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Net Neutrality – A perspective of European telecommunication entities into the debate

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"NET NEUTRALITY - A PERSPECTIVE OF EUROPEAN TELECOMMUNICATION ENTITIES INTO THE DEBATE".

Dissertação apresentado(a) ao Curso de Mestrado Profissional Executivo em Gestão Empresarial do(a) Escola Brasileira de Administração Pública e de Empresas para obtenção do grau de Mestre(a) em Administração.

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I dedicate this work partially to my mother Andrea de Mattos Motta, for giving me strengths in all the stressful times and reminding me that life is only a breath away. However this research can be used for further research at Detecon Consulting GmbH.

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Abbreviations

Body of European Regulators for Electronic Communications (BEREC)

business to business market (B2B)

business to costumer market (B2C)

compact disc (CD

compound annual growth rate (CAGR)

content provider (CP)

content providers (CPs)

electronic sell-through (EST) services.

European Union (EU 28)

Federal Communication Commission (FCC)

International Telecommunication Union (ITU)

Internet Exchange Points (IXPs)

Internet of Things (IoT)

Internet Protocol (IP)

Internet Service Provider (ISP)

Internet Service Providers (ISPs)

Machine-to-Machine (M2M)

Megabyte (MB)

Mobile virtual network operator (MVNO)

mobility to a Voice over IP networks (mVoIP)

National Regulatory Authorities (NRA)

Net Neutrality (NN)

net neutrality (NN)

Net Neutrality Debate (NND)

Network Function Virtualization (NFV)

Over- The-Top (OTT)

Pay-per-View (TVoD).

Platform as a Service (PaaS)

Quality of Service (QoS)

short message system (SMS)

Software as a Service (SaaS)

The European Mediterranean Regulators Group (EMERG)

The European Telecommunications Standards Institute (ETSI)

transactional (TVOD)

United States of America (USA)

Video Streaming (SVoD)

Video-on-demand (VoD)

Video Download (EST)

Abstract

Purpose - The purpose of the research was to investigate possible innovation strategies, which may improve and strengthen the position of big telcos corporations in the European net Neutrality Debate (NND).

Methodology – The thesis uses the expert interviews as the only quantitative part. Hereby the research used not a academic interview analysis. Furthermore, a more open approach was used. Combined with expert and industry specific reports, the research answered the research question.

Findings - Revenue stagnation, inefficient network management practices or unable to generate new business opportunities, are creating high-pressure for the European telecom industry. New players are competing and forcing the telecommunication industry to reinvent itself. This particular overall pressure can be reduced by an application of a mixed innovation strategy. Hereby the main assumption is that the big telco corporation reinvest the new revenues, in order to improve current network infrastructure.

Limitation - Although EU market can be considered as one whole market, the analysis showed only a general approach. Furthermore by only interviewing a German top tier European telco corporation (Deutsche Telekom), which might follow different strategies and facing other problems than other European telcos. The thesis has to less data to give a fundamental and precise recommandation, due lack of data varity (other top tier telco are missing). There are big differences among national markets and among the top tier European telco corporations. Moreover the biggest limitation lies on the how the quantitative part of the research was done. The interviews should have used a clear structure and should have been recorded. As illustrates, the finding of the interview are in some ways disperse. Evidence for this limitation is that the thesis found interesting things but not connected to the research question, this is partially caused by the lack of interview structure. Another big limitation of the research is that the analysis of the telecommunication industry (in order to find out which kind of problems the industry are facing) did not follow any industry analysis scheme or framework. Consequently there are more problems that the industry is facing as indentfied.

Practical implication- By focusing on the big european telco perspective the thesis provides insight into the current situation and problems of the industry. The research creates awareness about the current obstacles and reinforce the imporatnces of the NND.

Originality - The study focuses onthe situation of the big european telco corporatioins and how they can use innovation sztartegies to overcome some current problems and at the same

way strengthen their possition on the European NND.

Keywords - Net Neutrality, innovation strategies, telco technology

Category - Master thesis

Resumo

Objetivo - O objetivo da pesquisa foi investigar possíveis estratégias de inovação, que podem melhorar e fortalecer a posição das grandes empresas de telecomunicações no Debate de Neutralidade da Rede Europeia (NND).

Metodologia - A tese utiliza as entrevistas com especialistas como a única parte quantitativa. A pesquisa não utilizou uma análise de entrevista acadêmica. Além disso, foi utilizada uma abordagem mais aberta. Combinada com relatórios específicos de especialistas e do setor, a pesquisa respondeu à pergunta de pesquisa.

Resultados - A estagnação da receita, práticas ineficientes de gerenciamento de rede ou incapazes de gerar novas oportunidades de negócios estão criando alta pressão para o setor de telecomunicações europeu. Novos participantes estão competindo e forçando o setor de telecomunicações a se reinventar. Essa pressão geral específica pode ser reduzida pela aplicação de uma estratégia de inovação mista. A principal suposição é que as grandes empresas de telecomunicações reinvestem as novas receitas, a fim de melhorar a infraestrutura de rede atual.

Limitaçãoes - Embora o mercado da UE possa ser considerado um mercado inteiro, a análise mostrou apenas uma abordagem geral. Além disso, entrevistando apenas uma empresa européia de telecomunicações de nível superior alemã (Deutsche Telekom), que pode seguir estratégias diferentes e enfrentar outros problemas que outras empresas de telecomunicações europeias. A tese precisa de menos dados para fornecer uma recomendação fundamental e precisa, devido à falta de variedade de dados (outras empresas de primeira linha estão ausentes). Existem grandes diferenças entre os mercados nacionais e as principais empresas europeias de telecomunicações. Além disso, a maior limitação está no modo como a parte quantitativa da pesquisa foi realizada. As entrevistas deveriam ter uma estrutura clara e ter sido gravadas. Como ilustra, as conclusões da entrevista são, de certa forma, dispersas. A evidência para essa limitação é que a tese encontrou coisas interessantes, mas não ligadas à

questão da pesquisa, isso é parcialmente causado pela falta de estrutura da entrevista. Outra grande limitação da pesquisa é que a análise do setor de telecomunicações (para descobrir que tipo de problemas o setor está enfrentando) não seguiu nenhum esquema ou estrutura de análise do setor. Consequentemente, há mais problemas que a indústria está enfrentando como identificada.

Aplicabilidade do trabalho - Ao focar na grande perspectiva das telecomunicações europeias, a tese fornece uma visão da situação e dos problemas atuais da indústria. A pesquisa cria consciência sobre os obstáculos atuais e reforça as importâncias da NND.

Originalidade - A teses enfoca a situação das grandes empresas europeias de telecomunicações e como elas podem usar as estratégias de inovação para superar alguns problemas atuais e, ao mesmo tempo, fortalecer sua participação na NND europeia.

Palavras-chave - Net Neutrality , estratégias de inovação, tecnologia de telecomunicações

Categoria - Dissertação de Mestrado

1. Introduction

The Internet is increasingly important to modern society (Wu, 2003). It has become a ubiquitous platform for information, communication and entertainment. Its constantly growth over the years is one evidence for it. The global percentage of households with Internet access increased from 14% in 2002 to 57,8% in 2018 (Statista, 2019). Not only did the Internet grew dramatically over the years, furthermore it has drastically reshaped the way we communicate, behave, interact with each other and do business. It creates an innovative space of countless wide ranged business and personal opportunities (Mossberger, McNeal, & Tolbert, 2007). However big telco corporations haven't used that space to generate an innovation flow. Furthermore the industry is facing some serious problems. With this rapid development and constantly growth of data traffic, the role of network infrastructure owners has shifted to an essential gatekeeper position inside the information society (Mossberger, McNeal, & Tolbert, 2007) & (Krämer , Wiewiorra, , & Weinhardt , Net neutrality: A progress report, 2012). Those network infrastructure owners are mostly owned and monetized by the Internet Service Providers (ISPs), which mostly belong legally to big telecommunication corporations. Most the networks are controlled by those entities. This fact theoretically reinforces the strong position and power of the telcos (Waterman & Choi , 2011). However some governments, especially the European Union (EU 28), the private sector and individuals are concerned that the ISPs could abuse their strong position for maximizing their profits and to reshape and also redefine the open Internet and therefore net neutrality (NN) rules in place to prevent this kind of behavior. Especially theb European Regulators main objective is to prevent such a behavior of the telcos (European Commission , 2016). The discussion how data should be monetized and managed in the future and today, in order to ensure the best service to the end-consumer, can be labeled as a discussion on the future use of the Internet (Mossberger, McNeal, & Tolbert, 2007). This particular discussion on the future of the Internet is broadly known as the net neutrality (NND).

At the same time the telecommunication industry is facing a huge change, like other traditional industries, and is trying to convince society and regulators for change. However this change might not come from the regulator, furthermore big telco corporations should try to solve their problems on their own and to reinforce their position. One solution could be throughout innovation strategies, which might solve some current problems and might reinforce the position in the NND for the big telco corporations.

1.1 Research Question and Objective

The research question reads as follow:

Which innovation strategies one top tier big European telco corporation could use to overcome some of the current problems and therefore reinforce their position in the European NND?

Besides the illustration of some innovation strategic approaches, the thesis wants to find out if some current problems of the European telco industry could be solved by innovation itself and at the same time reinforce the position in the NND. Consequently the thesis should provide following information in order to answer the research question fully:

- Get an overview of some innovation concepts and illustrate them.
- What influences innovation
- Identify and illustrate some current problems
- Next steep, which kind of problems are connected to innovation and to the NND.
- Find out which trends or developments in the telecommunication industry could strengthen their position on the debate in the future
- Find some innovations, which can solve some problems and reinforce the position in the debate

However the main goal to find out which innovation strategies / concepts can be used to overcome some current problem and therefore additionally reinforce their position in the European NND.

1.2 Scope of Research

This particular thesis gives a comprehensive perspective of the eurpopean telecommunication sector. The theoretical framework, meaning the innovation strategies includes in this research only concepts of:

- *Skunk works, intrapreneurship and innovation labs*
- *Ambidextrous organization*
- *Three horizons of innovation*
- Lean start up method

In the main part of the thesis, the European telecommunication sector and the available innovations are been discussed and presented, here mainly industry and experts reports are used for the analysis part in chapter 5. Those reports are used widely in the telecommunication industry and were provided by ovum, Analysys Mason, Detecon

International GmbH, Detecon Consulting,TeleGeography and IDATE research. However it has to be mentioned that the thesis does distinguish between Internet Service Provider (ISP) and telcos. Hereby the thesis is using both terms, meaning the same entity.

1.3 Research Method Used and Structure

The thesis uses as main method, the expert interviews with different stakeholders. Hereby the interviews are seen as additional source of information and used to deepen the understanding and provide more practical relevance. The literature review will include the some written academic publications, articles and books concerning net neutrality but mainly strategic innovation concepts. The industry reports are used to draw a realistic situation of the telecommunication industry. Those reports are provided by Detecon International GmbH. Hereby it has to be mention that Detecon also helped to schedule and to organize the right interview partners. Regarding the structure of the thesis, in the first step relevant academic papers and books built the basic theoretical framework for the research. The following chapter summarizes my findings during the interviews. In next chapter, which is the biggest part, the current and future developments, issues and opportunities of the European telecommunication sector is been illustrated. Afterwards the main results and findings are been presented and been discussed.

1.4 Relevance

First, and most important, is the academic relevance, since the dissertation will create academic value by generating new knowledge that will be available to the public and universities. Currently, there are not that much studies available regarding this particular topic. Therefore, a knowledge gap is existing that would be closed by the dissertation. The second aspect enacts as hybrid of the two dimensions. The dissertation could be used as a teaching material for lectures at universities that cover Digital Plattforms or even for specific law courses. Hereby, it acts as a teaching note for the professor. Therefore, the dissertation teaches students new academic knowledge by simultaneously allowing them to put the knowledge in practice. Lastly, the dissertation will be from personal relevance. I am highly interested in the new development of the digital business environment. Thus, the topic will allow me to deepen my personal knowledge and to gather first practical experiences that can be of high value for my future career.

2. Methodology

The following chapter defines the method of research used to collect information related to the research topic. Furthermore, this chapter also describes the basis of the research and details how several research tools are used. The methodology of research portrays a well-defined structure and contributes to gathering the information for the following research.

2.1 Data Collection

The goal is to have for various stakeholders, one particular interview partner. In this particular thesis the interviews are conducted face-to-face, via the phone or Skype. Additionally statements of stakeholders will be included in the interview studies. This thesis uses a more open format to gain more in-depth knowledge. The interviews are not recorded, furthermore no academic interview analysis is used. In these partially unstructured interviews conversation is free with a couple of primary research questions, which will change from interview to another.

2.2 Data Treatment

For the qualitative part of the dissertation, the data will be analyzed by using content analysis. First, the insights of the interviews are organized and collected. Herby the interviews, should give an indication, which top have been relevant for the analysis.

3. The Net Neutrality Debate

3.1 Net Neutrality Debate Example – The dispute of Comcast and Netflix

A good example of the recent year would be the dispute and deal between Netflix and Comcast. Netflix is a provider of on-demand Internet streaming media with headquarters in California. "Open Connect " a video CDN owned by Netflix enables ISPs to receive Netflix content at no cost. In letters to their shareholders Netflix supports strong Net Neutrality regulation. The company emphasizes the importance of addressing "interconnection points" in the regulatory framework. Comcast is the largest cable network operator in the United States of America and a large media conglomerate. As of 2014, Comcast has 25,8% market share in the mature US fixed broadband market (78% household penetration). With around 68 billion $ revenue in 2014 Comcast is the biggest media company worldwide. The group includes TV-channels and stations as well as production studioIn 2014 Netflix accounted for over 30% of peak Internet traffic in the United States and provided the fourth largest Content Delivery Network (CDN), in terms of traffic shares in the US (Detecon International GmbH & Deutsche Telekom Group, 2015). At first Netflix used Akamai's servers as its primary content delivery firm, but due to the accommodate growth in its streaming service Netflix moved away and began streaming data through another content delivery firms (Mainly through Cogent, others were Limelight, Level3) (Greenstein , Peitz , & Valletti , 2016).

Neflix had a **transit agreement** with Cogent, which then delivered the traffic to Comcast via a **peering** arrangement.

Comcast as the last-mile provider then send the requested traffic to the end customer. Cogent had a peering agreement with Comcast implying no money exchanged hands, instead Netflix paid Cogent for traffic delivery and Comcast was paid by the end customer. Due to significant increase in traffic (because Netflix increased in popularity) and its asymmetrical flow from Cogent to Comcast's retail customers, Comcast refused to continue peering with Cogent. Therefore Netflix built its own CDN to bypass the issue. Those used servers were collocated in the last-mile ISP's network, which handle own traffic and offload from the ISPs.

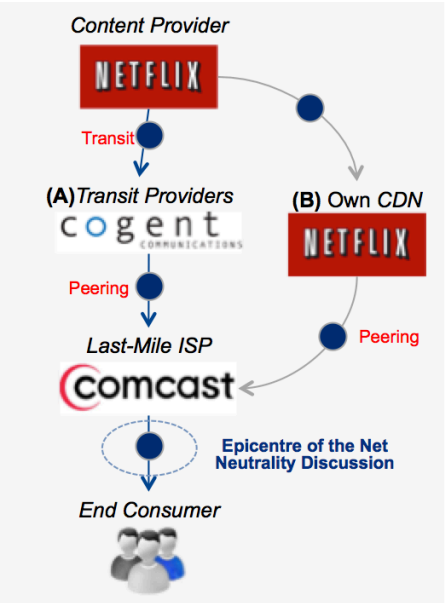

Figure 1: Netflix content delivery structure

Source: Training report 2015 "Wholesale and Regulation- Net Neutrality" of Detecon International GmbH in corporation with the Deutsche Telekom Group

However the physical management of Netflix's hardware was still the responsibility of the ISP (Detecon International GmbH & Deutsche Telekom Group, 2015). Herby note the figure 5, where the Netflix content delivery structure is illustrated.

Due to the continuously increasing traffic coming from Netflix's streaming services Comcast started to refuse to pursue the peering agreements with the IP transit operators that carried Netflix traffic. In additionally Comcast refused to link those Netflix servers and required same transit agreement as it requested from Cogent. At the same time Netflix streaming speed dropped, but it was unclear whether this was due to Comcast or other reasons (Detecon International GmbH & Deutsche Telekom Group, 2015). Nonetheless in February 2014, Netflix and Comcast came to a deal. The terms are not publically disclosed, nonetheless Netflix paid Comcast to co-locate servers inside Comcast's network (Greenstein , Peitz , & Valletti , 2016). Netflix agreed to a transit deal with Comcast, but argued NN issues as Comcast is 'discriminating' Netflix traffic by slowing it down (Detecon International GmbH & Deutsche Telekom Group, 2015).

Comcast was the first large terminating access network to implement a peering strategy that resulted in direct payments from Netflix. As a result Netflix also agreed to pay Time Warner Cable, AT&T and Verizon for interconnection. Netflix aggressively pushed the argument that such interconnection fees are discriminatory practice due to the market power of the gatekeepers and their incentives to abuse it (Detecon International GmbH & Deutsche Telekom Group, 2015).

Those agreements over the interconnection fees were all done before the Federal Communication Commission (FCC) 's Open Internet Order. This Open Internet Order was released by the FFC in the United States of America, in order to enact strong, sustainable rules grounded in multiple sources of legal authority to protect the Open Internet and ensure that Americans reap the economic, social, and civic benefits of an Open Internet today and into the future (Federal Comunication Commisson, 2015).
The new FCC rules also cover the exchange of Internet traffic through the service providers. Unjust and unreasonable practices in that market are prohibited. Companies that feel unfairly treated in the middle mile can file a complaint. (Federal Comunication Commisson, 2015). Netflix stated that these measures would have been used had they been in place during the

negotiations but also implies that it is not going back and have those deals reversed. It is likely that Netflix is making use of a complaint in the next negotiations

4. Theoretical Framework

Strategy is the track of an organization over the long-term. In a more precise way, it can be defined as a plan of what the company wants to achieve and how it is planning to realize it with its resources within a challenging environment. (Johnson & Scholes , 2002). The theoretical framework will present a factor (environment), which influence strongly the strategy, followed by types of innovations and innovation strategies. At the end a broad overview of the net neutrality debate (NND) will be illustrated.

4.1 Innovations and Environment

Strategies of companies are most of the time not fixed, furthermore constantly under a big influence of the given environment, where the company have their footprint. Especially, when it comes to innovation. Consequently not all strategies are suitable for all environments (D'Aveni, 1997).

