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MASTERARBEIT

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„Enterprise Value of Cloud Computing - An Analysis from Provider's and Customer's Perspective and Challenges for a Future Development“

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IV. List of Abbreviations

API	Application Programming Interface
Bn	Billion
CAGR	Compound Annual Growth Rate
CRM	Customer Relationship Management
ERM	Enterprise Resource Management
Etc.	Et cetera
IaaS	Infrastructure-as-a-Service
IDC	International Data Corporation
IT	Information Technology
M	Million
N.a.	Not applicable
NIST	National Institute of Standards and Technology
PaaS	Platform-as-a-Service
SaaS	Software-as-a-Service
SLA	Service Level Agreement
US	United States
$	Dollar

1. Executive Summary

This master's thesis focuses on the enterprise value of cloud computing from two perspectives. Therefore, the main analysis is divided into two sections: the analysis of cloud providers, and the analysis of cloud users. The thesis starts with an introduction into cloud computing and where it came from. Cloud providers and their presence in the market are described in the first case study leading towards the enterprise value of cloud computing from the vendor's side and defining, whether there is a unique selling proposition or not. Subsequently, the thesis takes a look at the enterprise value from user's side. The development, requirements and drivers for the adaption of cloud computing are being discussed in this context and a second case study leads towards the real potential of cloud computing from user's side. Afterwards this thesis carves out the concerns on cloud computing in order to check, whether cloud computing is able to cope with them. The last chapter of the thesis provides an analysis of how cloud computing will be able to develop and improve in the future. Both sides are connected and compared to create a roadmap to handle the challenges in the way of the future development of cloud computing. Those challenges are based on obstacles, business models and the expectations of the IT industry. The research implications examine the enterprise conversion of cloud computing.

Research implication 1 suggests that the enterprise value today cannot compete with the expectations of the IT industry. **Research implication 2** addresses the obstacles of cloud computing and neglects that cloud computing will be able to handle all of them.

The scientific method to cope with the research implications is the case study. Two case studies present the value propositions cloud providers and cloud users achieved by now. The provider's section presents a look at successful vendors of cloud computing, while the user's section analyzes three outrider enterprises in

the field of cloud integration. Through qualitative data this master's thesis generates a framework of the most important achievements and objectives of enterprises, develops business models and then analyzes the outcomes.

Research implication 1 presents well-suited providers which are performing in between the expectations, but also enterprises which are only attracted by the potential and do not perform on the same level. From a user's point of view, the enterprise value of cloud computing lags behind the expectations. There do already exist well performing outriders. But the IT industry demands a broad and fast enterprise acceptance and integration, which has not happened, yet.
Research implication 2 features an analysis from both sides, too. The outcome is that the obstacles create a direct connection between customer and provider and therefore cooperation is needed to handle the obstacles.
The most important outcome is that cloud computing will never develop its full potential. There are frontiers in the development that restrict the progress of cloud computing and limit its improvement to a certain point.

2. Introduction

Cloud computing is the upcoming new hosting paradigm in the mindset of the IT industry. For the next years a step towards widespread enterprise integration and an improvement of service offerings is forecasted. But there is no agreement on the way of the exact development of cloud computing and the expected outcomes vary heavily. On top there is a lot of skepticism and mistrust from customer's side.

This master's thesis features the analysis of enterprise integration from two perspectives. A cloud provider and a cloud user analysis enable an insight into the expectations of different stakeholders. This thesis introduces a case study for every side as research tool of choice. Qualitative data leads towards a roadmap for the enterprise value of cloud computing (Eisenhardt 1989). The case studies guide towards an answer of the research implications, which are:

Research implication 1: Implemented enterprise value of cloud computing today is far behind the expectations of the IT industry.

Research implication 2: Cloud computing will not develop its full potential because of obstacles that are not able to be removed.

Therefore data on various enterprises is aggregated, evaluated and compared to scientific and journalistic literature, which presents the expectations and forecasts of the IT industry. The closure presents a description of the necessities to improve cloud computing and the effort to generate a theory of how cloud computing can deal best with its barriers and frontiers in order to create the greatest possible enterprise value (Eisenhardt 1989).

