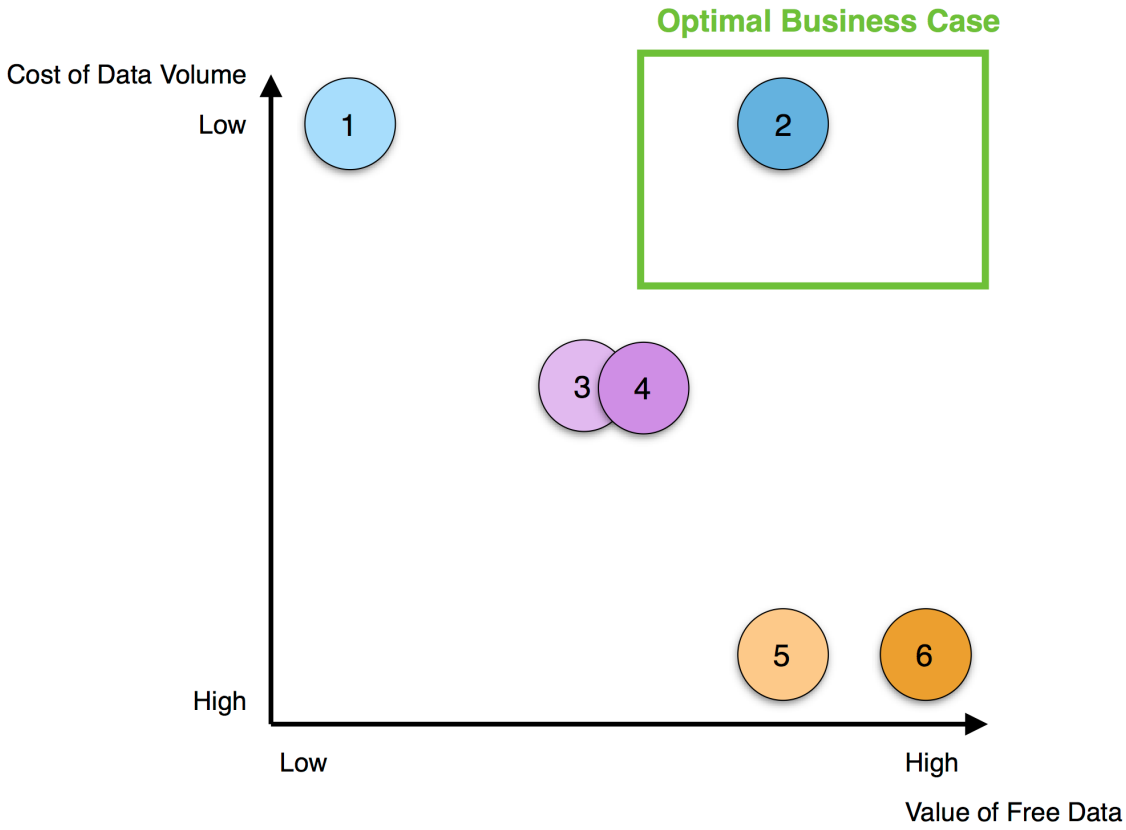

Figure 30: Comparison of the different content industries in relation to markets.

As can be seen in Figure 30, the optimal business case for sponsored data is (2) m-commerce in African markets. It is worth mentioning that none of the industry studies ended in the lover left corner, which represents the least favorable business case. However, to complete the feasibility analysis of sponsored data solutions for m-commerce in African markets would require the particular content service to be known as well as the threat of Net Neutrality in the considered market.

10. Conclusions

Based on the analysis of actors, value chains and business trends within the frame of this thesis, the aim has been fulfilled as how digital content is distributed over Internet for mobile end-consumption. In addition, trends and expectations have been evaluated to provide valuable insights of future business opportunities within the industry. The following chapter provides the main conclusions that can be derived from the analysis of this thesis.

The evolution that has occurred within the industry for the last two decades have erased the limits between the ICT and media industries. Today, everything is expected to be digital and digital content is distributed over the same infrastructure regardless of the type of content. However, by taking the three industry case studies into consideration, it is clear that there is no standard way of distributing digital content over Internet for mobile end-consumption.