A good example here would be the digital environment, where the society is witnessing a lot of fast changes, new trends and norms of behavior emerged. As for instance the communication market, which is a subsection of this market, has seen a complete change of the environment. For instance as of 2017 more than 1.6 billion photos and messages per day were send by the Internet protocol (IP) messenger application WhatsApp (Statista , 2018). Some players' won by providing new types of service (as WhatsApp or) to customers and other players (as the big telecommunication companies) were forced to follow. Environment like this, with constant turbulences can be explained as hypercompetitive environment, where sustainable advantages are rapidly created and eroded (D'Aveni, 1997). This particular concept was introduced by Richard D`Aveni in his work "Walking up to the New Era of Hypercompetition" in 1997. He describes environment as follow: "Industries have changed from slow moving, stable oligopolies to environments, characterized by intense and rapid competitive moves, in which competitors strike quickly with unexpected, unconventional means of competing. They now confront "hypercompetitors" who continuously generate new competitive advantages that destroy, make obsolete, or neutralize the industry leader's advantages, leaving the industry in disequilibrium and disarray." (D'Aveni, 1997, S. 183).

However he also reinforces his statement with the fact that every leader company could become a follower in a few years and on the contrary every challenger has a chance to

become a leader (D`Aveni, 1990). According to Richard D`Aveni there are four different types of hypercompetitive environments that require different strategies for success (D`Aveni, 1990) & (D'Aveni, 1997):

- **Equilibrium:** The given environment is characterized by slight or no competence-destroying turbulence. Meaning the incumbent controls the environment by creating barriers of market entry .
- **Fluctuating Equilibrium:** The given environment is characterized by rapid turbulence based on frequent competence-enhancing disruptions. Meanwhile Incumbents with core competences sustain their leadership by enhancing old products/services.
- **Punctuated Equilibrium**: This particular environment is characterized by brief dynamic periods of innovations, which are followed by longer periods of convergence.
- **Disequilibrium**: This environment is characterized by constant innovations, which are replacing the old products/services.

Align with Richard D`Aveni's work, hypercompetitive environments are mainly driven by four forces (D'Aveni, 1997):

- Consumers dictated, meaning most markets are a buyer`s market.
- Technology, which caused paradigm shifts affecting almost every industry.
- Falling entry barriers around nations and industries.
- Usage of deep pockets. Meaning that nowadays companies are competing also against alliances. (Baghai, Coley, & White, 2000)

4.2 Types of Innovations

Firstly, there are many different definitions of innovations in the academic world in place. On one side innovation is seen as a means of changing a given organization, either as a response to changes in the external environment or as a pre action to influence a given environment (Damanpour , 1996). Additionally Damanpour in his paper "Organizational complexity and innovation: developing and testing multiple contingency models" innovation broadly to include a range of types, such as the development of new products or service, new process technology, new organization structure or administrative (Damanpour , 1996). On the other side other variations in the definition of innovation arise from different disciplinary perspectives. For instance in discipline of knowledge management, innovation is totally different defined. Hereby the knowledge its self is been vital for the definition of innovation.

As of Plessis notes: "Innovation as the creation of new knowledge and ideas to facilitate new business outcomes, aimed at improving internal business processes and structures and to create market driven products and services." (Plessis , 2007, S. 21).

According to Clayton M. Christensen, there are two types of innovations, which are either sustaining or disruptive innovations. Sustaining innovations are the ones that only improve the performance of already established products, services or processes. On the contrary disruptive innovations offer completely new products with new features. Consequently those innovations have the power to enable new markets to emerge (Christensen, The Innovator`s Dilemma , 2000) & (Christensen , Exploring the Limits of the Technology S-Curve. , 1992).

O'Reilly and Tushman in their work "The ambidextrous organization" add that companies should aim to exploit and pursue sustaining innovations in their existing products, to operate more efficiently and deliver greater value to the customers. At the same time, companies should change fundamentally components or elements of their current business, in order to allow sustaining innovations to arise (O`Reilly & Tushman , 2004).

However the creation of completely new products, services and processes are the ones that give companies the significant first mover advantage (Christensen, The Innovator`s Dilemma , 2000) & (Christensen , Exploring the Limits of the Technology S-Curve. , 1992).

4.3 Innovation Strategies in theory

In the following section innovation strategy models will be illustrated and discussed. All of those models, where used already by various companies.

4.3.1 Skunk works, intrapreneurship and innovation labs

Skunk works

The main idea behind is that a small group of the best and also the brightest researchers are secretly isolated from the influence of the rest of a given company. The main differences between a skunk works project and a product development project is that, in skunk works projects a small group, which have to accomplish one single goal without any corporate bureaucracy. Therefore the organization of a skunk works projects are more flat organized and much more goal oriented. Not only it gives the possibility to the researches necessary autonomy and independency. Furthermore it gave the researchers the freedom to escape other departments of the business and allow them to be disruptive (Owens & Fernandez, 2014).

As illustrated above skunk works model claims to bring several advantages, but in Owens`s and Fernandez`s opinion "it is insufficient to ensure corporate survival during unpredictable market shifts and rapidly mounting competition. Additionally, because they often threat existing lines of business, they are generally kept secret and this makes it hard for them to cooperate with the company on any matter." (Owens & Fernandez, 2014, S. 40).

Intrapreneurship

Alternatively to skunk works is intrapreneurship, which is far more open approach. All projects of intrapreneurship are widely publicized and not kept secret in the company (Owens & Fernandez, 2014). "Intrapreneurs" were first defined by Gifford Pinchot in 1984 as "Dreamers who do. Those who take hands-on responsibility or creating innovation of any kind, within a business" (Frauenhofer Venture, Telekom, Deloitte Digital Ventures, S. 5). That being said, intrapreneurship relates to individuals (but also could refer to a certain group in the organization), who innovates but not for a specific process or department. Furthermore it tries to improve and advance the entire company as whole. Meaning it is stretching and improving current services, products and technologies, consequently increasing diversification, developing new organizational capabilities and fostering disruption at the same time. This particular innovation strategy model is mostly embedded in the corporate entrepreneurship strategy (Owens & Fernandez, 2014) & (Frauenhofer Venture, Telekom, Deloitte Digital Ventures).

In general all employees of an organization have ideas to improve processes, but usually they don't know what to do with them. This concept is enabling exactly that. Not only is it boosting the employee's morale. Furthermore it is promoting the company`s innovative spirit. Therefore companies have the capacity to support intrapreneurship from the bottom up to transform the ideas into products and services that have value in company`s external and internal environment. The normal process would be like; coming up with the idea, drawing up the business plan, pitching it to an existing department, building the product and at the end being absorbed by the department (Desouza , 2011) & (Owens & Fernandez, 2014).

Similarly to skunkworks, intrapreneurship isn`t as successful as it is supposed to be in practice. Most companies and their employees hold on to existing corporate structures, employees have their know-how and are involved in department itself, which makes it hard for them to let go and think out of the box. Therefore the results are rather sustaining than disruptive innovation (Owens & Fernandez, 2014).

Innovation labs

Another innovation concept is the innovation lab. In this method a number of paid intrapreneurs are gathered together in an easy-going, entrepreneurial, start-up-like office atmosphere that is supposed to encourage workers to come up with new innovations. The ultimate goal is to incorporate new solutions into existing or new products, services or processes, which will be useful and profitable for both sides, users and the companies that create them. Normally each bigger company has its own innovation lab, which offers a unique insight into the company's research culture and strategic vision. Most of the time, big companies aren`t commercializing any of its inventions created in the innovation lab. The reason behind it, is that it is really difficult to seek funding inside and outside of the organization. In fact, the lack of financial autonomy and financial structures are in most cases the factors causing the missing success. Therefore it can be generally concluded, that the efforts of innovation labs of big corporations rarely accomplish anything of a long-term significance. However innovation labs of search or social media corporations, like Google, Facebook or Twitter have made quite a success. The reason is that those labs are organized differently and fulfill another mission, than representative duties. Particular those labs are more interactive with potential consumers. The new products, services, or tools are open to the public to test, interact with and offers therefore valuable feedback for the developers. Therefore those companies are obtain valued information, if idea could work or could not work (Owens & Fernandez, 2014).

4.3.2 Ambidextrous Organization

The concept of "Ambidextrous organization" by O'Reilly and Tushman states following: In case if the company pursue to create disruptive innovation, it needs to focus not only on innovation itself. Furthermore it should not forget the core business model and their core competencies. This concept of O'Reilly and Tushman requires executives to explore new opportunities while they are exploiting existing capabilities. Particular this harmonization between executing and exploring appears to be very hard for most of the organizations. Not only because of the lack of flexibility, furthermore because of given cross-functional team structure itself. In order to exploit and explore successfully at the same time, a separation of the new exploratory units from traditional exploitative ones has to occur. Therefore it allows the different processes, structures and cultures inside of the organization. However both units are connected via the senior executive level. At a theoretical level, ambidextrous organizations would outperform most other organizational types. The reason is for it is that is allows cross- fertilization among the departments and at the same time prevents cross-contamination among the business units. Given condition of a tight and strict coordination from the management side, this would enable the new exploratory units to get the necessary resources from the traditional units (such as financial resources, talent, expertise, customers etc.). However only the separation ensures that the new created units would not be under no influence of the established company`s culture, structures or processes (O`Reilly & Tushman , 2004). As illustrated in figure 1 "Structure of Ambidextrous Organizations & Cross-functional Teams at a glace". One of the biggest requirements for the successful implementation of ambidextrous organization is the need of ambidextrous senior teams and managers that have the ability to understand completely and to act sensitive towards the different business (existing and emerging). Additionally the vision of the company has to be really clear and compelling, in order facilitate the implementation (O`Reilly & Tushman , 2004).

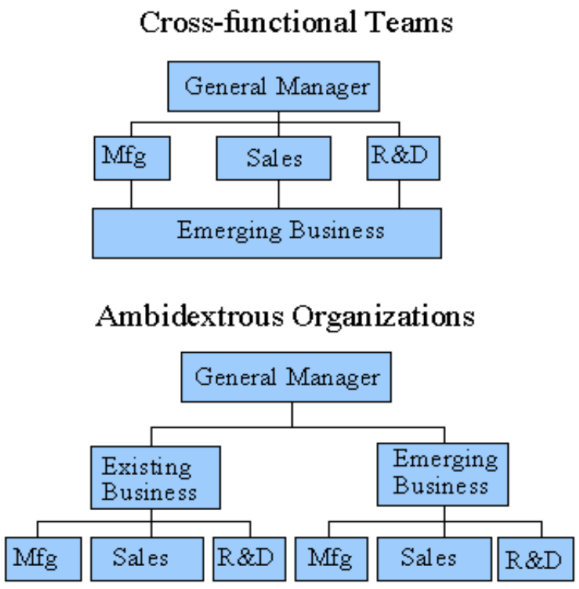

Image 2: Illustration of Ambidextrous Organizations
Source: (O`Reilly & Tushman , 2004)

Figure 2: Illustration of Ambidextrous Organizations

4.3.3 Three Horizons of Innovation

As mention before innovation can be distinct clearly between sustainable and disruptive innovations after Clayton Christensen (Christensen, The Innovator`s Dilemma , 2000). However there are some innovations, which can't be characterized by those Christensen's categories. The introduction of three horizons of innovation can solve this issue, which was created by McKinsey employees. Additionally it allows visualization of the future ambidextrous organization. In this concept there are three horizons and each of them requires a different focus on strategy and management action. Nevertheless most of the time companies have to pay attention to all three horizons simultaneously, when it comes to enable innovation throughout a certain strategy (Baghai, Coley, & White, 2000).

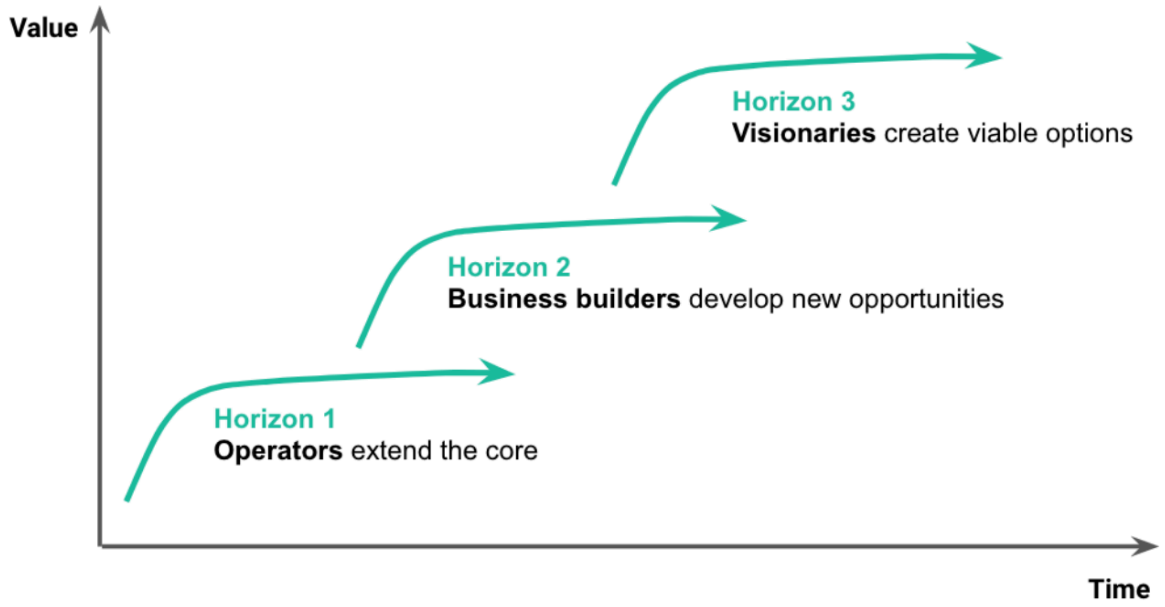

Figure 3: Illustrion of three horizons of innovation model

Source: (Hill , 2017)

As graphically illustrated above in figure 2, the x-axis represents the phase by which the business moves over time (from Horizon 2 to Horizon 1, or from Horizon 3 to Horizon 2) The y-axis represent the growth in value, that companies may achieve by attending to all three horizons simultaneously (Baghai, Coley, & White, 2000).

Horizon 1 - Mature core business	**Horizon 2** - Rapidly growing business	**Horizon 3** - Emerging business:
• Critical to deliver higher/ outstanding performances. • However provides the greatest profits and cash flow that can be used for growth. • Small growth potential are still left in many cases. • The focus lies on improving current performance, in order to maximize the remaining value. • Horizon 1 have to be successful in order for Horizon 2 and 3 to start and be effective as well	• Highly likely to generate substantial profits in the near future. • Emerging stars of the company that will attract investors' attention in the future. • Have the power to transform the company. • Considerable investments needed. • Focus in lies on initiating resources, increase revenue and market share. • Horizon 2 takes time and requires new skills, but is vital for the company's growth.	• Real activities and investments on finding future business opportunity) • Research projects, pilot programs, or minority stakes in new businesses • Focus here should be on discovering options for future opportunities • Try to understand the first steps toward actual future business. • If evaluated as successful, it would reach next Horizon.

Table 1: Illustration of each horizon

Source: (Baghai, Coley, & White, 2000).

4.3.4 The Lean Start-up Method

New business opportunity outcomes and the creation of new markets are very unpredictable. Most of the time companies, which react quickly and aggressively towards innovations, have a greater chance of success (Owens & Fernandez, 2014). Owens and Fernandez (2014), illustrated a strategic concept of how big corporations can take a successful role as innovators, like start-ups. According to them big companies have the possibility to employ the lean start-up method of innovation. However this particular concept was introduced by Eric Ries in 2011 in his book " The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses". The lean start-up method tries to explain the phenomenon, how start-ups are able to develop and introduce new products and services in a much faster and efficient way to the market as big corporations. The core of this particular method is a mix of business-hypothesis-driven experimentation. The main idea is that companies should constantly create/develop new products and services, in order to ensure sustainable success. Hereby the measurement of the performance of new products is crucial

for the entire concept. Therefore it ensures a precise illustration of customer engagement, satisfaction and overall acceptance (Ries, 2011) & (Owens & Fernandez, 2014).

However the organization using this concept should always have the capabilities to learn from past experiences for further ideas, continuously finding new problems and lastly solving them accordingly, as illustrated blow in image 4. Therefore it ensures a unique repeatable way to determine the customers base, needs and how to deliver it to the given customer base in an efficient way. By an early introduction of new services and products, which consumers really want, it increases the success chance of the innovation (Ries, 2011) & (Owens & Fernandez, 2014).

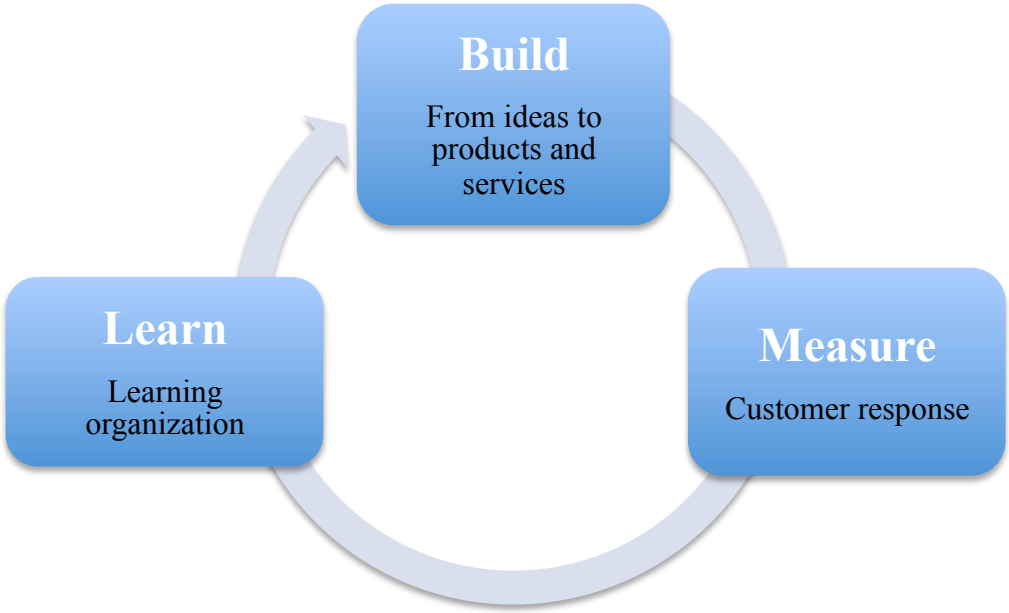

Figure 4: Illustration of The Lean Start-up Method

Source: own illustration, (Owens & Fernandez, 2014)

Owens and Fernandez (2014) incorporate the lean start-up method into their theory. They conclude that big corporations have the possibility to innovate as efficiently, successfully and quickly as small start-ups, despite the difference in organizational size. According to them any innovation strategy should be broader and more flexible than a typical corporate strategy. They describe it as a two-dimension matrix, which variables are control and momentum that yields following four strategies (Owens & Fernandez, 2014):

I. **Incubation** (high control, low momentum):
   Is the case, when start-ups are incubated internally, so there is almost no momentum. Innovation department is developing new from scratch, therefore the maximum control.
II. **Acquisition** (high control, low momentum):
   Start-ups are acquired, which enables the advantage of any momentum.