The thesis delivers an analysis of cloud computing in today's enterprises, from a provider's and a user's perspective. The outcomes of those case studies are used to prepare a roadmap for the future development of cloud computing.

The master's thesis presents extensive analysis on different areas of cloud computing. Therefore figure 1 presents the scheme and method of this thesis.

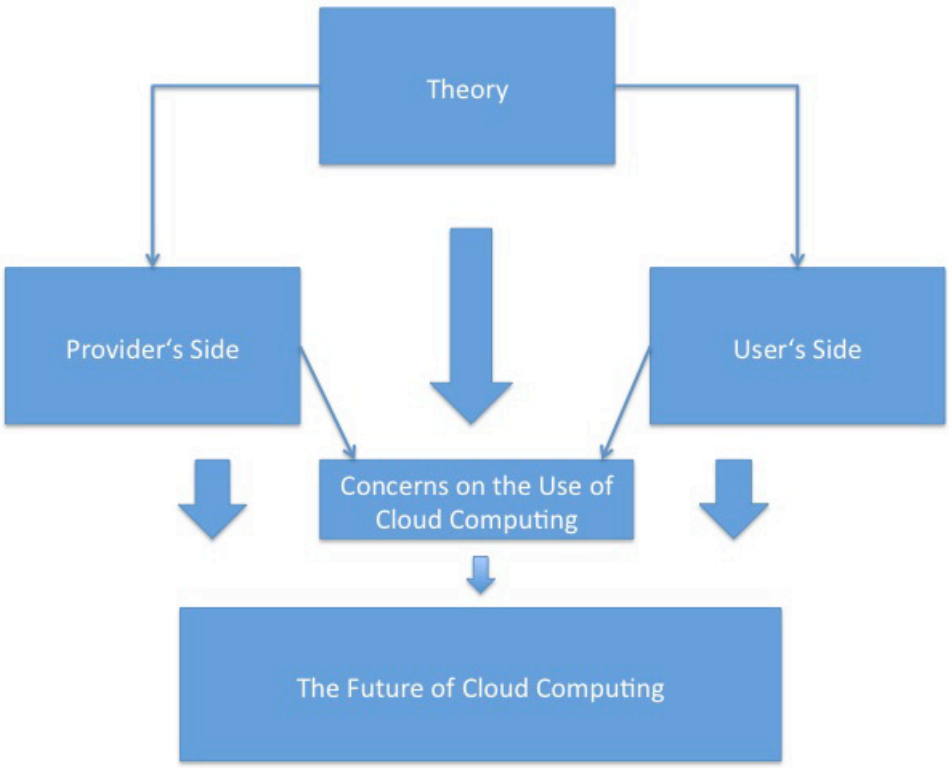

Figure 1: Roadmap to this Master's Thesis

The first part of this master's thesis, named **Theory**, presents the introduction to the theme and the theoretical aspects considering both sides of cloud computing: provider and user.

The section **Provider's Side** analyzes the enterprise value from vendor's perspective and compares it to the theoretical section in order to generate a conclusion for the research implications.

The section **User's Side** analyzes the enterprise value from customer's perspective and compares it to the theoretical section in order to generate a conclusion for the research implications.

The section **Concerns on the Use of Cloud Computing** presents the main obstacles, vulnerabilities, drawbacks, barriers and frontiers of cloud computing to prepare for the last part and provide an overview of the difficulties which are in the way of cloud computing.

The last part**,** named **The Future of Cloud Computing**, connects the provider's side and the user's side to analyze the obstacles in the way of cloud computing and generate a roadmap towards the future enterprise value as a combination of both, provider's and user's benefits.
The section presents a SWOT analysis on the direction of the business model, the requirements to lead the way and the steps to take for cloud computing. The last subsection discusses, whether cloud computing presents a new paradigm or not.