It can be concluded that the evolution within the industry has brought a complex value chain for the distribution of digital content over Internet. Although, combining both theoretical and empirical findings within the scope of this thesis, results in a simplified model for digital distribution of content for mobile consumption. An End-User's consumption of digital content is facilitated by a mobile network subscription that the end-user has with a MNO, as well as by a relationship that the End-User has with a Content Provider. For a paid content service, the End User thus pays both the MNO and the Content Provider to get access to the content. The actual distribution of the digital content, from Content Provider to End-User, is facilitated by the MNOs that buy technical solutions from Network Element Providers. These four groups of actors are all identified as key groups of actors within the value chain for distribution of digital content over internet for mobile end-consumption.

The simplified model can also be applied to the business case of sponsored data and/or zero rated data solutions. In a sponsored data solution, the data is sponsored so that the end-user can access content without being charged for the data consumption. The sponsor could be any other actor that would gain from the End-User's consumption of the digital data, e.g a Content Provider that would gain from an increased uptake of end-user subscriptions or from increased advertising revenue due to increased reach. However, in a case where the MNO is the sponsor it is typically called zero-rating though these terms are sometimes confusingly used for describing the same thing. Furthermore, though sponsored and zero-rated solutions are debated constellations for the distribution of digital content, given the recent Net Neutrality debate, both theory and empirical findings have identified them as alternate solutions of how to distribute digital content over internet for mobile end-consumption.

A further analysis of interrelationships between the four key groups of actors show that the complex value chain for distribution of digital content for mobile end-consumption is characterized by changing roles amongst its actors, as summarized in Appendix II. New actors such as CDNs have taken on an important role. End-Users are demanding more sophisticated content services and higher QoS which affects the whole value chain. The relationship between the MNOs and Content Providers is of special interest. The sponsored data solution has changed how the traditional value chain looks like with the MNO becoming an intermediary between the Content Provider and the final customer. In addition, it has been shown how external factors such as regulatory bodies and social context can affect business relations a in relation to the Net Neutrality debate.

Furthermore, empirical findings have shown that m-commerce, music streaming and video streaming services are all industries on the rise for digital content consumption over mobile platforms, although they all exhibit different trends, consumption patterns and requirements for how digital content is distributed, not only from a technical point of view but also from a strategical point of view.

In a wider perspective, as both theory and empirics have shown, consumers are expecting services to give them instant access to the digital content they want, whenever they want it and wherever they are. Although, as content industries differ both in the type of content as well as in the type service, the implication of being mobile and available anywhere at anytime differs between content industry as well as the market in consideration.

Streaming services are becoming increasingly popular, especially for mobile end-consumption. However, popular content services such as music and video streaming are typically heavy in data volumes and therefore strain network capacity. As the the trend of increasing mobile consumption is expected to continue with consumers demanding additional functions and enhanced experiences, capacity challenges poses a real challenge for all players within the value chain. It will thereby not only be important to secure the capacity to meet future expectations for the growth of mobile consumption, but also to secure capacity for a higher QoS/QoE for content services.

In addition to similarities and differences between content service industries, empirics have also identified that market differences have a great affect on trends, as well as consumption patterns and requirements for distribution of digital content over internet for mobile end-consumption. Nordic markets and African markets exhibit different market prerequisites that have implications on how digital content can be distributed and consumed mobile. Technology wise, what access technology that is used in different markets varies, which in turn affects consumption patterns.

Thereto, there is a great variety in the applicability of business solutions as what is considered popular and valuable content differs between markets. These insights becomes important when considering viable business opportunities in relation to different markets.

Lastly, the analysis have illustrated how the feasibility for implementing a business case for sponsored data can be evaluated by several parameters and supporting factors. The first parameter is the value of free data, from the end-customer perspective. The second parameter is identified as the cost of data from the content provider's perspective. The third identified parameter is the value of reaching new customers, that is how beneficial it is for the content provider, in monetary terms, to reach a larger customer base. Furthermore, it has been concluded that ideally, a feasible sponsored business case will have high value of the free data and low cost of data for the content provider that is sponsoring. In addition, the content provider must see a value in reaching new customers in monetary terms, to compensate for the cost of sponsoring data. However, an additional factor when considering the feasibility of a business case for sponsored data is the Net Neutrality principle which has shown to be a threat to sponsored data deals, both when considering governmental and social aspects.