III. **Investments** (high momentum, low control)

IV. **Partnerships** (low control, low momentum):

Enables companies to exchange knowledge and skills, increase insights on technology.

By choosing one of the illustrated strategies, big corporations have the possibility to gain insights and knowledge into potential disruptive trends, that otherwise would not have the chance to notice. Those strategies allow big corporations to get a close-up view of emerging business model and opportunities, which can be used also in a big corporation context. Each strategy has advantages over another (Owens & Fernandez, 2014).

4.4 Innovation Failure

Surprisingly there are companies that try aggressively to be innovative or to be too customer sensitive, are likely to fail when it comes to find new technologies and markets. Therefore not that surprisingly is the fact that currently successful companies are mainly focused on their current products or services and fail when it comes to revolutionary and radically offer new products and services, or as explained before fail to create disruptive innovations (Christensen, The Innovator`s Dilemma , 2000). However the most common failure to achieve breakthrough innovations of big corporation according to O`Reilly and Tushman, is not the fact to be too innovative, or to be too consumer sensitive or the strict focus on current products and services as described by Clayton Christensen. Furthermore it is the high motivation of corporations to achieve steady improvements to old products and services (O`Reilly & Tushman , 2004).

It has to be mentioned at this point that the reasons for difficulties to create innovations are different and can have a numerous sources of nature. However the failure can be explained by two explanations.

The first explanation is organizational and managerial structure. There are many different analyses of this topic and most of them conclude that bureaucracy, complacency, quarterly budgeting, salary based compensation, creative thinking and “risk-averse” culture are among reasons for that failure (Christensen, The Innovator`s Dilemma , 2000) & (Owens & Fernandez, 2014). The organizational structure of established corporations are usually focused on component-level innovations. Meaning that the product development consists of subgroups that correspond to various product components and among departments. Such structure works well until there is no disruptive innovation. However in case of new disruptive technology organizational changes is required, but hereby the organizational structure itself represent the

strong barrier for change. In other words that the organization structure can limits or prevent innovation (Henderson & Clark, 1990) & (Christensen, The Innovator`s Dilemma , 2000) & (Owens & Fernandez, 2014). Clayton Christensen as value network introduces the second possible explanation. Within a value network each company's competitive strategy determines its perception of the economic value of a new technology. Sometimes this particular perception differs among the firms and one company expects to obtain a greater value through the innovation as another company. However especially disruptive innovations are complex, because their value and applications are uncertain according to the criteria by established companies. Ignoring technologies that do not concern your company`s customers can become fatal though (Christensen, The Innovator`s Dilemma , 2000).

4.5 The Net Neutrality Debate

4.5.1 Two Basics Definition Perspectives of Net Neutrality

In a broad perspective, the discussion on NN focus on the potential consequences of ISPs exercising additional control over the data traffic in their own network (Krämer , Wiewiorra, , & Weinhardt , Net neutrality: A progress report, 2012). Thus, the interpretation of "control" is often interpreted differently and ambiguously by the academic world. The definition ranges from blocking certain types of undesired or unaffiliated traffic (Wu, 2007), to termination fees (Lee & Wu, 2009), to offering differentiated services and taking measures of network management (Krämer , Wiewiorra, , & Weinhardt , Net neutrality: A progress report, 2012). However, there is no universal precise definition of NN, since all public and academic discussions are marked by two basic definitions perspective. The first basic component sees NN as a "network design" concept and the other defines NN more as an "user right" concept (Krämer , Wiewiorra , & Weinhardt , Net neutrality: A progress report, 2012).

The NND can be traced till to the late 1990s, when Lemley and Lessig published a paper about the possible threats of the "end-to-end" nature of the Internet, due to the fact that they observed that many carriers and cable companies had vertically integrated ISPs (Lemley & Lawrence , 2000). However, Tim Wu a law professor fom Columbia University, first used the term of NN in 2003 (Wu, 2003). Wu's "The proposal for Net Neutrality" paper describes the the first basic component of the NND, where he praised the principle that ISPs, corporations and governments should and have to treat all Internet traffic equally, and not discriminating different users, content, services, applications, devices or modes of communication. Wu

argues that a neutral public network should always deliver the most to the world, economically speaking. Meaning by serving as an innovation platform and source of innovation. In addition, his point of view is align with the first principle of the Internet. Wu also mentioned in his paper that many American ISPs have prioritized their short-term interests over their long-term interests, which had caused a general tendency to ban or partially to restrict the new innovative applications or network equipment in their networks. In Wu's opinion, the only solution is to prohibit harmful acts, therefore net neutrality laws should prevent behavior that creates profits for the ISP (Wu, 2003). The second basic component is seeing NN as the "user's rights" concept. Thus the WWW's inventor, professor Tim Berners-Lee says the following: "It's about consumer rights, it's about free speech, its about democracy" (Detecon International GmbH & EMERG, 2016, S. 3)Congestion Sensitive

4.5.2 Congestion Sensitive Content Providers

One of the most controversial part of the NND is seen the question how the future relationship between telcos and Content Providers (CPs) should be. In this particular section the paper "Network Neutrality and Congestion Sensitive Content Providers: Implications for Content Variety, Broadband Investment, and Regulation" of Jan Krämer and Lukas Wiewiorra will be discussed. The choice for this particular academic paper is because the relationship might influence the big telco corporation and their environment.

The NN academic community has a controversial opinion on Quality of Service (QoS), which in other words network management practices. Those practices are used to improve the current network performance and ensure that congestion are rarely occurring. There are different practices available, some of them are violating against current NN rules. There is one side that believes that through QoS the network capacity of the best-effort traffic lane (non-priority lane) will be effected negatively by slowing this lane down. Consequently, those CPs who are not willing to pay for the priority lane are put in a big disadvantage. The reason for it is that other providers' content is accelerated in lieu of their own content and can provider therefore higher quality of service. Moreover, it is claimed that the overall broadband infrastructure investment are likely to be lower, because telcos would not be forced to provide sufficient bandwidth in order to attract new content types and to satisfy consumers at a high level (Krämer & Wiewiorra , Network Neutrality and Congestion Sensitive Content Providers: Implications for Content Variety, Broadband Investment, and Regulation , 2012).

However the opposite side sees QoS as a chance to stimulate more content variety and broadband investment. Herby it is argued that nowadays there are services offered on the market that are very sensitive to congestion. Therefore in case that experience of use reaches a unsatisfied level because CP's service cannot be reliably offered, this CP's revenues will decline and possibly up to the point where it is forced out of business. Hence, QoS may in fact be welfare enhancing because it explicitly enables entry chances for innovative CPS, who crucially needs priority lanes in order to offer their services (Krämer & Wiewiorra , Network Neutrality and Congestion Sensitive Content Providers: Implications for Content Variety, Broadband Investment, and Regulation , 2012). The paper of Krämer and Wiewiorra compares QoS tiering with network neutrality in terms of their impacts on content variety, broadband investment, and overall welfare. Herby they modeled the Internet as a two-sided market, which connects congestive CPs with end-consumers and that is controlled by a monopolist ISP. The assumptions made in the model were following:

"CPs can choose to buy priority access to consumers on the same nondiscriminatory conditions. That is, discrimination occurs only between the best-effort and the priority class, but not within each class. In addition to the network externalities that are generated by either side, we explicitly consider the adverse effect that traffic prioritization has on the transmission quality of the remaining best- effort class as well as the positive effect that congestion is allocated away from the most congestion sensitive CPs." (Krämer & Wiewiorra , Network Neutrality and Congestion Sensitive Content Providers: Implications for Content Variety, Broadband Investment, and Regulation , 2012, S. 1304).

The main results of the paper concludes that in the short run QoS leads to the same level content variety as it does for a case of NN. Additionally the overall welfare is higher in the case of QoS, due to the fact that congestion are handled better in general. However at the same time it seems clear for the authors that it enables the chance for telcos for extract a part of the CPs' revenue, therefore the paper concludes that at first in the short run all CPs are worse of under QoS tiering than under NN regime. The paper advises the authority of policy makers to evaluate this particular shift of revenue (surplus) from CPs to ISPs, which is strongly connected to the NND (Krämer & Wiewiorra , Network Neutrality and Congestion Sensitive Content Providers: Implications for Content Variety, Broadband Investment, and Regulation , 2012). In the long run, the results of the paper change. It reveals that the chance is higher that under a QoS the overall investment level is higher than under the scenario with NN, because the additional revenue would used for network infrastructure. This holds true when the proportion of congestion sensitive to congestion insensitive CPs is balanced. Additionally the authors' opinion is that having a higher network capacity will encourage a higher amount of new entrants of CPs with innovative and sensitive services, which reflects automatically in an additional increase of demand for the priority services offered by the ISPs. Therefore it also ensures that the value of priority services is on a high level (Krämer &

Wiewiorra , Network Neutrality and Congestion Sensitive Content Providers: Implications for Content Variety, Broadband Investment, and Regulation , 2012)

5. Interview Research

The following chapter illustrates how the quantitative part of the research. By providing the background for the study, the actual results are presented. Hereby expert interviews were used as the only part for the quantitative research and structured. The main goal was to identify major current problems of one big European telco corporation related to innovation and topics, and which connected broadly, directly or indirectly to the European NND

5.1 Interview partners and Interview setup

The research is made by interviewing eight people, who are working or worked either a big European telecommunication corporation, or for a telecommunication regulator or for a management consulting company. Three of the interviewees are working within a big telecommunication corporation, three of the interviewees are working or worked within regulation and two of the interviewees are working in management consultancy with focus on the telco industry.

The different interview partner groups belong to various organizations:

- Big telecommunication corporation: Telekom Deutschland GmbH, T-Systems and Deutsche Telekom
- Industry Experts: Detecon Consulting
- Regulator: Body of European Regulators for Electronic Communications (BEREC), Bundesnetzagentur (BNetzA)

Some interview partners preferred to stay anonymous and therefore, some names are labeled as individuals X, the list of the interview partners are presented in the table 1 Appedix B.

The interviews were partially theme interviews and there was no binding set and fixed structure of interview questions, but the interviewer used a directive list of questions to guide the discussion in each of the interviews. The questions used for guidance are illustrated in table Appendix B.

The shortest interview lasted between 10-15 minutes and the longest around 20-30 minutes, and all the interviews were not transcribed, as it was not mandatory and not advised. The interviews were conducted from 20th of April to 15th of May in 2019, ten interview meetings were held in total during that period. The interviews were held either personal or over the telephone. Additionally the interviews and discussions were conducted mainly in German.

5.2 Illustration of Observations

In this section some the statements of the interview are illustrated below. They are structured either after the questions or after certain theme. As it was mentioned, due to the lack of transcription of the interviews, not all statements are available. Only in some cases, statements are available, which are presented below. However only portions of the statements are presented, all available statements are illustrated in appendix C. At the end of each it presented statement group, there is a short summary of all interviews. The interviews with Detecon Consulting and T-system are excluded from the statements, but are included below in the summarized sub section below.

Factors affecting NND in Europe: Which factor is affecting NN at the moment in the EU 28 /Germany? (Question 1)

Telekom Deutschland

- For us at Telekom Deutschland, where mainly three big players are on the market, the investments are really high.
- For us 5G is at the moment the one of the biggest investments for the future.
- It seems clear that with 5G opportunities are created, nonetheless we expect an increase in data and in usage of the Internet.
- Why? Firstly it creates new business models and new applications, which have totally other network requirements. Therefore the users can access other and really innovative applications, which is good but will pressure us to deliver it at the best possible quality. Secondly the digital transformation of the Internet. Hereby shared economy has to be mentioned. Lastly connected with the digitalization it is the new entrants of giant players like Google or even Facebook, which weaken or affecting the debate in Germany and Europa.

Deutsche Telekom

- Technological developments, currently 5G because the rollout will be next year. This will enable a lot of opportunities for us, however at a high cost of investment.
- The other point is that we observe the recent years more and more entrants, which pressure us.
- The amount of connected gadgets will increase in the near future. Therefore applications, like M2M will contribute to more data traffic and could in the mid term additionally weaken our position

(Translated)

BNetzA

- Aue Bad Schelma has different uses case requirements and totally other access to the debate than for instance Cologne.
- The geographic difference in connectivity and infrastructure is one of the biggest obstacles, which has to overcome and to be solved, before talking about NN.
- Rural areas have a totally other access to the debate than urban areas.
- Implementation of European NN regulation would mean to first minimize those geographic differences. This could be reached with an improvement of network infrastructure.
- At the meantime there is a need of standardized legal framework among the member states. This in my opinion is currently the biggest factor affecting net neutrality
- Lack of standardized framework creates uncertainty for all players involved

(Translated)

Network Management Practices: How should network management be done? (Question 2, part 2)

Deutsche Telekom

- Virtualization of our network infrastructure should be implemented as soon as possible. The regulator should incentivize the telcos to virtualize their network infrastructure. Therefore we could apply more efficient practices.
- But at the same time we have incorporated SDN and NFV into our plans to migrate to new network architecture. We are more interested at the moment from a strategic point of view to incorporate NFV

(Translated and Neckline)

Network Management Practices

On one side, traffic prioritization and restrictions based on a reasonable cause, which is not clearly defined by the regulator as some interview partners articulated, are not generally seen as NN violations. While on the other side, blocking and degrading competitors' services in order to gain a competitive advantage and demanding an extra fee from a specific competitor's service are seen as NN violations. However, generally all interview participants identify a need for network management practices, in order to ensure a certain quality level of for the end-consumers. Some participants even have opinionated that regulators should allow more network management practices in some cases, and especially in the future. Another finding during the interviews was that some consumers should be degraded instead, due to their heavy high bandwidth usage. Meaning that, in some cases, users themself should be charged or restricted depending on their habits. The discussion is also, for some interview partners, one sided. Some participants had expressed their concerns regarding zero-rating (=no charge for specific applications or services provided by the ISP within the limited data plan) and saw in it as a problematic issue.

However almost every participant (6 out of 8)expect Substantial changes in and around the network industry, resulting from an accelerated convergence between IT and telecoms. Various players from these two worlds are involved in software-defined networking (SDN) standardization initiatives, OpenFlow and OpenDaylight, and in the ongoing work on Network Function Virtualization (NFV) led by The European Telecommunications Standards Institute (ETSI). The SDN's idea is to use software to centralize control over the network hardware, and so making the network more easily programmable. In the telecoms universe, SDN is often coupled with network functions virtualization, or NFV, another concept that involves deploying network functions as software. The NFV's appeal is the ability to do remotely with physical components and the associated complex process of interconnecting interfaces. These technologies are responsible for making networks more flexible, open, scalable, and efficient. They will gradually replace telecom network architectures that are being assailed by the new constraints of applications, and additionally by users' demands for

high quality. SDN and NFV are amongst the technical and economic responses available for telcos who are working to optimize their infrastructure investments and generate new revenue streams. The importance of these new concepts is reflected in the strong cooperation among various IT and telecoms equipment suppliers, and operators who are actually deploying these technologies. Deutsche Telekom, followed by other top tier telcos, have incorporated SDN and NFV into their plans to migrate to a new network architecture. However, Deutsche Telekom has expressed a greater interest in NFV. They are driven by the promises of cost savings, and the ability to deliver applications and services faster and easier than it's done nowadays.

Lastly one interesting point is that the German regulator has also pointed out during our interview a very important point regarding network management practices. It might be very important where the network practice is actually done, either in an urban environment or in rural areas. Networks will unavoidably have more capacities and lower latencies in urban areas, because it is significantly expensive to upgrade base stations in the rural areas. The challenges concerning networks in the future are related to get a good balance, in terms of network capacity and network performance, between rural and urban areas.

Technology & vertical Integration

Deutsche Telekom

- ….new and future possible application requirements the investments are rising and pressuring our position in the debate.
- Segen und Fluch zugleich" (it is a german expression) Meaning broadly it is on one side good but in the other side bad)
- New business models can be created. However competition will increase in our sector

(Translated and Neckline)

Telekom Deutschland

Germany is an innovator and not imitator. Meaning we and especially the German government have interest to secure and also improve innovation power to play an essential key role in the union.

(Translated and Neckline)

BEREC

- In favor! (vertical integration) Will enhance innovation and at the same time it will create a competitive market environment

(Translated and Neckline)

Market related Developments – Technology Factors

One of the most important findings, observed nearly in all interviews, is that there will be a digital transformation of the Internet service in the near future. Mainly cause by the collaborative economy, which takes matters further, maximizing the way services are

produced by having Internet users contribute to the process, and share their own resources. Consumer involvement in services production is nothing new on the Internet; it's already a reality for a range of digital resources, from the production of open source software or digital content (Wikipedia, Linux, OpenStreetMap). However, the underlying premise is to share underused resources – such as home, Internet connections, cars, backbones, various skills or special tools – which is not without impacting traditional industries. In the opinion of the interviews, the collaborative economy has created the ability of offering very competitive pricing, and in some instances, giving merchandise away for free, as the marginal cost of sharing resources is very low. Hereby the interesting observation was made that the 5G, which will impact the network significantly in the EU 28, is one of the biggest technological factor which is challenging the telco industry. However, the European Union member states (EU 28) are prepared in different levels for the rollout. Smart Cities' and different users' cases of 5G were discussed in the open discussion part of the interview. In the overall, the experts evaluated that 5G will change the Internet ecosystem dramatically, however regulators are not able to anticipate laws, which will be needed to protect the present Internet. One reason for it, is that the usage case's impact is mainly on theory. There are couple of usage case' trials mainly in western and middle Europe.