3. The Evolution of Hosting

3.1 History and Development

The starting point of the analysis of cloud computing is the development of the outsourcing and hosting process. As cloud computing established itself through combining different types of outsourcing and hosting offerings, the first look will focus on, where cloud computing came from to get an insight, what really is new about the cloud computing paradigm.
The most common definition of cloud computing, created by the National Institute of Standards and Technology (NIST) explains that

"Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction" (Mell & Grance 2011, p.6).

The definition is not a final one, there are a lot of different opinions on what cloud computing really is, for example Buyya et al. (2009) mention more than just one definition in their well-known cloud computing publication, "Cloud Computing and Emerging IT Platforms: Vision, Hype and Reality for Delivering Computing as the 5th Utility", to express that the definition of cloud computing is not finished yet and that there are still a lot of issues to figure out. Sosinsky (2010) mentions that people still think cloud computing is just the Internet with a new name, because people can watch their applications running over the Internet.
So there is a need to define the possibilities and benefits of cloud computing in a more precise manner and due to that starting with the evolution of the whole outsourcing and hosting paradigm is necessary.
Böhm et al. (2010) had an extensive view at the development of computing by starting with the first calculating machine in 1623. Their most important stages are presented in table 1.

Table 1: The Development of Computing (Böhm et al. 2010, pp. 7-8)

1941	First modern computer Z3
1969	Development of the Internet by the US ministry of defense
1973	First home computer
1988	Opening of the Internet for commercialization, creation of the first services
1989	World Wide Web
1990s	Grid computing
2000	Software-as-a-Service
2007	Cloud computing

Cloud computing is not a new technology. It is a set of combined, already existing technologies (Kopetzky et al. 2013, Kryvinska et al. 2014b). Zhang et al. (2010a, p.8) describe it 'as a new operations model that brings together a set of existing technologies to run business in a different way'. The table shows the evolution of computing and it already features computing technologies like Software-as-a-Service and Grid computing, which cloud computing uses to operate.

So the key statement of this table is that cloud computing is the next step in computing development and not an upcoming all new technology.

Cloud computing is the newest trend in the development of hosting. Figure 2 taken from Staten (2008, p.7), first introduced by Forrester Research, presents the main stages in the evolution of hosting with cloud computing at the peak. The process started with the provision of the Internet and developed from access points to racks for access points. After that an evolution took part and the ability to host not only structures, but software was established. Cloud computing tries to revolutionize the hosting market through new and more dynamic structures as well as the combination of offerings, as will be shown later on (Staten 2008).