11. Further Research and Recommendations

Although the thesis aim has been fulfilled considering the scope of the research, extending the scope can provide potential future opportunities for further investigation as discussed in the following chapter. In addition, this chapter provides Recommendations for Stakeholders based on the discoveries made during the project.

11.1 Further Research

Firstly, technical aspects of mobile consumption was out of scope for this thesis. However, when evaluating business opportunities such as solutions for sponsored data, the technical aspects must be considered. Especially in relation to evaluation of costs for implementation and alternative functions within the solution.

Secondly, the research presented in this report has been limited to the consideration of three industries. In addition, the feasibility parameters for sponsored data have been evaluated and used for comparing these three industries. Although these three industries have been very interesting and relevant to look at, it would be of interest to look at other industries and/or select one industry, or actor, and go into greater depth while building upon the existing analysis. To perform such an analysis would also give more detailed information for the evaluation and comparison of business cases.

As an example, the third parameter to consider when evaluating business cases for sponsored data, i.e the *value of reaching new customers*, is very dependent on the specific actor, the type of service and the ARPU the service generates within a specific market. The research conducted within the scope of this thesis was not able to generate sufficient data to evaluate this parameter in full. It is therefore recommended to further research this parameter in relation to more/other content services and/or markets.

Thirdly, this research has been focused on exploratory and comparative case studies of the three highly relevant content industries of m-commerce, music streaming and video streaming. However, it would be interesting to take this research a step further for a deeper analysis of interesting findings within each industry, e.g. to further investigate the usage of CDNs by complementing the study with the perspective of CDNs, as this research highlighted their importance for Content Providers.

11.2 Recommendation for Stakeholders

This research show, that in addition to the expected continued growth in mobile consumption, the demand for more sophisticated content services is also expected to increase. All three interviewed Content Providers showed interest in learning more about the functions of mobile

networks, some even stressed that they saw closer relationships with Network Element Providers as key to be able to meet future demand. Furthermore, Ericsson's account manager stressed that, although the relationships are few, Ericsson is currently using their relationships with Content Providers for advertising purposes when in negotiations with Network Operators as end-to-end solutions are desirable. Based on the findings in this research, it is thus concluded that for Network Element providers to engage in a closer cooperation with Content Providers could be a win-win situation. It is therefore recommended that NEPs consider closer engagements with Content Providers, and vice versa.

Regarding sponsored data, it is debated if a sponsored data solution could be a huge revenue generator for the operators. As the value and the cost must be optimized for the sponsor, the data volumes can not be too large, though the volume still needs to be large enough for the solution to be valuable to the customers. However, this research show that the value chain is characterized by a complexity with strong correlations and codependency between actors. Furthermore, findings show that the relationship between Content Providers and End-Users is becoming stronger and that it is therefore important for MNOs to secure new revenue streams. Thus, it is recommended for stakeholders to consider solutions for sponsored data.

Furthermore, this thesis research provides a tool for initial evaluation of business viability for sponsored data solutions. The tool can be used to evaluate and compare business opportunities with regard to industry and market prerequisites. Amongst the investigated industries and markets it was shown that viable business cases for sponsored data could be found within the m-commerce industry in African markets. It is therefore recommended for actors within the sector to consider such solutions although it needs to be remembered that the viability is very case specific.

Regarding sponsored data and the Net Neutrality debate, there needs to be a clear understanding of how sponsored data and zero-rating solutions relate to the Net Neutrality principle, especially in sensitive markets. Furthermore, it is recommended for all stakeholders within the value chain to keep close attention to the Net Neutrality debate. Especially as this research has revealed that the implications of the Net Neutrality principle is not only dependent on what is actually included in the principle or whether or not it is adopted by regulatory bodies. Instead, it is concluded that the merely discussion of Net Neutrality may impose a deal breaker if social aspects are considered.