Another finding connected to 5G, was the various future type of products connected to the Internet will change and increase in the near future. For instance, wearable technology to name one, it refers to everyday objects such as bracelets, watches, glasses, helmets and activity trackers that are outfitted with sensors and connected, typically indirectly, to the Internet through a device/concentrator, usually thanks to Bluetooth technology. However, currently in terms of connectivity, mobile operators are largely absent from this market since cellular connectivity is not considered vital. One interview partner mentioned that currently "only one ISP, AT&T, has invested in this segment, notably through a partnership with Timex, a US-watch-maker. Where a year's worth of connectivity is included when users purchase a Timex smart watch." However, Internet of Things (IoT) will make it even more possible to connect more objects to the Internet, even if it is not outfitted with the electronic components required for a direct connection, in that case an intermediary device will be used. The IoT also includes wearables, many of which also require an intermediate device to connect to the Web. Another interview partner mentioned that there will be 80 billion connected appliances in use by 2020, which is almost complete German. Machine-to-Machine (M2M) was also often mentioned. It refers to communications between machines. This can include anything from cars to photocopiers to e-books, but not multi-purpose devices such as

tablets or computers. Telcos have been looking for opportunities beyond connectivity they are now working to establish a sizeable presence in the market. M2M offers interesting prospects in that matter, despite low ARPU, the projects have a very long lifespan, very low churn out and contracts for several thousand if not millions of SIM cards. Therefore, operators are increasingly looking for services with high value-added, and beyond simple network management products. Most telcos, at the very least, supply a module management platform, and have positioned themselves in data integration for their customers' IT systems.

Lastly, during almost every interview with the participants, the rise of the new Internet heavyweights was mentioned. "The champions of this collaborative economy revolution" will be the players that are positioned, as resource aggregators, providing a consumer-to-consumer distribution platform. Examples of such companies are; Uber and its taxi-like service, Airbnb with its short-term home rentals or TaskRabbit for odd jobs, Venmo for cash loans between individuals and Kickstarter, among others, for crowd funding. Heavyweights from digital industries and traditional sectors have also entered the collaborative economy, primarily via acquisitions – such as the investment by Alibaba in a stake of Lyft.

5.3 Presentation of Main Observations

In this section the all findings of the interviews are illustrated. This illustration of all observations should identify the main findings. Hereby the main findings are those findings, which fulfill following characteristics:

- Illustrates a problem for a big telecommunication corporation.
- Is connected to the NND.
- Is related with either of one of the topics; innovation or technology.

All findings are presented below in table 2 and will be discussed if it is relevant for the research or not regarding the characteristics explained above. Therefore in the next step all relevant and main observations are presented. This table will be the basis of the further research and analysis.

Table 2: Illustration of all observation

All observation (Summarized)	**Problem**	**Connected to NND**	**Related to innovation and technology**	**Main findings**
Different national laws, there is a need of harmonization of the NN laws among the EU 28	Yes	Yes	No	No
Different standpoints among the EU 2, regarding NN laws (example. Netherlands and Hungary)	Yes	Yes	No	No
Different standpoints on data prioritization between Telco and regulator	Yes	Yes	No	No

There is a critical need for network improvements in rural areas	No	Yes	No	No
Network management -virtualization of the network (new available technology) Current congestion in the network could be solved partially through software-based (virtualization) network	Yes	Yes	Yes	**Yes**
Regulators and telcos are able to detect, if the amount of data traffic of a specific end-consumer changed significantly over time. (would facilitate to discriminate by heavy users and light users)	No	Yes	No	No
5G as the highest investment cost for telcos.(Cost aspect)	Yes	Yes	No	No
5G seen as uncertain opportunity/threat. It will have an impact on the position in the NND, because the things connected to the Internet will increase. Therefore the network will be more burdening as before.	Yes	Yes	Yes	**Yes**
Concerns regarding zero-rating (=no charge for specific applications or services provided by the ISP within the limited data plan)	Yes	Yes	No	No
Mobile subscriptions have higher priority in the network than consumer mobile subscriptions (Deutsche Telekom)	No	Partially Yes	No	No
Company subscriptions are offered with a higher price and with a higher priority. Volkswagen or Deutsche Bahn, have higher priority in the networks because important operational business activities are connected to it (Deutsche Telekom)	No	Partially Yes	No	No
In favor of price discrimination between users (heavy and light)	No	Yes	No	No
M2M, opportunity or threat. Will negatively impact the network capacity (related to NND) but on the other side great opportunity for telcos	Yes	Yes	Yes	**Yes**
All participants are totally or partially in favor of open standards	No	Yes	Yes	Yes
Improvements Open standards could strengthen the telso's position in the NND by decreasing the manufacture power.	No	Yes	Yes	No
Manufactures (Apple or Android) have to much power on hardware standards.. Lack of open Standards	Yes	Yes	Yes	**Yes**
The emerge of new big players in the Internet ecosystem	Yes	Partially Yes	No	No
Development of vertical integration is changing structure of the Internet ecosystem	Yes	Yes	No	No
New player entering the Internet Ecosystem. Not only competition rises, furthermore the performance requirements towards the network are changing (applications of today had completely other network requirements than 10years ago)	Yes	Yes	Yes	**Yes**
The rise of collaborative economy.	Yes	No	No	No
The rise of new entrants in the internet market. (Deutsche Telekom)	Yes	Yes	No	No
Type of products connected to the Internet will change and increase**. (**Especially wearable, or IoT to name some examples)	Yes	Yes	Yes	**Yes**
Networks will unavoidably have more capacities and lower latencies in urban areas, because it is significantly expensive to upgrade base stations in the rural areas. (BNetzA)	Yes	Yes	No	No
Networks between continents and mobile networks may become bottlenecks (congestions) in the future. (T-system)	Yes	Yes	No	No
Digital transformation of various services in the near future. (Developments like M2M,5G are enhancing and accelerating this transformation partly)	Yes	Yes	Yes	**Yes**
The challenges concerning networks in the future are related to get a good balance, in terms of network capacity and network performance	Yes	Yes	No	No

In the next step the main observation of the interviews are presented. As mentioned before those observations match the given characteristics (problem and related to NND, innovation and technology). The main observations from the ten interviews are:

I. Network management -virtualization of the network (new available technology) Current congestion in the network could be solved partially through software-based (virtualization) network.
II. 5G seen as uncertain opportunity/threat. It will have an impact on the position in the NND, because the things connected to the Internet will increase. Therefore the network will be more burdening as before.
III. M2M, opportunity or threat. Will negatively impact the network capacity (related to NND) but on the other side great opportunity for telcos.
IV. New player entering the Internet Ecosystem. Not only competition rises, furthermore the performance requirements towards the network are changing (current applications had completely different network requirements than 10years ago).
V. Type of products connected to the Internet will change and increase. (Especially wearable, or IoT to name some examples).
VI. Digital transformation of the various services in the near future. Developments like M2M, 5G are enhancing and accelerating this transformation partly. Excluded from further research due to redundancy.

The sixth observation is a more general finding and includes actually the observation two, three and five partially in it. Therefore this particular finding will be excluded from further research.

6. Analysis

6.1 European Telecommunication market at glace

In this subsection the revenue, profitability, the demand and supply side (network infrastructure) is shortly illustrated, in order to draw a current situation of the European telecommunication market.

Herby following reports were mainly used:

- IDATE DigiWorld "Next Gen Telcos" of December 2016
- DIGI year book "The challenge of the digital world" of 2015

6.1.1 Main Players in the European Market

According to Dataxis market analysis in 2017, the Deutsche Telekom, Vodafone and Telefonica, are the top leading telecom groups in Europe, in term of revenues for the second quarter of 2017. Additionally Dataxis's analysis concludes that top ten telecom corporations in Europe amounts to 51 billion EUR as per data published Q2 2017 by Dataxis.

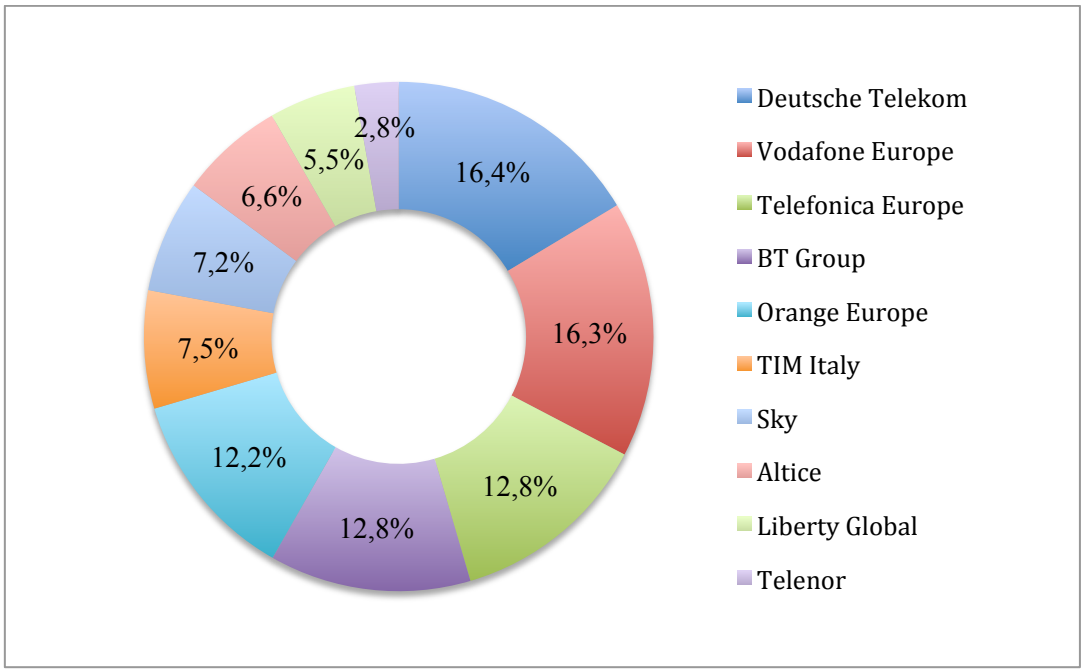

Figure 5: Top European Telco Groups at glace by (51billion EUR) turnover as Q2 2017 (in%)

Source: Own illustration, data from (DATAXIS, 2017)

As illustrate above in image 5 the top five (in terms of revenue) Telecom corporations in Europe, contributed almost 70% of the revenues in the second quarter of 2017.

In most of the European countries there is a oligopoly market structure, although this trend is starting slowly to disappear. As for instance in Germany and Italy the an increase of rivalry is been observed. However in some countries there is a high market concentration as for instance in the Netherlands, the UK, Austria and Ireland. Moreover French market situation is getting close to perfect competition (Pennings , 2016).

6.1.2 Revenues

The telecom industry finds itself in a challenging situation, sandwiched between an ever-growing demand for connectivity and services on the one hand and strong price competition on the other hand. This is particularly true in Europe. Telcos in the EU28 have seen their revenues decline with each consecutive year between 2008 and 2015. The prospect of a flat growth rate in 2016 therefore needs to be considered as relatively good news for operators in this region. The situation is expected to improve slightly over the years to come, but it will take many years before European telcos return to the nominal revenue they had in 2008 (Bonneau, 2016).

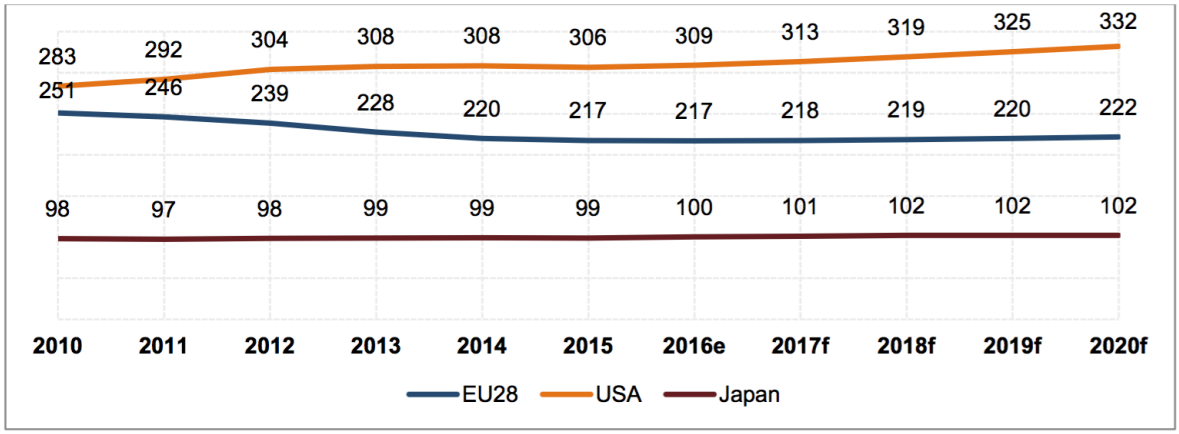

Figure 6: Telecom revenues in EU28, USA, Japan, 2010-2020 in (Billion EUR)

Source: IDATE DigiWorld, Next Gen Telcos, December 2016

Unsurprisingly, disaggregating telecom revenues into different services shows that the trends are quite different for different usages. Data services are the driver of revenue growth in fixed as well as in mobile services. Voice still accounts for a significant chunk of total revenues, but its share is on a downward trend in both fixed and mobile services. This trend reflects the demand for underlying connectivity; however, the growth in revenues is trailing the growth in subscription to fixed broadband and mobile data services. Fixed broadband revenues will

have surpassed fixed voice revenues in 2016 and will continue robustly at rates comprised between 3% and 5% until 2020 (Bonneau, 2016).

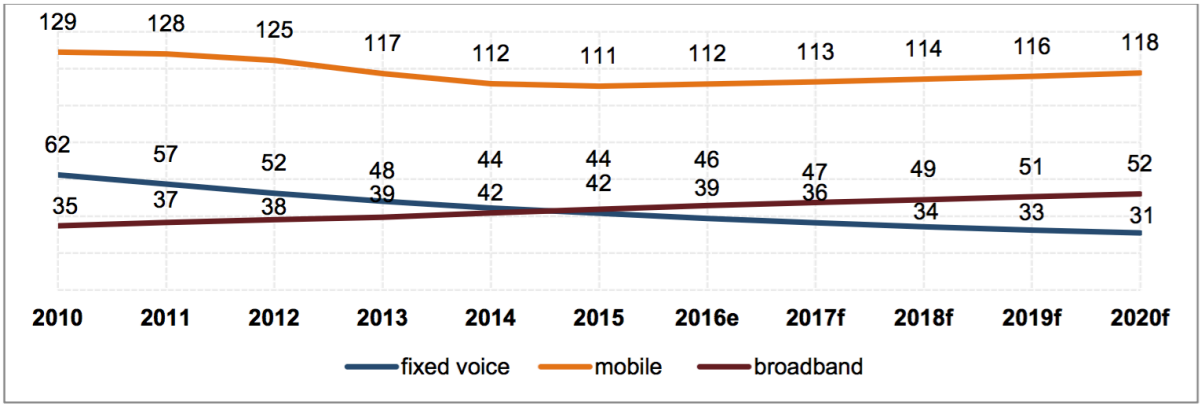

Figure 7: Revenues by service in EU28, 2010-2020 (Billion EUR)

Source: IDATE DigiWorld, *Next Gen Telcos*, and December 2016

Mobile revenues will achieve a turnaround in 2016, showing a slight increase in 2015 for the first time in many years. Like on the fixed network, revenue development is totally driven by data. Mobile voice and data revenues are developing in the opposite direction. In 2016, mobile data revenues will be roughly on par with revenues from voice services. In the future, data revenues will outweigh those of voice services, and by an increasing margin (Bonneau, 2016).

6.1.3 Profitability

The industry revenues falling for many years in a row, profitability of operators has not remained untouched. Falling prices have not only affected the absolute EBITDA levels, but have put pressure on EBITDA margins as well. Despite telcos' efforts to increase efficiency and push new services, the long- term EBITDA margin evolution does not show a rebound, but rather a downward trend. At the same time, operators are investing heavily as they upgrade their networks to 4G and 5G as well as NGA
technologies. The share of revenues devoted to investment has therefore been rising over time (Bonneau, 2016).

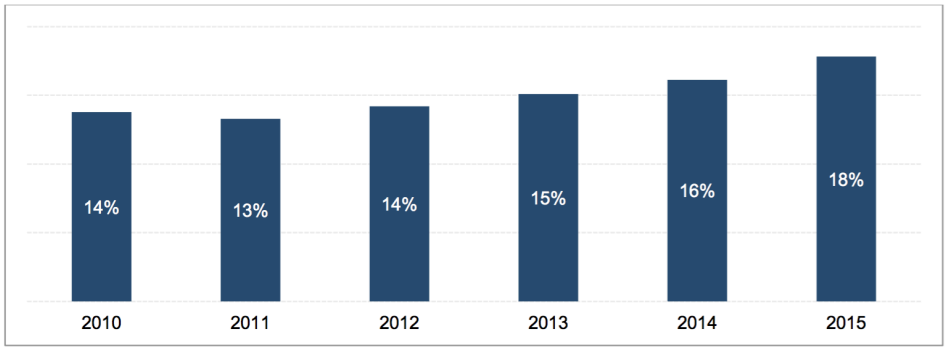

Figure 8: CAPEX/sales ratio in EU5, 2010-2015

Source: IDATE DigiWorld, *Next Gen Telcos*, December 2016

Consequently; free cash flow generated by the industry, which can be expressed as EBITDA minus CAPEX, is being squeezed. Given that 5G mobile networks will be launched soon and the more fibre will have to be deployed closer to the user over the years to come it is hard to see, how telcos could significantly reduce their CAPEX levels in the medium term (except perhaps through open access co-investment). The industry will therefore have to find ways to grow EBITDA and EBITDA margins if it wants to succeed in raising free cash levels and become an attractive target for investors (Bonneau, 2016).

6.1.4 Demand for Connectivity

As mentioned in the previous section, demand for connectivity keeps growing as new users keep entering the markets for fixed and mobile broadband and more experienced and affluent users multiply the number of connected devices they own. As the Internet of Things continues to expand, the number of M2M modules deployed further stokes the growth in the number of mobile subscriptions. Traditional narrowband access lines are less and less common, and their number is now smaller than that of fixed broadband access lines in the EU 28 (Bonneau, 2016).