References

de Denesse, R. & Weidinger, E. (2014). *Analyst view: AT&T's Sponsored Data service may not be a viable marketing model for all content providers.* Retrieved on April 22, 2015 from: http://www.analysysmason.com/Research/Content/Comments/ATT_sponsored_data_ Jan2013 _RDMM0/

ARCEP. (2012). *Report to Parliament and the Government on net neutrality.* English version. Retrieved on April 30th, 2015 from: http://www.arcep.fr/uploads/tx_gspublication/rapport-parlement- net-neutrality-sept2012-ENG.pdf.

Arlandis, A. & Ciriani, S. (2010). How Firms Interact and Perform in the ICT Ecosystem? *Communications and Strategies: International Journal of Digital Economics, 79,* 121-14.

AT&T. (2014).*AT&T Introduces Sponsored Data for Mobile Data Subscribers and Businesses*. Retreived on May 5th, 2015 from: http://www.att.com/gen/press-room?pid=25183&cdvn=news&newsarticleid=37366&mapcode=

Basole, R. C. & Rouse,W. B. (2008). Complexity of Service Value Networks: Conceptualization and Empirical Investigation. *IBM Systems Journal, 47*, 53-70.

Becheno, S. (2014, November 26th). *Exclusive: Ericsson CEO Vestberg talks transformation, operators, smartphones, Facebook and SDN.* Retrieved on January 22st, 2015 from: http://telecoms.com/interview/exclusive-ericsson-ceo-vestberg-talks-transformation-operators-smartphones-facebook-and-sdn/

Blomqvist, P. & Hallin, A. (2015). *Method for engineering students, Degree projects using the 4-phase. Model.* Studentlitteratur AB, Lund, Sweden. ISBN 978-91-44-09555-4.

Bohlin, E. (2014). *The ICT Ecosystem: An Example of an Innovative T&S System with Four Case Studies* [Powerpoint slides]. Unpublished manuscript, TEK320, Chalmers University of Technology, Gothenburg, Sweden.

Booth, W. C., Colomb, G. G. & Williams, J. M. (1995). *The Craft of Research*. Bristol; Chicago, Ill: University of Chicago Press.

Bryman, A. & Bell, E. (2011). *Business Research Methods*. Oxford University Press, New York, ISBN 978-0-19-958340-9.

Casas, P., D'Alconzo, A., Fiadino, P., Bar, A., Finamore, A., & Zseby, T. (2014). *When YouTube does not work-analysis of QoE-relevant degradation in Google CDN traffic*. IEEE Transactions on Network and Service Management, 11(4), 441-457. doi:10.1109/TNSM.2014.2377691

Cisco. (2015). Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2014– 2019. Retrieved on February 27th, 2015 from: http://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/white_paper_c11-520862.pdf

Criteo. (2015). *State of Mobile Commerce, Q4, 2014.* Retrieved on March 27th, 2015 from: http://www.criteo.com/resources/mobile-commerce/

Crews, C. (2014). *President Obama's Net Neutrality Plan To Regulate Google And Internet Content Providers.* Retrieved on January, 21st from: http://www.forbes.com/sites/waynecrews/2014/11/10/president-obamas-net-neutrality-plan-to-regulate-google-and-internet-content-providers/

Eisenach, J. A. (2015). *The Economics of Zero-ratin*g. Retrieved on May 5th, 2015 from: http://www.nera.com/content/dam/nera/publications/2015/EconomicsofZeroRating.pdf

Ellos Group. (2015). Linkedin: *Ellos Group*. Retrieved on March 20, 2015 from: https://www.linkedin.com/company/ellos-group

Ericsson. (2014a). *History.* Retrieved on January 21st, 2015 from: http://www.ericsson.com/thecompany/company_facts/history

Ericsson. (2014b). *This is Ericsson*. Retrieved on January 21st, 2015 from: http://www.ericsson.com/thecompany/company_facts

Ericsson. (2014c). *Our Vision.* Retrieved on January 21st, 2015 from: http://www1.ericsson.com/ag/thecompany/company_facts/vision

Ericsson. (2014d). *LTE Explained*. [video] Retrieved on May 7th, 2015 from: https://www.youtube.com/watch?v=4YgGuK9cuSU&list=PLsn61Zheh8igGgRxaEVpC_vyjYB1mr9VB&index=45