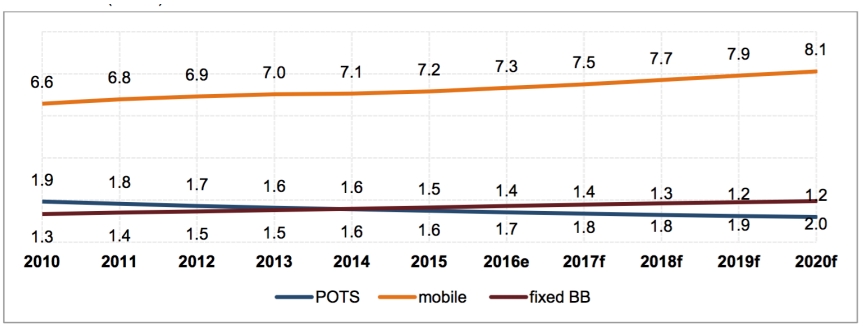

Figure 9: Access lines in EU28, 2010-2020 in billion

Source: IDATE DigiWorld, *State of telecom services & players*, July 2016

6.1.5 Network Infrastructure

The modernization and evolution of network infrastructures remain the priority for the majority of telcos. Despite limited capital investment, major expenses are still needed in the physical networks in order to increase their capacity to absorb growing traffic and expand coverage (Bonneau, 2016). A good example here is the Deutsche Telekom is massively investing in the modernization of its network infrastructure, and especially in an all-IP infrastructure to meet market 'needs. The transformation to a fully IP-based network is to be completed by 2018 in Germany and Europe. Around 23.5 billion EUR of CAPEX is dedicated only to the German network from 2015 to 2020, including a coverage expansion of both fixed and mobile networks in line with regulatory obligations. On the fixed side, Deutsche Telekom has the ambition to provide 50% of households with at least 100 Mbps by 2018 and has started the deployment of 500 Mbps connections. Or another example in Europe would be Orange, who aims to be a high-speed broadband provider on both fixed and mobile networks and has planned to invest more than 15 billion EUR in its networks from 2015 to 2018. Precisely, the telco aims to triple 2014 average data speeds by the end of 2018. Thus, network investments will be prioritized based on the needs of customers. Orange also plans specific involvement and expansion on fibre networks in other countries where it operates, such as Spain, Poland and Belgium. Orange will also make a similar effort on the expansion of its high-bandwidth mobile service. The telco expects 4G to be available to over 95% of European households by 2018 thanks to a 5 billion EUR investment dedicated to mobile networks. Another example, which illustrates the high investments in network infrastructure, is Vodafone in the UK. The British telecommunication company launched in 2013 a three-year network investment project, in order to accelerate and modernize broadband and mobile networks. However after the end of the investment project in 2016, more than 19 billion GBP had been spent over three years (Bonneau, 2016).

6.1.6 Consolidation in the Telecom Industry

Consolidation is a massive trend in the telecoms industry, which can be observed in developed and emerging markets alike. In the USA, the development started in the early 2000s and has led to the coronation of AT&T and Verizon as undisputed market leaders worldwide. In Europe, the consolidation movement set in later but it has gained significant momentum in recent years, particularly with mergers in the mobile segment bringing down

the number of players from four to three in many markets. Consolidation can take various forms including partnerships or infrastructure sharing as well as fully-fledged M&A. In any case, in an industry where scale is paramount, consolidation is a means to exploit synergies, resume growth and find more resources to cover the investment needed to deploy new generation networks (Pennings , 2016).

The IDATE research report from Penning "Digital Economy 2025 -The future of Telecom and Internet ecosystems states five key drivers for consolidation, which reads as follow:

- The deteriorating economy of operators with markets under pressure;
- A relatively fragmented industry
- The hefty financing requirements for new generation networks (5G);
- Fixed-mobile convergence;
- Several regulatory incentives, mainly promoting infrastructure sharing

(Pennings , 2016, S. 22)

Nowadays fixed-mobile convergence is making more sense than ever before. Not only from a usage and commercial point of view, furthermore also in terms of network infrastructure. The Wifi offloading of mobile traffic and the use of fixed network infrastructure for backhauling purposes create substantial synergies and create strong incentives for pure-play fixed or mobile operators to merge with a complementary player. This applies in particular to telecom operators, which are mainly or exclusively mobile as well as cable players, which are highly successful in fixed broadband but are usually lacking the capacity to compete head-on with their Telco rivals in the mobile sector. Combining these players' assets would therefore seem to make a lot of sense. A good example is Vodafone, which has long abandoned its strategy of "mobile-only" and had tried to develop its fixed- line business in the early to mid-2000s. The acquisition of Kabel Deutschland's assets in Germany and the takeover of cableco Ono in Spain gave Vodafone immediate access to an important subscriber base and it fully upgraded fibre cable networks. These acquisitions make Vodafone less dependent on incumbents' wholesale access products and provide important capacity for its LTE networks. Another example can be found in France, where Altice acquired a controlling stake in the mobile and fixed units of SFR. Previously Altice had already acquired the biggest (mobile virtual network operator) MVNO in the French market, Virgin Mobile. A stronger integration of cable and traditional telcos globally and, especially for mobile operators, seems inevitable in future (Pennings , 2016).

This trend towards consolidation is certain to continue to play an important role in the industry over the next years. However, there are also some major uncertainties linked to this trend. The question is how far will the consolidation trend ultimately go. So far, the consolidation game has primarily been a national one, even where multinational operators have merged or otherwise linked their entities. It is easiest to gain synergies within the same national market, where it is relatively straightforward to eliminate redundancies between the entities. One of the most notable exceptions to this may be BuyIn, the procurement joint venture between Deutsche Telekom and Orange, where the geographic overlap between the companies' different operating companies is rather limited. On the other hand, the scope of the collaboration is quite narrow, too, compared to a merger of a two operating business units. At cross-border level, not only is it more difficult to cash in on quick wins, but the barriers to successful integration risk a priori being higher. Inconsistencies in culture and language may play a role in this context, but also differences in privacy consumer protection or different labor regulations may make international M&A more risky. Political resistance is also likely to play in cross-country mergers, as many governments will be more than hesitant to see the country's former incumbent taken over by foreign players. Despite these limitations, international consolidation is not a purely theoretical scenario but is actually happening already. The French Altice group, for instance, has acquired Cabovisao and the incumbent operator PT in Portugal as well as Cablevision in the USA. The takeover by Danish incumbent TDC of the Norwegian cablecom is another example of cross-border consolidation. While the creation of international mega-players with, say, four or five operators catering to virtually the entire European market may not be on the agenda in the immediate future. ISPs are likely to take consolidation up to the next level, particularly in Europe if the EU succeeds in creating a truly integrated digital single market. From an antitrust perspective, too, such a seemingly radical evolution – from more than 100 operators to no more than a handful – would not necessarily seem problematic, as long as users in any given place have a reasonable choice between competing offers (Pennings , 2016).

6.2 Data Traffic Management

Another main concern related to the net neutrality is ISPs' ability to use various traffic management techniques to limit unwanted traffic and congestion of data. They have the possibility to prioritize or even block certain traffic flows in order to distort competition or to maximize their profitability. But not all traffic management is counterproductive there are various strategies, which will be presented in this particular chapter. Mostly the ISPs use

traffic management to increase their own efficiency of their networks and to protect their networks' security (Krämer , Wiewiorra , & Weinhardt , Net neutrality: A progress report, 2012). The chapter will illustrate briefly the current situation of the global data traffic.

6.2.1 Network Traffic

In the following subsection main source will be the report from ovum knowledge center "Network Traffic Forecast: 2018-23", conducted by Mehment Kemal and garet Sims. Ovum's updated network traffic forecasts provide in depth analysis of how future digital content and services will be consumed over different networks and devices.

Globally, total data traffic from cellular and consumer fixed broadband networks will grow at a 29% compound annual growth rate (CAGR) from 2017 to 2023, as illustrated in figure 13. This is over 4.3 million petabytes (PB) of data, which is equivalent of every person on the planet uploading over 5,700 photos per day. This is the forecast in 2023, up from around 940,000PB in 2017. This represents a 4.5 times increase of the market. Within cellular, this expansion will be more extreme, because total traffic is expected to grow almost eight times over, equivalent to a CAGR of 41% (Kemal & Sims, 2018).

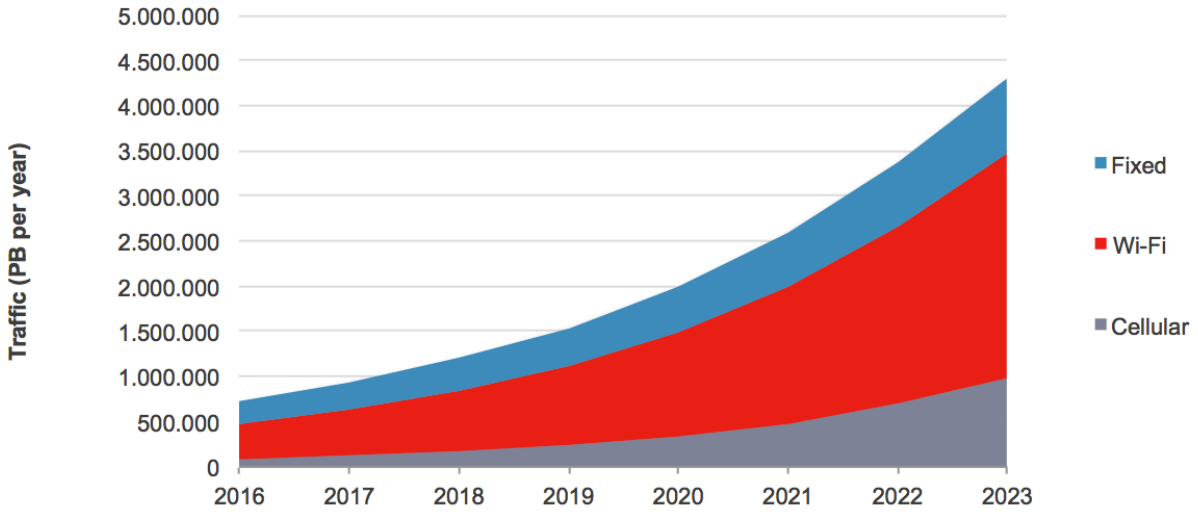

Figure 10: Traffic forecast by network

Source: Network Traffic Forecast: 2018-23 of ovum knowledge center

Growth in traffic is being fueled by the insatiable demand of consumers wanting to access digital content and services more frequently and for longer periods of time. This has been made possible largely due to the increased supply of affordable devices and services aligned to the rollout of improved network infrastructure. We are now witnessing a world that is rapidly moving beyond simply connecting people to one in which "always-on" access to digital services is seen as a basic need. Users are already generating more traffic from

wireless devices than from wired devices. In terms of traffic, Wi-Fi has for many years been the dominant wireless technology and now with the growing influence of cellular, the vision of a wire-free world is becoming ever more real (Kemal & Sims, 2018).

As the figure 15 below shows, video dominates total traffic, and this is particularly the case on fixed broadband networks and on larger-screen devices such as tablets and laptops. This comes as no real surprise as screen size, network quality, and indoor coverage are key attributes to improving the overall viewing experience. Within the video category, video streaming (including progressive downloading) far outweighs the traffic from video downloads, even though the length of video is shorter and often of lower quality. The main reason for the dominance of video streaming is the fact that many of the services are free or significantly cheaper than transactional (TVOD) or electronic sell-through (EST) services. Another factor is the limitation of many devices to store large video files, restricting the option of downloading (Kemal & Sims, 2018).

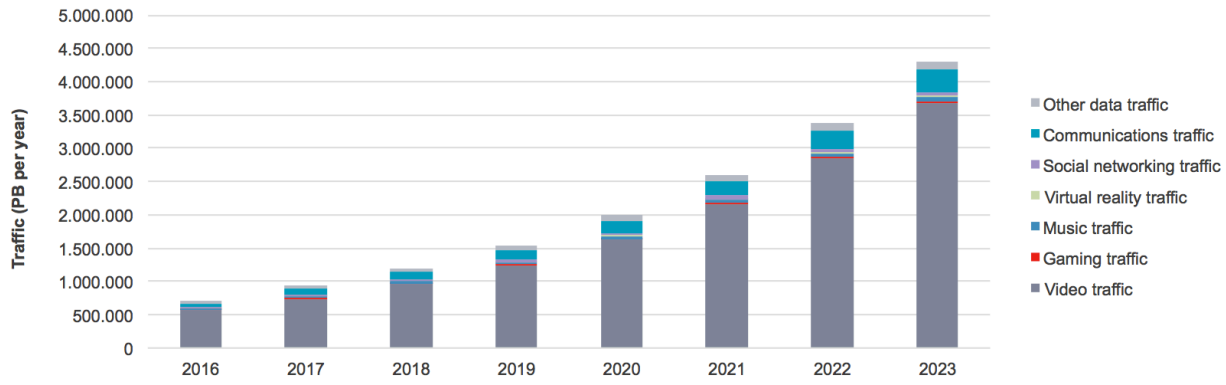

Figure 11: Traffic forecast by service

Source: Network Traffic Forecast: 2018-23 of ovum knowledge center

The main inhibitor of streaming services is the quality of the delivery network, but this area has improved significantly over the past few years with faster networks. When it comes to calculating traffic, a "unit" of video (either streaming or downloading) consumes far more data than any other type of service. For example, streaming one minute of HD video consumes around 19MB whereas one minute of music streaming will use around 1MB. Therefore, once the barriers of price, device, and network quality are removed, it's understandable how this service category accounts for such a high proportion of traffic. Other than video, communications and the "other data" category capture the next biggest share (Kemal & Sims, 2018).

The combination of new the Internet enabling devices, the growth of broadband penetration in developing markets, an overall higher broadband access rates globally, and bandwidth-intensive applications (video streaming) will continue to fuel strong internet traffic growth (TeleGeography , 2018).

6.2.2 Price Developments on Data Transfer

IP Transit pricing is differing extremely between global regions also impacting retail pricing, as illustrated in figure 16 (TeleGeography , 2018).

From a capacity and pricing perspective, North America and Europe can be seen as the "core" of the Internet and pricing is cheapest at major hubs (London, Frankfurt, New York and los Angeles). The further a city is away from this core, the more expensive is the sourcing of Internet traffic. With more capacity deployed in other regions overall pricing levels will converge towards United States of America / Europe levels (Detecon International GmbH & EMERG, 2016). However IP transit prices continued to decline steadily in 2018, with weighted median 10 GigE prices across a global sample of transit markets in London, New York, São Paulo and Singapore decreasing an average of 27 percent compounded annually between 2015 and 2018. In the primary Internet hubs of London and New York, 10 GigE price declined a bit less than the average at 15 and 21 percent compounded annually from 2015 to 2018, respectively. The higher growth, more expensive 10 GigE markets of São Paulo and Singapore dropped 45 and 30 percent, respectively, compounded annually from 2015 to 2018 (TeleGeography , 2018).

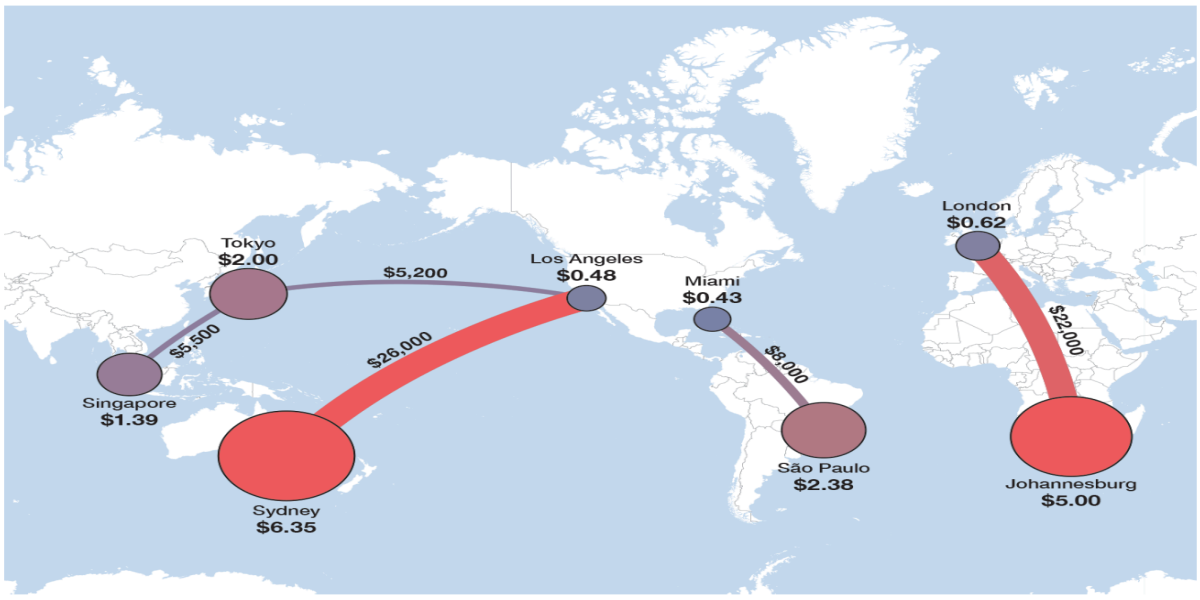

Figure 12: Weighted Median 10 Gbps IP Transit & Wavelength Prices on Major International Routes, in Q2 2018

Source: Executive Summary of the report "Global Internet Research" of Telegeography

Notes: Each line represents the weighted median monthly lease price for an unprotected 10 Gbps wavelength on an individual route. Each circle represents the weighted median monthly price per Mbps for a 10 GigE IP transit port in the listed city. Routes and cities are shaded corresponding to price, from least expensive in blue to most expensive in red. Prices are in US-dollars and exclude local access and installation fees. (10 Gbps & 10 GigE = 10,000 Mbps.)

Different rates of price decline have converged prices in more and less mature transit markets. The weighted median in Singapore is now just twice the price of London, compared to 4 times the price in 2015. Similarly, São Paulo's 10 GigE price is now 4 times the price of New York, compared to thirteen times in 2015. Outside of these markets, substantial price differences persist (see Figure 15: Weighted Median 10 GigE IP Transit Prices & Three Year CAGR Decline in Major Global Cities, Q2 2018). In Q2 2018, the 10 GigE IP transit in Sydney was 13 times the price in Los Angeles, largely due to the underlying cost of transport across the Pacific to access global Internet hubs. In remote locations with limited bandwidth utilization and competition, such as sub-Saharan Africa and remote island nations, unit prices extend far higher than global hubs (TeleGeography , 2018).

6.2.3 Quality of Service (QoS)

Generally QoS can be defined as follow; the capability of a network to provide a better service for a selected network traffic by either raising the priority of a flow or limiting the priority of another flow. Therefore ISPs have the possibility to increase their profitability and their efficiency of their network. Although since it is not distinct legally how much QoS is too abusive, this leads to one of the key questions in NND how much network management ISPs can legitimately use on their networks (Krämer , Wiewiorra , & Weinhardt , Net neutrality: A progress report, 2012). In the Ovum's inaugural survey of the fixed broadband industry of 2015, conducted by Nicole McCormick one finding was that QoS is vital for fixed broadband. "Quality of service is a must." (Mc Cormick, 2015, S. 2). It has escalated as a priority for fixed broadband players in the wake of higher demand for HD video services and OTT competition. Almost 40% of respondents said QoS was "the most important differentiator," followed by speed as illustrated below in figure 16," followed by speed.