Ericsson. (2014e) LTE *In-depth information.* Retrieved on February 27th, 2015 from: http://www.ericsson.com/article/lte-information_1295448658_c

Ericsson. (2014f). Internet goes Mobile: Country Report Nigeria. Retrieved on May 16th, 2015 from: http://www.ericsson.com/res/docs/2015/consumerlab/ericsson-consumerlab-internet-goes-mobile-nigeria.pdf

Ericsson. (2014g). Sub-Saharan Africa: Ericsson Mobility Report Appendix. Retrieved on May 16th, 2015 from: http://www.ericsson.com/res/docs/2014/emr-june2014-regional-appendices-ssa.pdf

Ericsson. (2015a). *A fond farewell to the analog age* [Video file] Retrieved on February 27th, 2015 from: http://www.ericsson.com/news/150507-fond-farewell-to-analog-age_244069646_c

Ericsson. (2015b). Ericsson Mobility Report: On the Pulse of the Networked Society. Retrieved on February 27th, 2015 from: http://www.ericsson.com/res/docs/2015/ericsson-mobility-report-feb-2015-interim.pdf

Ericsson, & Telia. (1998). *Att förstå telekommunikation: 2*. Stockholm, Lund, Studentlitteratur.

Fransman, M. (2007). Innovation in the New ICT Ecosystem. *Communications and Strategies: International Journal of Digital Economics, 68,* 89-110.

Fransman, M. (2008). *Innovation in the new ICT Ecosystem.* Retrieved on April 27th, 2015 from: http://www.slideshare.net/stephenmcclelland/martin-fransman-presentation-for-audiocast-link?from_action=save&from=fblanding

Fried, I. (2015, March 4th). AT&T Pushes Ahead on Toll-Free Data Plans in Wake of Net Neutrality. *ReCode*. Retrieved on May 5th from: http://recode.net/2015/03/04/att-pushes-ahead-on-toll-free-data-plans-in-wake-of-net-neutrality/

Gillet, J. (2014). GSMA Intelligence: How the US is embracing the 4G data revolution. Retrieved on May 2nd, 2015 from: https://gsmaintelligence.com/research/2014/01/how-the-us-is-embracing-the-4g-data-revolution/413/

Grigorik, I. (2014). Why is my CDN slow for Mobile Clients, Retrieved on April 22nd, 2015 from https://www.igvita.com/2014/03/26/why-is-my-cdn-slow-for-mobile-clients/

Hennink, M. Hutter, I & Bailey, A. (2011). *Qualitative Research Methods.* London: Sage Publications Ltd.

IFPI. (2015). *IFPI Digital Music Report.* Retrieved on May 6th, 2015 from: http://www.ifpi.org/downloads/Digital-Music-Report-2015.pdf

Junipier Research. (2013). Retail M-commerce - Market Sizing and Forecast. Published November 12th 2014. Retrieved on March 19th, 2015 from: http://www.juniperresearch.com/researchstore/commerce-money/mobile-commerce-markets/market-trends-competitive-landscape

Lawler R. (2012). *Netflix Rolls Out Its Own CDN: Open Connect*. [Online Article] Published June 4 2012. tech crunch.com Retrieved May 16th, 2015 from: http://techcrunch.com/2012/06/04/netflix-open-connect/

Manne G. (2014). *Understanding Net(flix) Neutrality*. Retrieved on February 15th, 2014 from: http://www.forbes.com

Merriam Webster. (2015). *Dictionary: E-commerce*. Retrieved on May 17th, 2015 from: http://www.merriam-webster.com/dictionary/e-commerce

Music streaming: Secret harmonies. (2014). Financial Times. Retrieved on May 16th, 2015 from: http://search.proquest.com/docview/1635062980?accountid=10041

Metsälä, E. & Salmelin, J. (2012) *Mobile Backhaul*. Hoboken, NJ USA: John Wiley & Sons. [Books24x7 version] Retrieved on May 26th, 2015 from: http://common.books24x7.com.proxy.lib.chalmers.se/toc.aspx?bookid=49683.