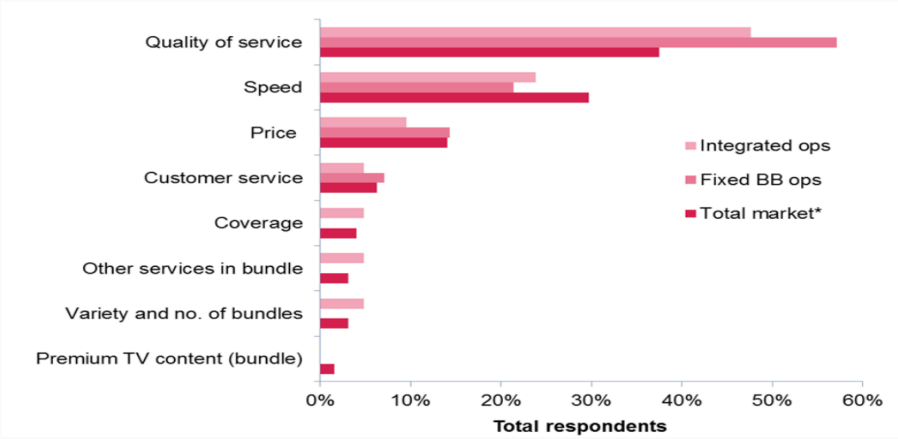

Figure 13: Most important differentiator in the fixed broadband market

Source: Ovum`s Global Fixed Industry Survey of 2015, conducteed by Nicole Mc Cormick

6.3 Internet Ecosystem

In this section the analysis will focus on the Internet Ecosystem. As observed during the interviews and presented as the first part of the third main observation "**New player entering the Internet Ecosystem…".** This section tries to illustrate this particular entering of new players in the Internet Ecosystem. Herby the reports from the institution IDATE research "Digital Economy 2025 -The future of Telecom and Internet ecosystems" and "Digiworld Yearbook 2015" are being used for the analysis. Lastly the important stakeholder will be identified, due to the analysis before combined with the literature framework.

6.3.1 New Powerful Players – Internet Giants

The telecommunication industry is certainly not the only sector likely to undergo a profound transformation over the decade ahead. The Internet industry, too, has a track record of rapid change and the rapid ascension and decline of service providers. Yahoo!, MySpace and AltaVista are just some of the examples of companies which have been boosted into fame at some point in time and are today either struggling with irrelevance or out of business, as in the latter. Yet, despite the potentially quick rise and fall of Web services and applications, the leaders of the Internet arena are now a rather well established group of players. 'GAFA' for Google, Apple, Facebook and Amazon was coined as far away as mid-2011, indicating that these four companies have already been global for about half a decade already – a time-span which seems quite long for the Internet industry. The French financial newspaper Les Echos noted earlier in 2015 that the combined market cap of the GAFA exceeded that of the entire CAC40, the leading French stock index. Dislodging these players may indeed be a difficult task for rivals, not only because they so dominate their respective core businesses but also

because each player in the GAFA is pursuing aggressive M&A policies. In this way, not only are they diversifying their capabilities and expanding the volume of data they have access to but, to a certain extent, they are also trying to prevent the risk of being made redundant by new competitors (Pennings , 2016).

From today's perspective, challengers for the incumbent Internet giants (GAFA) seem to be most likely to arise from two distinct sources, namely the group known as "NATU", which is derived from Netflix, Airbnb, Tesla and Uber, The NATU group comes from very different backgrounds to those of the current GAFA leaders. However, companies from both groups will compete head-on in a number of key markets. The outcome of this competition will determine, to a significant extent, which companies will be the leading Internet players in the future years (Pennings , 2016).

A good example of a threat for telco could the Internet giant Google, which has initiated itself as an ISP with Google Fiber. Launched in 2012, the fibre project is focusing on future network. In early 2015, Google is said to have 30,000 customers but in the end the Internet giant aims to cover around five million homes. Google has a similarly strong interest in mobile networks with its project Google Fi, where the giant positions itself as a MVNO (Pennings , 2016). Another example is that project Facebook and Google where the both Internet Giants are working on airborne Internet solutions to provide coverage via data transceivers flying at high altitude for rural areas (Bonneau, 2016). One of the reason is that, the telcos and IT companies cannot satisfied their needs anymore of those Internet giants and therefore they Build out their own IT infrastructures, and even their own network, around the cloud and datacenters, CDN (IDATE research , 2015). Internet giants are now going well beyond the traditional field of information and communication technology, with initiatives addressing payment, food retail, automotive, energy and healthcare, to name but a few. As shown in the example above, Google has expanded – and will doubtless continue to do so – into various verticals, but has failed in many. This leaves major uncertainties on the capacity of telcos and Internet players to operate in verticals. There, business models are very different, leading to trade-offs for the players involved, in terms of positioning within the ecosystem (Bonneau, 2016) & (Pennings , 2016). This new stage in the development of the digital ecosystem will be a veritable revolution, with the development of connected things and the collaborative economy. With connectivity, and delivery by a multitude of technologies (especially 5G), it is the very nature of the product that changes. For instance connected cars pave the way for the autonomous car, while connected health equipment enables the development of remote home care and monitoring of patients with chronic ill- nesses. There

will be more and more products that are worthless without connectivity (IDATE research , 2015).

6.3.2 Upcoming Power Shifts Possible Scenario

This new wave will reshuffle the deck and force a rethink of business models in traditional sectors. The ability to cut costs due to productivity gains is still valid. However traditional businesses have to contend with the threat of being cut out of the loop, particularly those operating in sectors that are more B2C oriented. The Internet giants (especially the GAFA group and in the future also NATU group) will be able to leverage their central positions in a handful of services, in terms of user traffic, and/or hugely popular devices to position themselves as customer relations platforms, covering all segments, and so extending well beyond just digital products and services. At the very least, this allows them to reap the rewards of the intermediary, if not to build a complete vertical business, capitalizing on their existing customer base. Pioneer initiatives in this direction are already many and growing, for instance the Google Car, Android and iOS in cars, diversification into the grocery business (Google and Amazon) and health products (Google and Apple), and digital wallets from virtually everyone – all these are typical. Vertical market leaders will therefore need to choose between partnering with these firms, to reach their commercial targets. Another possibility would be, trading their margins for a larger customer base in order to compete with them (GAFA & NATU group) directly (IDATE research , 2015). However at the meantime due to the vertical integration of those Internet giant into business the network requirements will significantly change and increase. Herby for instance the connected health care or connected car are some areas, where telcos will need to meet the new network requirements of the Internet Giants but can also seek new opportunities by competing or co-working with the Giants. For the case of connected healthcare includes a variety of new products and services, assuring the right information delivered to the right hands at the right time. Here the networks need to perform with very low latency and congestions in the network, would actually be significant degrease of quality in service. Through connected devices and care delivery platforms, patients and doctors are connected within healthcare systems in a continuous manner. Right now the initiatives by the Internet giants and device makers are mainly user- and patient-facing. They play a key role in intermediating device-generated data, such as Apple HealthKit (Bonneau, 2016).

The biggest value will be generated from care delivery platform, however IDATE estimates that the global connected installation base, which includes both connected healthcare

wearables and medical systems, will grow from 29.5 million units in 2014 to 91.6 million units in 2020, at a CAGR of 20.8% over this period (Bonneau, 2016). In case of the connected cars even more players are involved, which challenges the telcos even more. A 'connected car' is a car equipped with access to the Internet (the network of networks), whereby it can communicate with the outside world. This allows the car to share Internet access with other devices, both inside and outside of the vehicle. The figure below illustrates the entire automotive value chain including the main players. The essential players are car manufactures, connectivity providers (telcos) and platform providers with service providers (Internet Giants). Herby the telcos are essential acting so far and only as suppliers, which means that leading players are indeed OTT (mainly the Internet Giants) and car manufacturers (Bonneau, 2016) & (IDATE research , 2015).

Figure 14: Value chain of the connected car market

Source: IDATE DigiWorld, *Connected cars*, November 2016

For Internet players, the strategy is clear, but can differ dramatically among them. Generally the automobile is an additional connected device just like smartphones, tablets and laptops, which definitely needs to be addressed. However, Apple and Google do not really have the same approach here. Indeed, whereas Apple aims to introduce its technology to interface with its products, Google is promoting the embedment of its technology into the car as a regular device. Therefore could collect data and provide very accurate advertising. On the other hand for telcos, connected cars are seen firstly as an additional significant traffic increase. However connected cars can be seen as a business opportunity, where providing mobile connectivity to the vehicle can be a key business opportunity for telcos. But they also face competition with

OTTs to offer platforms, through which they can provide enabling solutions to automotive makers (Bonneau, 2016) & (IDATE research , 2015). According to IDATE research on the market side, by 2021, 498 million automobiles will be connected. This represents a 35% CAGR, since around 81 million were connected in 2015. Europe is expected to benefit from a 32% CAGR to reach 114 million units in 2021, mainly driven by the eCall regulation, entering onto market by end March 2018 (Bonneau, 2016)

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6.4 Innovation and Technology

6.4.1 5G

The next-generation technologies that are currently being, or will be rolled out, will allow improvements in the performance of telecommunication: some are currently in development and are usually the evolution of an existing communications protocol. 5G will be rolled out in the next few years, with first trials already announced for 2016. It is set to progressively replace such former cellular technologies as 2G/3G, and provide more bandwidth. The mobile technology will probably remain available for a long time yet as 2G is still available in the majority of countries (Bonneau, 2016). The implementation of 5G, enables various innovations, which are presented in the following section. The second main finding during the interviews, reads as follow:

II. 5G is seen as potential opportunity/threat scenario. However it is sure that it will have an impact on the position in the NND, because the things connected to the Internet will increase and therefore the data traffic. This causes network additional congestions.

As 5G is inevitable and is already deployed by almost every big telco corporation globally, the research will exclude this finding. The reason for it is that this particular technology is already included in the corporate strategy and additionally cannot be used anymore in order to create an innovation strategy. However the other vital point to exclude 5G is that, the implications of it, for instance Iot relates applications or M2M applications are already subject of the research and therefore the 5G aspect is included. Therefore to not bee redundancy, the second main finding will be excluded.

6.4.2 M2M

M2M is not, itself, a technology, but rather a logical combination of different technologies based on electronics, telecommunications (as with SMS and Internet) and computing (information systems), all of which makes it possible to build new services. M2M solutions allow a central server (operated automatically or manually) to communicate with a group of distant machines, via a private, public or operated network. The purpose generally is to

capture data that is stored on the machine and/or to send data to alter the state of the machine (Bonneau, 2016).

The majority of M2M applications are designed for generating substantial savings in the B2B context. The M2M market by segment, as illustrated below in table 3, main objective is to be able to collect existing data, which had previously been collected manually, in a more automated, efficient and sophisticated way. Therefore sustainable improvement on data collection can be reached. The value of M2M lies therefore on managing those new data streams and to use them for the future. The biggest deployments thus involve traditional IT integrators, using M2M building blocks supplied by telcos and module suppliers (IDATE research , 2015).

M2M market segmentation are below illustrated in table 3.

Market	Description of possible service /example of applications /business impact
Security	• All kinds of surveillance or alerts applications • Abnormal situation detection
Energy	• Remotely collect data on flow rate, pressure, AMR temperature, tank level and equipment status as an alternative to manual applications. • Improves data collection • Improves Energy distribution (pipeline surveillance)
Transport	• All kind of tracking applications (live tracking) • Telematics services (tracking application) • Emergency alert application on vehicles • Fleet management Improvements
Commerce	• E-payments • Virtual wallet solution
Automotive	• Customized insurance rates (as data could indentfy between dagerous and save drivers) • Telematics services • Pay-as-you-drive' model • Remote diagnostics (in case the car is broken in the middle oft he street)
Home Automation	• Remote applications for surveillance applications or energy management • Smart home
Healthcare/ Wellness	• Essentially dedicated to patients in order to track everywhere for instance the blood pressure or glucose level

Table 3: M2M market segmentation

Source (Bonneau, 2016)

In 2014, the global M2M market represented 230 million modules and 28 billion EUR in revenue, of which 6.9 billion EUR for connectivity. In 2013, market value grew by around 10.7% and market volume by 30%. In 2012, Asia-Pacific was the biggest M2M market, ahead of Europe, largely thanks to the explosion of the Chinese market, whereas Europe still led the way in terms of revenue. Between now and 2020, average annual growth is expected to reach more than 13% in terms of value and 26% in terms of volume, for a global market of 45.5 billion EUR and 573 million modules by the end of the period (IDATE research , 2015).

As of today pioneer applications are mainly notably in security and the remote management of production machines. However those applications are reaching their maturity.. The utilities market is considered one of the most promising, forecast to over- take consumer electronics by 2019 and accounting for more than a billion models, all technologies combined. The automotive sector is also booming, buoyed in particular by regulations in various parts of the globe, as with eCall in Europe. Other markets that are equally promising, especially in terms of volume, are expected to take off further down the road, such as eHealth, a market where a number of obstacles are presented, because of regulation issues (IDATE research , 2015)& (Bonneau, 2016).

6.4.3 Internet of Things related innovations

6.4.3.1 Connected Health Care

The healthcare sector could be one of the prime beneficiaries of the digital transition. Digital technologies make it possible to address some of the industry's biggest issues, including the ability to reduce medical errors or treat better chronic illnesses. It encompasses a variety of new products and services, ensuring that the right information delivered to the right hands at the exact right time. As of connected devices and care delivery platforms, patients and funders would be connected within healthcare systems in a continuous way (IDATE research , 2015) & (Bonneau, 2016). The main objective of connected healthcare is to optimize the using of limited healthcare resources, in order to decrease significantly expenditure for healthcare organizations (hospitals), providing a flexible and efficient care for patients, and at the same time increase the care outcome and therefore general health conditions (Bonneau, 2016).

Segmentation after broad application categories:

Categories	Definition/Comments
Telemedicine and remote monitoring	Telemedicine, as one of the widely developed services, allows remote interactions between care givers and patients via connected sensors, mobile devices and service apps. Those services are mainly for the elderly or patients with chronic diseases, and those having inadequate access to healthcare services, e.g., people in rural areas. Remote monitoring enables many benefits that cannot be achieved before, since a variety of vital signs (e.g., blood glucose and ECG) can be collected and passed to healthcare professionals. For professionals, the analytics based on the continuous datasets support clinical decisions; for patients, they can get timely alarm and aid before diseases appear, as well as advices on how to improve overall health conditions.
Healthcare apps	The tools can be websites, software or mobile apps, which can be patient-centric or tailored for healthcare professionals. On the side of healthcare professionals, there are dedicated social networks, which allow the exchange on healthcare knowledge and such topics as healthcare reform or politics. Besides, they are increasingly using apps for scheduling and practice management, as well as for collaboration among physicians, nurses and other care teams.
Home care and silver economy	The silver economy concerns the care-taking of senior citizens, or "aging-friendly". It spans from eHealth, active aging, to senior tourism and age-friendly housing. Specific to ehealth, improving health conditions and the longevity of seniors is at the centre of silver economy. Aging-friendly related initiatives cover the monitoring of living conditions, security, as well as senior health evolution, chronic disease management and event alerts (e.g., when falling down). On top of that, home-based care and social services, such as nursing call centers and home-care delivery teams, will also be considered as part of the silver economy.
Customized medicine	It may accelerate a new era of medicine delivery that takes into account individuals' health history, genes, environments, and lifestyles. Technology is at the heart of the shift to customized medicine - the industry demand of Big Data and analytics are on the rise.

Table 4: Connected healthcare Segmentation

Source: (Bonneau, 2016)

Even though the giants from other sectors are stepping in, medtech companies still maintain their very strong position in the connected healthcare realm, with comprehensive offerings covering full blocks of the value chain. Business customers such as hospitals, physicians and doctors have still others focuses. In addition the business model of connected healthcare markets remains rather unclear. Coverage policies are not defined yet. Further, neither the social system nor the insurers are ready to cover or reimburse the telemedicine and tele-assistance solutions, particularly in Europe (Bonneau, 2016). Especially, data privacy and ethical issues are the main difficulties for further development of these new health- care industry solutions. The medical field is subject to a great many regula- tions and protocols when it comes to data collection (IDATE research , 2015).

6.4.3.2 Connected Cars

One common definition of connected car reads as follow: "…connected car is a car equipped with access to the Internet , whereby it can communicate with the outside world. This allows the car to share Internet access with other devices, both inside and outside of the vehicle." (Bonneau, 2016, S. 80)

Segmentation by applications available on connected cars:

Categories	Definition/Comments
Telematics	This combines the power of computers and computer systems with remote communications technologies (such as GPS, wireless or cellular) to remotely obtain information about vehicles. Users can unlock their cars, check the status of batteries on electric cars, find the location of their car, or remotely activate the air conditioning. It mainly relates to driver assistance services and also includes emergency call services.
Infotainment	• Information-based media content (entertainment) • Includes also telematics and more advanced tools. • Applications are related to mobile applications.
Emergency calls	It makes use of black-box hardware installed in vehicles to wirelessly send information on airbag deployment and impact sensors, together with GPS coordinates, to local emergency services. Numerous regulations have been introduced across the world. In Europe, 'eCall' is a project of the European Commission designed to bring rapid assistance to motorists involved in a collision anywhere in the European Union.

Pay-as-you-drive insurance	Type of insurance whereby the costs of motor insurance are dependent upon type of vehicle used, measured against time, distance and place.
Security	This refers to the services provided in the case of car theft, through embedded vehicle- tracking systems, as provided by (luxury) car manufacturers.

Table 5: Connected cars Segmentation

Source: (Bonneau, 2016)

(Bonneau, 2016)

Regarding the market side, according to IDATE report "Next Gen Telcos: New telco economics by 2025" it is estimates that by 2021, 498 million automobiles will be connected worldwide. In 2015, there were around 81 million cars connected. In the future (2021) it is forecasted that Asia will have the leading position in the connected car market, reaching over 215 million vehicles. At the same time Europe is forecasted with 114 million units in 2021, mainly due to eCall regulation, which was introduced to the market by end of March in 2018. Additionally the report of IDATE forecasts that the connectivity revenues (the revenue that telcos made) will be around 3.36 billion EUR in 2021. In comparison in 2015 only the connectivity revenues were 581 million EUR. Connectivity revenue includes the direct connectivity through embedded systems (telco network) but also the indirect revenue related to smartphone usage. The major issues to be raised here are on the real willingness of the user to pay for such additional services. To encourage users to subscribe, telcos and manufacturers are already contemplating different revenue models including share plans (Bonneau, 2016).

Lastly, new business opportunities are emerging with connected cars in the automotive industry. As automotive is one of the most promising industries managing large amounts of data, data monetization of connected cars becomes the top opportunity for various stakeholders, as for instance for the insurance company. Analysis of data, regarding customer expectations, driving experiences or driving behavior could deliver new services, allowing optimized customer relationships and engagement (Bonneau, 2016).

6.4.3.3 Smart Home

As part of the Iot (Internet of Things), this new innovation encompasses everything in a household that can be potentially connected. Basically, all home devices are equipped with connectivity module that can be controlled remotely through a mobile app. However the smart home is really broad (Bonneau, 2016).

The scope of smart home generally covers following applications/services:

- Energy management and climate control systems (sustainable cost savings for customers)
  Security and access control systems (increases the security level of the house significant)
- Lighting remote control
- Windows and doors remote control
- Home appliance control systems
- Consumer electronics

(Bonneau, 2016)

The market is starting to gain traction amongst consumers. Typically, consumers are ready to purchase smart home devices if they generate cost savings related to energy management or security applications (Bonneau, 2016).

The smart home market is perceived as a growing market with more and more consumers being attracted to purchase a smart home system, but growth is still limited as it is focused on specific applications. Indeed, consumers will start by acquiring one piece of smart equipment before adopting a whole smart home system. Typical first devices to be adopted will be linked to energy management and security and safety systems including smart thermostats and connected alarms. In terms of market structure, it can be observed that the market involves various players from different industries, as illustrated below in figure 14. However the main field of competition is been predicted to be on the platform and services side, as all players want to play the gateway/integrator role, which will be the central key role. Through this position, the player will be able to process all data. To do so, all of them are device-agnostic and are multiplying their partnerships with the (same) device manufacturers (Bonneau, 2016).

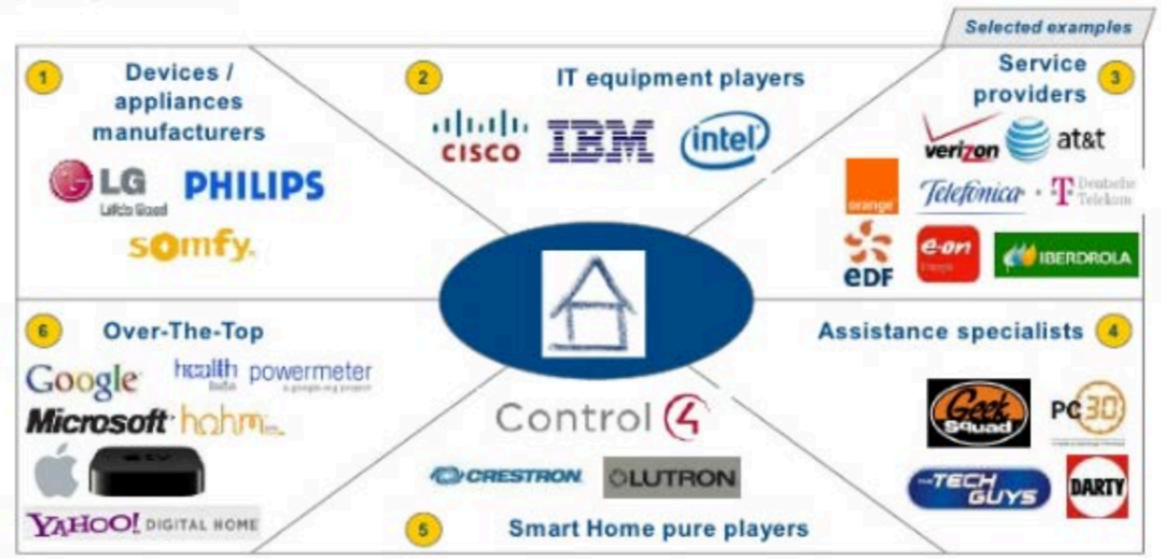

Figure 15: Smart Home competition environment

Source: IDATE DigiWorld, Telcos' Connected Objects Strategies, April 2016

The smart home market of today is characterized by the presence of a full raft of players already, both as household equipment providers as well as new players. They have different positions depending on their scope and openness of their products towards third parties. There are indeed still no dominant player in this market, which remains very fragmented and may be captured by players capable of acting as integrators and providing face-to-face services in addition to digital services. Telcos could benefit from this relatively open market (Bonneau, 2016).

6.4.3.4 Wearables

This particular invention referees to a gadget (like a watch), which is connected through a smartphone. Hereby the smartphone could be required to read and display the information generated by the gadget, such as temperature and pressure. Object manufacturers mainly dominate the market of wearable. As for instance, the smart watch market is much consolidated as three main vendors (Pebble, now part of Fitbit, Sony and Samsung) now accounts 85% of the total market. At the same time connectivity players (like telcos) are absent from this market for now, even though they are looking at business perspectives, at least in terms of volume. Lastly, the the rport of IDATE concludes that the market of wearables is a niche market in the short term, and even in the medium term. While wearables are hitting the headlines at present, their adoption rate still remains very limited (Bonneau, 2016).

6.4.4 Softwarised Networks

As already described in the interview section of the research, this particular technology will have an sustainable and significant impact on telcos network management practices but also on the cost side.

The idea behind is to use software to centralize control over the entire network hardware, and to create a network, which is much easier to program (Bonneau, 2016). Herby the technology is moving the entire telecom architectures from a hardware- to software-based network infrastructure. Therefore networks resources can be optimized and intelligence injected into the system. This not only allows higher programmability, which will improve network management practices in a much more sophisticated and efficient way. Furthermore it provides improvements in operations performance, increases opportunities for new business

and reduces CAPEX and OPEX in the long term (up to 50%). To adopt this innovation, telecom corporations have to renew or change their entire network equipment. This ‘migration’ induces important investments and Capex, and cannot be done on a ‘one- shot’ basis. The adoption has therefore to be done gradually, and these barriers currently form the major uncertainty for the massive adoption of this particular innovation. That said, the rollout still has to be done quickly, and on a large scale, in order to see the benefits of the network virtualization (Bonneau, 2016) & (Pennings , 2016)

7. Discussion & Conclusion

Which innovation strategies one top tier big European telco corporation could use to overcome some of the current problems and therefore reinforce their position in the European NND?

The research wanted to find out which innovation strategies / concepts can be used to overcome some current problem and therefore additionally reinforce their position in the European NND.

During the interviews but especially during the analysis part, following current problems of big European telco corporation were identified:

- New Players entering the connectivity and Internet market. Therefore a sustainable increase in competition is occurring.
- Stagnation in total revenue.
- Lack of new revenue streams for big telco corporations.
- Profitability is decreasing, mainly caused by high investments in high performing networks and at the same time not a sustainable increase in profits.
- Overall traffic increase during the last years, which are challenging current network capacities.

Additionally to the current identified problems of big telco corporation, the main findings of the interviews read as follow:

I. Network management could be improved by virtualization of the network. Therefore not only current congestion in the network could be solved partially in a more sophisticated and efficient way.
II. M2M could turn into opportunity or threat scenario. On one side it can negatively impact the network traffic, due to missing network capacity, which will cause additional congestion in the network. However on the other side, it may create new revenue opportunity and therefore increase the overall telsco's sales.
III. New player entering the Internet Ecosystem. Not only competition rises, furthermore the performance requirements towards the network are changing (current applications had completely different network requirements than 10years ago).
IV. Type of products connected to the Internet will change and increase. (especially wearable, or IoT- related applications).

7.1 Discussion and Conclusion of Results

In this section the main observations during the interviews and during further research, which was done in chapter 6.analysis are been presented and discussed. At the same time it will be brought in perspective of current theories, which were presented at the beginning of the thesis.

7.1.1 Softwarised Networks

I. **Network management could be improved by virtualization of the network. Therefore not only current congestion in the network could be solved**

Generally, during the analysis it was observed a enormous increase in data traffic and it is expected to grow, even more, in the near future (Kemal & Sims, 2018). As described in section 6.2 Network Traffic, video dominates the total traffic, thus the content providers (CPs), who provide streaming services are the main distributer, offering exclusive content for the customers. Especially for the European market, where streaming video on demand (SVoD) is significantly present and used by the consumers. It accounts for 64% of all VoD services in Europe. One of the dominant players is Netflix, which has a well-established position in the European market. In 2017, almost 30 million subscribers in the EU28, by 2023 it is expected to reach 55 million subscribers (Statistika , 2019). VoD services consume far more bandwidth than any other available service. High definition (HD) video consumes 19 times more bandwidth than music streaming (Kemal & Sims, 2018). Another Internet application, which is increasing by subscribers and data traffic, is Social Media. A staggering percentage of 42% of all individuals in the EU 28, from 15 years up, are using social media on a daily basis. Clearly, this also has an impact on the data traffic caused by these sites (Statista , 2018). The content shared on those social media platforms is becoming more graphic, which leads to a significant increase in bandwidth data traffic demand around the world. In 2013, 250 billion photographs were daily uploaded, on Facebook alone (Detecon International GmbH & EMERG, 2016). This significant high traffic is mainly caused currently from extensive usage of OTT Communication services and applications, mainly driven by the combination from the enormous subscriber base building communities across borders from the CPs and the high data volume usage during content consumption. Therefore, the big telco corporations are investing heavily in their networks, while market competition obligates telcos to lower their broadband prices. Evidence herby is on one hand, the revenue's share devoted to reinvestment, which is rising over the last

couple of years (Bonneau, 2016). On the other hand, the shrinking EBITDA margins, which is partially caused by the lower prices and higher cost (Bonneau, 2016) & (IDATE research , 2015). This particular finding can be described in image 8. The European regulator only tries to optimize network management practices throughout information transparency (Detecon International GmbH & EMERG, 2016) & (BEREC-Report , 2012). Moreover the European Commission partially forces big European telco corporation to invest in their networks, in order to be in alignment with the "Digital Agenda" presented by the European Commission and to reach the coverage targets and the network performance targets (BEREC-Report , 2012), but it needs to be mentioned that the European Commission provides some of its public funds, via different instruments to invest in broadband infrastructure (The European Commison , 2019).

Hereby the virtualization of the network could help the telco corporation by moving from hardware to a software-based network infrastructure. The benefits of this particular innovation were discussed in the section 6.4.3 Softwarised Networks in detail (increase of network management efficiency and sustain cost reduction for network infrastructure). According to Clayton M. Christensen this particular innovation can be categorized as sustaining innovation. Because after his definition sustaining innovations are the ones that only improve the performance of already established products, services or processes, which is here the hardware network itself (Christensen , Exploring the Limits of the Technology S-Curve. , 1992) & (Christensen, The Innovator`s Dilemma , 2000). Additionally O'Reilly and Tushman are adding that companies should aim to exploit and pursue sustaining innovations in their existing products, to operate more efficiently and deliver greater value to the customers (O`Reilly & Tushman , 2004). Including this theory in our thought, it become clear that big European telco corporation should enhance and incorporate innovation of virtualization of the network in their current organizational structure and in their overall strategy. Not only because it could improve the current network management practices and therefore strengthen the position in the NND, furthermore it will enhance the overall efficiency of the telco corporation by saving cost and delivering connectivity in a more sophisticated way.

Hereby it has to be said that the European regulator does not subsidize any further rollout initiatives towards to the network infrastructure virtualization as it subsidizes investments initiatives in high-speed broadband (The European Commison , 2019).Consequently the big European telco corporation could not expect support implementing this particular innovation.

7.1.2 M2M

II. M2M wither opportunity or threat scenario possible. On one side it can negatively impact the network traffic, due to missing network capacity, which will cause additional congestion in the network. However on the other side, it may increase revenues for the telcos.

This particular innovation has the potential to create new business services for the big European telco corporations. Therefore new revenue streams could be created and at the same time an increase in revenue in the mid-term could be occurring. Consequently on one side this would counteract the current situation of revenue stagnation, but on the other side it would strengthen the position in the European NND for the telcos. Especially the last point, because it could create additional revenue. This new profits could be used to reinvest in network infrastructure, aiming to avoid current and future network congestion, to avoid continuous network managements (which may violate against current European NN laws) and to increase current network capacities.

The fact that with M2M completely new products but especially new services are created, makes it a good representative for disruptive innovation according to Clayton Christensen (Christensen , Exploring the Limits of the Technology S-Curve. , 1992). M2M application can be used in various markets, as illustrated in table 3. By choosing for instance the lean start-up method from Owens and Fernandez, the big corporation would have the possibility not only to innovate efficiently, furthermore they would gain important insights and knowledge of M2M applications in general. Afterwards they could evaluate the market segments by size, potential and company fit (Owens & Fernandez, 2014). In the last step the big European telco corporation could choose one of the proposed strategies by Ownen and Fernandez (incubation, acquisition, investments or partnerships) , in order acquire the needed knowledge and to launch the innovation (Owens & Fernandez, 2014). Looking into the market, it can be observed that there are two most common strategies chosen by the telco corporations. The first is through partnerships, especially through joint ventures. In this particular strategic approach two or more players from different industries are coming together for a common objective (Owens & Fernandez, 2014). For instance; Orange and Veolia Water launched the smart metering program “m2o city”, helping to pave the way for the emergence of a global standard for remote data collection networks. The other common strategy is through

acquisitions; hereby the key advantage is that the new innovative solutions can be adapted better in the entire corporation strategy (Owens & Fernandez, 2014). A good example would be Vodafone thus purchased telematics giants Cobra Telematics, specialized in M2M applications and services for the automotive market (Bonneau, 2016).

7.1.3 Internet of Things related innovations

III. **New player entering the Internet Ecosystem. Not only competition rises, furthermore the performance requirements towards the network are changing (current applications had completely different network requirements than 10years ago).**

IV. **Type of products connected to the Internet will change and increase. (Especially wearable, or IoT- applications).**

In general, the big top tier telco corporations are facing an overall rise in competition. Different players from different industries are entering the connectivity and Internet market, especially the Internet giants as described in 6.2 Internet Ecosystem. Those new players are causing vertical integrating in different industries, like healthcare or automotive industry. Hereby on one side the Internet giants (Google, Facebook …) are increasing their market presence and consequently also strengthen their market power and position (Pennings , 2016). Those giants are acting aggressively on the market, mainly throughout acquisition. Therefore it can be observed that the demand in high performing networks is increasing significantly. Additionally due to vertical integration, new network requirements are established, for instance the health care industries has totally different requirements and needs than for instance the automotive industry (Pennings , 2016) & (IDATE research , 2015). This could cause that those Internet giants establish their own network infrastructure, to ensure high quality of service and to meet the new requirements. Google is already partially doing it with Google Fibre (Pennings , 2016), as explained in 6.2. At the moment those own built infrastructures by the Internet Giants are used primarily for in-house needs (IDATE research , 2015).

As demonstrated and illustrated, in section 6.2 Upcoming power shift, the vertical integration market development does not only create new network requirements towards connectivity providers (telcos) or increases the overall competition in the market. Furthermore in combination with the invention of IoT applications, a significant amount of innovative

products and services are created. Those innovations may have a negative impact on the overall data consumption on one side. However on the other side those new available innovations can be an opportunity for the big European telco corporations, in order to create new services for current and new business units and therefore create new business opportunities in general. Consequently this would counteract current revenue developments for the telco corporations. Hereby the telcos could reinvest a certain percentage of the new gained profits in new network infrastructure enhancing projects. This would increase not only the capacity and performance of the network (which may be needed due to the new innovative services and products offered). Furthermore it would strengthen the position in the European NND. As the telco corporations are claiming that network infrastructure should be partially paid by the CPs, which clearly violates against European NN- laws. Within this strategic approach, those new services and products offered to the market would partially paying for those infrastructure-enhancing projects.

In addition to this, the paper of "Network Neutrality and Congestion Sensitive Content Providers: Implications for Content Variety, Broadband Investment, and Regulation" of Jan Krämer and Lukas Wiewiorra" underlines the advantage, which telcos may gain to reinvest in their networks. Due to the increase in network capacity, it encourage companies to develop new innovative but congestion sensitive services, which reflects automatically in an additional overall increase of demand in connectivity (Krämer & Wiewiorra , Network Neutrality and Congestion Sensitive Content Providers: Implications for Content Variety, Broadband Investment, and Regulation , 2012).

Connected Health Care

In case of connected healthcare, the introduction of three horizons of innovation of Banghai, Coley and White of 2000 may help to identify better the type of innovation. As in some cases, there are innovations that cannot be categorized according to Clayton Christensen (Baghai, Coley, & White, 2000).

The connected health care market is likely to grow rapidly in the future, as for instance the IDATE report forecasted that connected services will increase between 2016 and 2022, from around 5 million EUR to around 18 million EUR. Meaning that the market will increase by a compounded average growth rate (CAGR) of 24%. Another evidence this market is growing rapidly is the number of devices connected to connected health care, which rises from around 30 million in 2016 to over approximately 92 million new devices connected to health care. This accounts a CAGR of around 21%. As for the definition of Banghai, Coley and White,

this particular innovation (connected health care and all included services, products and applications) can be categorized as the second horizon. This implies that the telcos take attention on this current innovation development. If the big telco corporation evaluates this innovation as vital for their business, it shall develop new skills after the theory of the three horizons of innovation (Baghai, Coley, & White, 2000).

However as mentioned before in section 6.4.2.1 medtech companies still maintain their very strong position in the connected healthcare, with comprehensive offerings covering full blocks of the value chain and with a lot of innovation power (Bonneau, 2016). Despite this fact, telcos are active in this promising market and are evaluating connected healthcare as an essential part of their IoT strategies. It is naturally that big telco corporations hold advantages in connectivity and data capabilities, thus widely partnering with industry players—notably especially with hospitals and governments. For instance, Orange is the first telecom operator recognized by the French Ministry of Health for the hosting of private medical data (Pennings , 2016).

In the short to middle run, the telcos' positioning does not seem to radically change. Connectivity and data securing and management will still be their strength and can offer some competitive advantages. Further, telcos can play a key role in the connected health care as the system integrators and providers of network. Telcos will be able to offer critical connectivity and enhanced security with 5G and other innovative technologies, with limited opportunities for competition from other stakeholders. Nevertheless, the power of telcos in other areas remains very limited. The entry barrier is very high to get involved in the R&D of medical devices, or to build relations with hospitals, healthcare professionals and patients. In addition, Medtech and the traditional health/wellness players (e.g., wearable manufacturers) have invested heavily in the emerging products and services, gradually integrating them into their existing offerings and making it difficult for telcos to push their own remote monitoring or other services in a B2C approach (Pennings , 2016).

Connected Cars

As described before with connected health care, the categorization after the three horizons may be more precise and better. It can be concluded by choosing this particular theory, that the innovation of connected cars is in horizon 2. As the market will growth rapidly in the future, as the number of cars connected is forecasted to increase from 81 million connected cars in 2016 to around 550 million cars in 2022 (Pennings , 2016). In case that the big telco corporation is evaluating this innovation as vital for the core business, they should start initialing resources and to develop needed knowledge (Baghai, Coley, & White, 2000).