Netflix, 2015. *Open Connect Appliances.* [Online] Retrieved on May 16th, 2015 from: https://openconnect.itp.netflix.com/deliveryOptions/

Nooren, P. Leurdijk, A. van Eijk, N. (2012). *Net Neutrality and the Value Chain for Video*. Info, Vol. 14 Iss 6 pp. 45 - 58. doi:10.1108/14636691211271226

Norwegian Agency Nixes Zero-Rating Programs. (2014). *Telecommunications Reports, 80*(24), 31-32. Retrieved on 2015 from http://search.proquest.com/docview/1660088257?accountid=10041

Olsson, A. (2004). *Understanding Changing Telecommunications, Building a Successful Telecom Business*. Studentlitteratur, Lund, Sweden. ISBN 91-44-03072-X

Olsson, M. & Mulligan, C. (2013). EPC and 4G *Packet Networks: Driving the Mobile Broadband Revolution*, Second Edition. [Books24x7 version] Retrieved on May 26th, 2015 from: http://common.books24x7.com.proxy.lib.chalmers.se/toc.aspx?bookid=51031.

Osterwalder, A. & Pigneur, Y. (2009). *Business Model Generation*. Amsterdam.

Porter, M. E. (1985). *Competitive Advantage: Creating and Sustaining Superior Performance*, Free Press, New York.

Porter, M. E. (1986). Changing Patterns of International Competition. *California Management Review*. Volume XXVIII, Issue 2, Winter 1986. The Regents of the University of California.

Porter, M. E. (2008). The Five Competitive Forces that Shape Strategy. *Harvard Business Review*, 86(1), 78-93.

PostNord. (2015a). *E-barometern 2014 årsrapport*. Retrieved on March 31st, 2015 from: http://www.hui.se/statistik-rapporter/index-och-barometrar/e-barometern

PostNord. (2015b). Retrieved on March 31st, 2015 from: http://www.postnordlogistics.se/sv/branschlosningar/e-handel/Sidor/ellos.aspx

Pro Music. (2015). *Find Music Services.* Retrieved on May 9th, 2015 from: http://www.pro-music.org/legal-music-services.php

Sanjoy, P. (2011). *Digital Video Distribution in Broadband, Television, Mobile and Converged Networks : Trends, Challenges and Solutions*. [Books24x7 version] Retrieved on May28th 2015 from: http://common.books24x7.com.proxy.lib.chalmers.se/toc.aspx?bookid=40923

Spotify. (2015a). *Information.* Retrieved on March 17th, 2015 from: https://press.spotify.com/se/information/

Spotify. (2015b). *Spotify Explained.* Retrieved on May 9th, 2015 from: http://www.spotifyartists.com/spotify-explained/

Spotify. (2015c). *Spotify for Brand*s. Retrieved on May 9th, 2015 from: https://www.spotify.com/se/brands/

Spotify. (2015d). *Sponsored Session*. Retrieved on May 9th, 2015 from: https://www.spotify.com/se/brands/formats/sponsored-session/

Spotify. (2015e). *Spotify - Music for Everyone*. Retrieved on May 9th, 2015 from: http://www.spotify.com

Strategy Analytics. (2015). *Measuring the Success of Sponsored Data*. Published March 5th, 2015. Retrieved on May 5th, 2015 from: https://www.strategyanalytics.com/access-services/networks/mobile-operators/mobile-operators/reports/report-detail/measuring-the-success-of-sponsored-data#.VWjGrotly9B

Statista. (2015). *Facebook Average Revenue per User by Region*. Retrieved on May 12th, 2015 from: http://www.statista.com/statistics/251328/facebooks-average-revenue-per-user-by-region/

The White House. (2015). *Net Neutrality: President Obama's Plan for a Free and Open Internet.* Retrieved on May 3rd, 2015 from: https://www.whitehouse.gov/net-neutrality

Tidal. (2015). *Tidal.* Retrieved on May 9th from: www.tidal.com

Users Batter Telecom Firms over Zero Rating, Net Neutrality. (2015). *Communications Today,* Retrieved on May 2nd, 2015 from: http://search.proquest.com/docview/1673115790?accountid=10041

Vargo, S. L., & Lusch, R. F. (2004). The four service marketing myths: Remnants of a goods-based, manufacturing model. *Journal of Service Research: JSR, 6*(4), 324-335. Retrieved on February 4th from http://search.proquest.com/docview/210506959?accountid=10041

Vestberg, H. (2014). *Networked Society: A Strategy for the Future* [2014-10-06]. Retrieved on January 21st, 2015 from: http://www1.ericsson.com/ag/thecompany/company_facts/vision

Wu, T. (2003). *Network Neutrality, Broadband Discrimination*. Retrieved on February 15th, 2015 from http://www.jthtl.org/content/articles/V2I1/JTHTLv2i1_Wu.PDF

Yoo, C. S. (2010). Innovations in the Internet's Architecture that Challenge the Status Quo. *Journal of Telecommunications and High Technology Law,* Vol. 8, p. 79, 2010; U of Penn, Inst for Law & Econ Research Paper No. 09-32; U of Penn Law School, Public Law Research Paper No. 09-25. Retrieved March 19th, 2015 from: SSRN: http://ssrn.com/abstract=1472074

Yoo, C. S. (2014). *The Evolving Internet Architecture.* Unpublished manuscript. Christopher S. Yoo, University of Pennsylvania Law School, USA

Zeithaml, V. A., Parasuraman, A., & Berry, L. L. (1985). Problems and strategies in services marketing. *Journal of Marketing, 49*(2), 33. Retrieved on February 4th, 2015 from http://search.proquest.com/docview/227714946?accountid=10041

Unpublished References:

Account Manager. (March 10, 2015). Personal Interview at Ericsson, Stockholm, Sweden.

Bohrarper, P. & Gustavsson, N. (March 17, 2015). Personal interview at Spotify, Gothenburg, Sweden.

Ekelöf, D. & Porsaeus, T. (March 11, 2015) Personal interview at SVT Interactive, Stockholm, Sweden.

Ström, H. (March 25, 2015). Personal interview at Ellos Group, Borås, Sweden.

Ogwujiakwu, S. (May 6, 2015). Online interview at Ericsson, Nigeria through Lync.

Appendix I

Generic Interview Guide

All interviewees were given the following interview guide prior to each interview:

”The interview will be semistructured and thus conducted more as an open conversation where we are interested in your thoughts and stands in regards to value generation in the services you offer with the focus in mobile end-consumption.

The areas that will be covered are:

(1) Generic questions about the services you offer, what type of values your digital services give and for whom they are intended.

(2) Questions focused on your thoughts about digital distribution for mobile end-consumption in relation to what your services require, what your customers expect and what you request from Mobile Network Operators and Network Element Providers.

(3) Questions focused on your thoughts and expectations of current and future development of mobile consumption”

Generic question base - Content Providers

Please note that the following question base is not to be considered a questionnaire per say, but rather as base of what type of questions that was covered. The interviews were conducted as conversations where the interviewees were given space to speak freely and therefore all questions were not asked during all interviews though all subjects were covered.

“your”: [Company name]

1. General Questions

[Introduction]

- How would you describe your business model for online services?
- What are your thoughts on mobile consumption of your services?
- How important do you think mobile consumption of your services is?

1.1. Your Customers

- How would you describe your key targeted customer segments?
- How do you reach your customers? What channels and methods do you use?

1.2. Your Value Proposition

- Do you have different services and/or offers for different customer segments? If yes, what are the key differences between them?
- What do you think your customers perceive as value of your services (can you name some specific parameters?, What is your perception of how your customers value these parameters?)
  - Price?
  - Quality?
  - Reliability?
- Do you think the same parameters are applicable for mobile services? Why / Why not?
- Do you think the same parameters will be applicable in the future (next 5-10 years)? Why / Why not?

1.3. Your Key Activities and Resources

- What are the key things you do to generate value for your users?

1.4. Your Partners and Suppliers

- Which actors in your value chain do you consider to be your partners and/or suppliers?
- What kind of products and services do you need from your partners and/or suppliers?
- How would you describe the relationships you have with your partners and/or suppliers?