For the big European telco corporations, the revenue opportunity of connected cars could be interesting, since connected cars will generate traffic that telcos will charge, either directly or, in most cases, indirectly (through the automobile manufacturer. In a context where their traditional mobile revenues are flat, providing mobile connectivity in cars is a key business opportunity for telcos. However they are also facing competition with OTTs to offer platforms, through which they can provide enabling solutions to automotive makers (Pennings , 2016).

Smart Home

The smart home market is perceived as a growing market with more and more consumers being attracted to purchase a smart home system, but growth is still limited as it is focused on specific applications. Indeed, consumers will start by acquiring one piece of smart equipment before adopting a whole smart home system. Typical first devices to be adopted will be linked to energy management and security and safety systems including smart thermostats and connected alarms. According to IDATE, the smart home market was about 24 billion EUR for services in 2016 (Pennings , 2016).

In this particular case, the big corporations could use the concept ambidextrous organization by O`Reilly and Tushman in 2004. As the big telco corporation could reorganize their organizational structure, in order to implement this particular innovation in their business. Within this concept the big European telco corporation would not forget the core business (mobile, data and fix) and their core business capabilities (as connectivity), but would explore this particular new innovation and would create consequently another business line. Hereby the harmonization between existing core business units and emerging business unit could be successfully occur. It would first separate the business unit (smart home) from the other current business units, in order to develop the needed processes and structures. Within this approach it ensures that the innovation can develop freely and efficient (O`Reilly & Tushman , 2004). Although ambidextrous organizations have been proven successful, it has to be mentioned that theory presents just an idea and it lacks the practical part. It doesn`t say how companies should engage with the theory in real life, how they should balance the tension between exploitation and exploration; this is the key challenge of this theory.

Looking into the market, it can be observed a high concentration of competition. However telcos have growing opportunities in the smart home sector as a central broker role, especially

by relying on terminals for centralized management such as s home routers. The biggest obstacle with this innovation is that it is like most consumer-connected products; its value is still linked to product sales (rather than services). However, the business model may shift from high-end hardware to material with some vital services (sales of value-added services, linked directly to the devices) (Pennings , 2016).

Wearables

This innovation is neither sustaining and neither disruptive according to Clayton Christensen (Christensen , Exploring the Limits of the Technology S-Curve. , 1992). As this innovation comes in the most cases without cellular network connectivity. The telcos play only an essentially role of distributors of wearable products. This positioning on the retail trade allows them to generate margins on products developed by manufacturers. Several operators have forged partnerships with "pure players" to market the wearable device. Meaning that the telco market see them as complementary gadgets to their smartphone, allowing them to continue to sell alongside the data plans, whether subsidized or not (Bonneau, 2016).

Therefore an active role of implementing the innovation wearables in the corporate strategy makes not much sense for big telco corporations, as the main power of innovation lies on the manufactures. Because, in a short to medium term, the wearable market still seems to be led by device manufacturers. Telcos' benefits from the device selling/distribution will remain the IoT strategic aspect, rather than revenue boosting (Pennings , 2016).

7.2 Final Comments On Discussion and Conclusion

Every top tier European telco corporations have some kind of innovation departments; they are usually a display of business as usual. Those innovation units are strongly influenced and dedicated by the top management. Additionally to that, most of the time those innovation departments are not equipped enough to react quickly on upcoming trend or market shifts. Despite the fact that they are managed separately, they cannot generate a sufficient innovation flow. But **why**?

Owens and Fernandez define innovation as "… a process of discovery that has to take place before execution, for this reason also the environment has to change accordingly" (Owens & Fernandez, 2014, S. 24).

This is align with Richard D'Aveni's work, which concludes that, especially when it comes to enhance innovation strategy. The fact that company's strategy is under constant influence of the environment makes it hard for the companies to provide one standard strategy (D'Aveni, 1997). Over the years different environments changed dramatically and will still evolve more and more. According to Richard D'Aveni's classification of different environments, the European telecommunication industry before the deregulation could be characterized as an equilibrium environment. Big telco corporations and incumbents, who controlled the entire environment, characterized this particular environment. However after the deregulation of the European telecommunication market, the environment changed and can be explained by fluctuating equilibrium; where the big telco corporations with their core competencies sustain their leadership by layering and leveraging new competencies on top of already existing ones. They are mainly focusing on their current competency (connectivity) and on their current services (mobile, data and fix) by creating steady improvements. However they fail to offer breakthrough innovations (D'Aveni, 1997).

Traditionally companies focus on competitive advantage when talking about strategy, but D`Aveni with his hypercompetitive markets definition takes the alternative path. According to his definition strategy is about creating something new that destroys the competition's advantage. Most big companies first start as small innovators by leveraging innovative technology to deliver good capabilities at a low price level. Once these innovations get adopted on a bigger scale, they are the market leaders and are faced by the market that they want to protect from any new disruptions (D`Aveni, 1990).

Another fact why innovation departments of big corporations fail to generate a sufficient innovation flow is because those innovation departments are not completely separated on day-to-day working topics, not connected with unconditional cooperation of other departments. Additionally the employees of innovation departments should be extraordinarily creative, energetic and independent, in order to create certain intrapreneurship spirit (Desouza , 2011). Therefore it ensures that an innovative culture can be developed and can be sustained. Meaning to create a space inside the corporation where it is allowed to take risks and where day play by rule, “take it or leave it” are daily business (Owens & Fernandez, 2014) & (Desouza , 2011).

That kind of change requires changing various components of the company. Hereby sometimes the organizational structure itself can be the biggest barrier for enhancing innovation. In other words the organization structure can limits or prevent innovation (Henderson & Clark, 1990) & (Christensen, The Innovator`s Dilemma , 2000). Therefore instead of changing the culture rapidly, new different culture has to be created separately before integrating into the entire organization. Hereby the concept of ambidextrous organization could be one complementary solution. Hence efficient working innovation departments have to be based outside the established company; creating a separate facility. (Owens & Fernandez, 2014) & (Desouza , 2011). Additionally to this needed separation, Owens and Fernandez (2014) conclude that for big corporations having more innovation departments (innovation colonies) increases the benefit of innovation power. Each innovation department focusing on different needs, markets products, process or services (Owens & Fernandez, 2014).

7.3 Recommendation

During this thesis telecommunication industry appeared to be more complex as I initially expected.

However the research showed that the European telco market is facing some problems, regarding revenue stagnation, lack of creating new revenue streams or network congestions due to the steady increase in data traffic. This is weakening the telco position partially in the European NND. Additionally the research showed that telco failed to offer any sustainable and disruptive innovation, despite the fact that the Internet market is changing partially caused by vertical integration. According to my findings, I can conclude that structured as the European big telco corporations are today, they can hardly stay competitive against that fast changing environment, while having a strong position on the European NND. In order to change this, I believe that big telco corporations should change their innovation strategy. Herby my recommendation is the usage of a combination of the three horizons innovation model and the ambidextrous organization theory combined with the lean enterprise theory. This is also a concept, that was analyzed by Steve Blank in 2015.

In horizon 1 the companies should focus on their core businesses with their core capabilities and resources by using the same processes as they did before. Additionally using the same key performance indicators to access the business. Consequently the only innovation that is occurring in horizon 1 is linked to pricing and processes improvements (Blank, 2015). Especially in this horizon, the big telco corporation could use the technology of virtualization of their networks. This would cause a sustainable improvement in their processes.

In horizon 2 the corporation is aiming to extend their current core business (smart home could be one particular opportunity) while looking constantly for new opportunities connected to their current product and service portfolio. In my case, they would still focus on connectivity but adding other services to it. The big telco corporations could try to integrate connected cars services, connected healthcare services and especially smart home services. With those services they would expand their current portfolio. At the meantime, the big telco corporations would look into deeper topics like smart city or future mobility or industry 4.0. Especially the topic smart city and industry 4.0 could be an interesting one.

Meantime, in horizon 3, the big telco corporation should only be focused on new disruptive innovations. They would establish innovation departments (innovation colonies), which are

physically separated from the corporation. Those innovation departments should act autonomous but aiming for different topics and needs. As a result they can enjoy the freedom and have their own procedures, policies, incentives (Desouza , 2011) & (Blank, 2015). The people employed in those innovation colonies should be entrepreneurs, and they should work in small teams and that can thus respond fast. Those employees shouldn`t be under the influence of politics from the corporation (Desouza , 2011).

Importantly is the fact that horizon 2 and 3 are organized with lean start-up method. Hereby those two horizons should be connected to the rest of the company via senior managers, who have the needed commitment to act and have a clear and compelling vision of the corporation strategy (O`Reilly & Tushman , 2004) & (Blank, 2015). Additionally to that condition is that horizon 1 and 2 have support horizon 3 with their competencies, experience and capabilities. Meaning by providing customer experiences, data or even market observations (Blank, 2015) & (Ries, 2011) & (Owens & Fernandez, 2014). Furthermore when horizon 2 or 3 have generated successful innovations, those have to be implemented by horizon 1, in order increase the current portfolio and therefore generate additional revenue and in best case scenario to provide a new business line. Once either disruptive innovations from Horizon 3, or sustainable innovations from Horizon 2 are successful implemented and rolled out by horizon 1, both horizons have to start again with a new cycle of innovations (Blank, 2015) & (Ries, 2011) & (Owens & Fernandez, 2014) & (Blank, 2015).

Summarizing the recommendation: The European top tier telco corporations should be organizational organized as, ambidextrous and “lean”. They should engage with new innovations constantly and simultaneously. Ensuring this by senior managers who share a common vision and values as the corporation. Furthermore the senior managers should execute the current business while being engaged with innovations constantly. Even one step further, the entire organization has to value and embrace not only continuous improvement but also successful innovations (Ries, 2011) & (Blank, 2015) & (Owens & Fernandez, 2014). Therefore the big telco corporation could overcome some problems, which they are facing currently. Additionally they would not only increase their own innovation power and create new revenue opportunities; furthermore they would strengthen their position in the European NND, because network management, capacity and performance could be sustainable improved. However the only requirement is that teclos would reinvest their additional profits to their network infrastructure.

Limitation

Although EU market can be considered as one whole market, the analysis showed only a general approach. Furthermore by only interviewing a German top tier European telco corporation (Deutsche Telekom), which might follow different strategies and facing other problems than other European telcos. The thesis has to less data to give a fundamental and precise recommandation, due lack of data varity (other top tier telco are missing). There are big differences among national markets and among the top tier European telco corporations. Moreover the biggest limitation lies on the how the quantitative part of the research was done. The interviews should have used a clear structure and should have been recorded. As illustrates, the finding of the interview are in some ways disperse. Evidence for this limitation is that the thesis found interesting things but not connected to the research question, this is partially caused by the lack of interview structure. Another big limitation of the research is that the analysis of the telecommunication industry (in order to find out which kind of problems the industry are facing) did not follow any industry analysis scheme or framework. Consequently there are more problems that the industry is facing as indentfied.

Further Research

In this paper only the variable innovation was touched but it would be interesting if maybe other variables could solve the problems and strengthen the position in the European NND. As for instance company culture or organizational structure , or change managemant could solve those industry problems. Another interesting field for further research would be how the Euopean NND will continue, after the harmonization of N N lawas among the member states. In the future, the debate may shift to new related topics such as service neutrality or device neutrality.

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Appendices

Appendix A. Basic question list used during the interviews.

Please note that there were variations applied based on the interviewee's organization, motivation and expertise.

Questions:

1. Which factor is affecting NN at the moment in the EU 28 /Germany?
    - The acts of the governments and regulatory authorities by the member states
    - Technological developments (5G, Internet of things…)
    - Market pressure,(new entrants in ecosystem)
    - Public opinion and believes (open Internet, free speech and democratic thinking in the EU 28)
    - Others:
2. Are network enhancing practices needed? How should network management be done?
3. What are the differences in between the EU 28 and the German net neutrality regulation?
4. Do you have an opinion on zero-rating? What is you thoughts about zero-rating?
5. Will the European regulation overrule the German regulation?
6. What do you think about prioritization of services?
7. Are you in favour of charging CPs for accessing the network (termination fee)?
8. When is the NN violated in your personal professional opinion?
9. Do you observe the power shift towards big Internet players (like Google, Facebook..)
10. Do you share the same opinion that more and more players from other industries are entering the Internet ecosystem and this might cause new issues related to the NND?
11. How do you think about vertical Integration (for instance: ISPs with CPs)?

Appendix B. List of Interview partners

Name	Position	Organization
Daniel Garcia Catalan	Management Consultant	Detecon Consulting
Alessandro Murino	Business Analyst	Detecon International GmbH
Jan Schmidt	Legal Advisory	Deutsche Telekom
Mona Baden	Innovation Advisor	Telekom Deutschland GmbH
Tu Halley	IT- implementation	T-System
Individuals X	Researcher	Konsumentenschutz
Individual X	Former Research	Bundesnetzagentur
Individual X	Programme Management Unit team	BEREC

Appendix C. All available statements at glace

	European Regulator **BEREC**	ISPs- Top Tier **Deutsche Telekom**	National Regulator **BNetzA**	National ISPs **Telekom Deutschland**
Question 1: Which factors is affecting the NN at the moment in the EU28 /Germany?	• The different national laws • Need for standardized laws • Different standpoints of the European member states, as for instance the Netherlands ban zero rating but on the other hand Hungary in favor of it. •	• Technological developments, currently 5G because the rollout will be next year. This will enable a lot of opportunities for us, however at a high cost of investment. • The other point is that we observe the recent years more and more entrants, which pressure us. • The amount of connected gadgets will increase in the near future. Therefore applications, like M2M will contribute to more data traffic and could in the mid term additionally weaken our position	• Aue Bad Schelma has different uses case requirements and totally other access to the debate than for instance Cologne. • The geographic differences in connectivity and infrastructure is one of the biggest obstacles, which has to overcome and to be solved, before talking about NN. • Rural areas have a totally other access to the debate than urban areas. • Implementation of European NN regulation would mean to first minimize those geographic differences. This could be reached with an improvement of network infrastructure. • At the meantime there is a need of standardized legal framework among the member states. This in my opinion is currently the biggest factor affecting net neutrality • Lack of standardized framework creates uncertainty for all players involved.	• For us at Telekom Deutschland, where mainly three big players are on the market, the investments are really high. • For us 5G is at the moment the one of the biggest investments for the future. • It seems clear that with 5G opportunities are created, nonetheless we expect an increase in data and in usage of the Internet. • Why? Firstly it creates new business models and new applications, which have totally other network requirements. Therefore the users can access other and really innovative applications, which is good but will pressure us to deliver it at the best possible quality. Secondly the digital transformation of the Internet. Hereby shared economy has to be mentioned. Lastly connected with the digitalization it is the new entrants of giant players like google or even facebook, which weaken or affecting the debate in Germany and Europa.
Question 2:	• We are talking here only about Prioritization and restriction of a reasonable cause,	• Of course no doubt! • However we see for the entire group the need to	• Partially no, depends again where! On the country side network	• The regulator should allow more network management practices,

Are network management practices needed? How should network management be done ?	right?! • Than Yes, of course but the question is not if, furthermore to which extent. It should be reasonable, which is defined in our guidelines	maybe charge for instance specific applications and content, which uses high bandwidth. They could be charged an extra fee for accessing the Internet • But also charging the customer differently is a good solution for enhancing the network quality. • However we already have similar practice in place. With our business clients have higher priority than customers. Volkswagen or Deutsche Bahn, which are one of our biggest clients have priority in the network, in order to ensure some business activities. • Virtualization of our network infrastructure should be implemented as soon as possible. The regulator should incentivizes the telcos to virtualize their network infrastructure. Therefore we could apply more efficient practices. • But at the same time we have incorporated SDN and NFV into our plans to migrate to a new network architecture. We are more interested at the moment from a strategic point of view to incorporate NFV	management practices may not be needed. • Additionally enhancement of transparency is vital in our view. The customer should be knowing when and which services are degraded and most important why	especially in the future with this new technologies. • Another point is related point to this topic is that heavy users should be charged differently. In my opinion this entire topic which network management practices is the best, is too one sided!
Question 10: Do you share the same opinion that more and more players from other industries are entering the Internet ecosystem and this might cause	• Yes but, we see this development not as near in the future as predicted in the market. However we see this power shift more as an additional competitor trying to enter the markets • Competition is something good for the market, customer and overall for the quality of the product	• The power shift is coming. Consolidation of markets and vertical integration is happening right now! *(Showed me a picture, where the consolidation of markets is illustrated and the new possibilities, please note Appendix D for it*)	• With digitalization of the Internet, new players are coming with. it. Totally normal and this particular development is to be expected to accelerated with the integration of the new technology	• In the near future those giants will challenge us and will require high quality network infrastructure. • Not only in Germany, all over the world this phenomena will be presented.

new issues related to the NND?				
Question 11: How do you think about vertical integration (	• In favor! Will enhance innovation and at the same time it will create a competitive market environment	• "Segen und Fluch zugleich" (it is a german expression) Meaning broadly it is on one side good but in the other side bad) • New business models can be created. However competition will increase in our sector	• No comment! Only the regulator should monetize those activities, in order to prevent big corporations or even monopolies who dictate the market	• Creates new products and have the power to improve the own sustainability
Open Standards	• Need for improvements • Good thing and should be in a topic addressed by the new European legislation • European General Data Protection Regulation is already addressing this topic by obligating standardization of personal data • Long term impact of open standards is not clear, may harm innovation in the market • However enforcement of open standards, to firstly reduce switching cost for consumers and secondly to weaken a little bit the very very strong position of manufactures.	• Space of improvement, it is only partially addressed by the regulator but it should be more incentivized by the regulator. What does it mean?	• European involvement should dictate national laws and not the other way around	• In favor! Would enhance the overall situation for us and the customer
Technology Investments	• Difficult topic! We see that Telcos have a higher investment rate than other players in the debate. • However there are some action in place through some European funds, in order to subsidize the investments needed. Especially for investments concerning 5G.	• Due to increase in data and new and future possible application requirements the investments are rising and pressuring our position in the debate. • Some technologies should be incentivized much more by the regulator as it is currently the case. Hereby especially virtualization of network infrastructure. •	• No comment! Because we concentrate primarily on network infrastructure and not on technology. • However we see improvements needed in network infra structure, rather than technology. Because technology needs first good infrastructure.	• Currently very high in Germany, because the government is interested in technology, which enhances innovation • Germany is an innovator and not imitator. Meaning we and especially the German government have interest to secure and also improve innovation power to play an essential key role in the union. • However network infrastructure investments should be main focus. But for the group (Deutsche Telekom) technology investments are a really important

				component.

Appendix D. Illustration of market consolidation and vertical integration connected their possibilities.