2. Distribution of Digital Content over Mobile Broadband

- How do you distribute your digital content to your users today, what actors and technologies are involved, (P2P / CDN)?
- How does the digital distribution look for your mobile end-users?
- How much data volume does your average consumer consume when using your services today? in total and over mobile broadband?
- What technical requirements does your services have in regards data volume, bit rate and latency?
- How sensitive are your services for delays in connectivity / connection loss? How can connection loss affect QoS and your customers' experiences?
- Given that mobile services are on the rise on the consumer side. How do you expect to handle larger data volumes in the future? Have you considered limiting usage of your

services for sustainability reasons? How large consumption would still be economically viable for you to maintain?

- What relations do you have to Mobile Network Operators?
- What relations do you have to Mobile Network Providers?
- If you could, how would you like to change functionality in your mobile distribution chain to meet your end-users' needs? Currently as well as in the future?
- What would you need from your partners and suppliers to make those changes?

2.1. Sponsored Data Distribution

[Brief explanation]

- What kind of values could you see from your perspective if you were to sponsor your end-users mobile data consumption?
- How could your business be improved by sponsoring your end-users?
- What kind of values for your end-users do you see in sponsoring?
- What content could you consider to sponsor?
- What type of costs would you associate with data sponsoring?
- What do you see as barriers to sponsoring data? (Do you have any takes on how to overcome these barriers?)

2.2. Net Neutrality

[Brief explanation]

- What are your stand on Net Neutrality? Why?

2.3. Future Expectations

- Where do you expect the market will turn for the next 5-10 years?
- Where do you see your company in 5-10 years?
- What do you expect you will have to do to meet the future demand for mobile services?

Appendix II

	Actors Involved	Dimensions from Theoretical Framework		Dimensions from Empirical Study

Relationship 1	Network Element Providers & Network Operators	'Old'	• Involves close cooperation and mutual dependance, where one could not survive without the other.
			• Incentives for innovation.
				• Technological sophistication growing from the consumer market.
				• Value perception for the MNO is changing.
				  • Price vs technology.
				  • Increased requirement for QoS.
				• CDNs: new, more specialized NEP entrants.
				  • Important role for distribution efficiency.
				• These CDNs are competitors to the traditional companies such as Ericsson.

Relationship 2	Network Operators & Content Providers	'New'	• Complex relationship. • Content Providers pay for using the service they directly consume but not what their customers consume. • Net Neutrality Principle.	• Today sponsored data solution can be found where the Content Providers sponsor the customers' data consumption. • Which actor pays is not so clear. • The MNO becomes an intermediary between the Content Provider and Final Customer. See **Relationship 3**. • Net Neutrality principle: threat or an opportunity? • Has Netflix gone around the issue? • Social pressure can kill business deals.

	Actors Involved	Dimensions from Theoretical Framework		Dimensions from Empirical Study

Relationship 3	Content Providers & Final Consumers	'New'	• Users' involvement adds value to the site.
			• The more users the more value.
			• A challenge to gain users due to high competition.
			• Final Consumers might pay directly or indirectly for content.
			  • YouTube: Clicks on a video is used for selling advertisements.
				• Indirect payment is evidential in Spotify's Free subscription.
				  • Additional actor, the advertiser, enters the picture, and finances the Final Consumer's consumption (although not the data).
				• The MNOs can become and intermediary in this relationship.
				• Who will be blamed for poor QoE (Content Provider or MNO)?
				• Customers' standards are rising.

Relationship 4	Network Element Providers & Final Consumers	'Old'	• Hand-set manufacturer and Final Consumer taken as an example.	• Challenge to analyze when looking actors such as Ericsson or CDNs. • Ericsson has an end-to-end perspective • Final consumers are not aware of the NEPs' role
Relationship 5	Network Element Providers & Content Providers	'New'	• The NEPs provide a platform for innovation and production. • Content Providers would not be able to offer their content to their customers without the NEPs.	• Ericsson works with a few Content Providers to improve their services and make sure they work. • Supports **Relationship 1**. • The Content Providers interviewed showed interest in more cooperation. • CDNs are becoming an important actor, both for technical reasons and strategic reasons.
Relationship 6	Network Operators & Final Consumers	'Old'	• Traditional telecom symbiotic relationship.	• MNOs get a new role as an intermediary for Content Providers. See **Relationship 3**. • Pressure for the MNO to deliver high QoS. • MNOs brand is important.