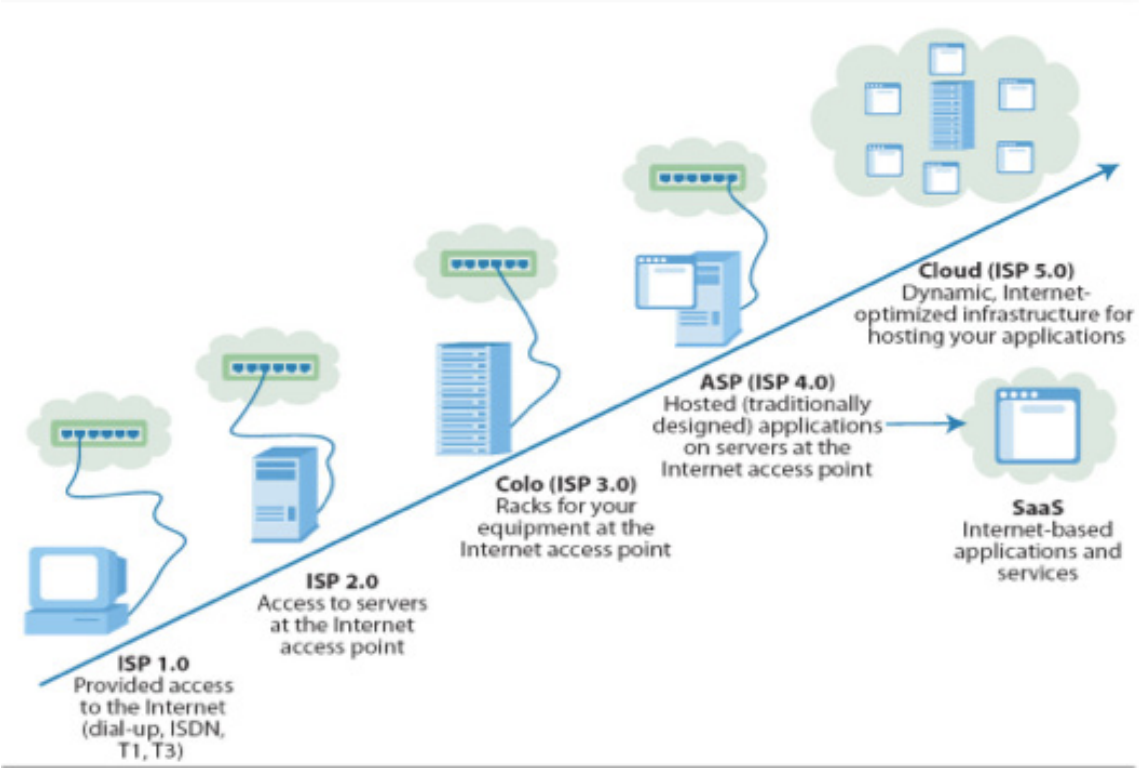

Figure 2: The Evolution of Hosting (Staten 2008, p.7)

Staten (2008) reminds that companies use cloud computing as an infrastructure management service. As time goes by open-minded companies discovered the real value in cloud computing and design their services as the next step of hosting. Those companies try to offer a widespread range of services to their customers.
Since Staten wrote his paper in 2008, more companies have been discovering value in cloud computing and adapted cloud structures to their operations.

The concept of hosting comes with the idea of outsourcing and is deeply linked with it. Outsourcing is enabled through computing systems and developed since the 1960s. As Lee et al. (2003, p.84) show outsourcing has started with hardware in the 1960s and went on with software in the 1970s to a total solution in the 1990s.

Year	Outsourcing Focus	Outsourcing Approach
1960s	Hardware	Services and Facility Management
1970s	Software	Facility or Operation Management
1980s	Hardware and Software Standardization	Customization Management
1990s	Total Solution	Asset Management

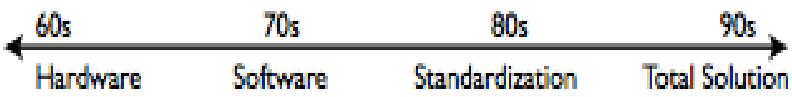

Figure 3: Timeline of the Outsourcing Trend (Lee et al. 2003, p.84)

Cloud computing is a further development of the term of total outsourcing. But now not only physical parts or the development of software can be outsourced. The whole company can be transferred to and run on outsourced servers.

The interesting point is that the steps of outsourcing are the same and the things companies are doing are still the same, too. Oracle's CEO Larry Ellison told that "the interesting thing about cloud computing is that we've redefined cloud computing to include everything that we already do" (Armbrust et al. 2010, p.50).

Bongard (1994) and Grover (1994) et al. discovered that the central motives for outsourcing have not changed, while outsourcing itself developed. They mention that outsourcing is still driven mostly by economic benefits, flexibility, technological advantages and an increasing quality of services. Cloud computing focuses on the same points to gain additional value for customers, so even in 2014 the intention of hosting and outsourcing is the same. The abilities to create value have changed. Leimeister et al. (2010, p.6) remark that "cloud computing aims to provide the technical basis to meet customer's flexibility demands on a business level". The changes are the innovative ways of provisioning combined with the points Bongard (1994) and Grover et al. (1994) mentioned. Dhar (2012, p.670) worked out the "asset-free provision of technological resources" as the argument that makes cloud computing an evolutionary development. From his point of view the opportunities of outsourcing can be achieved through cloud computing without struggling with most disadvantages of outsourcing. Flexibility, costs, lean management, the reduction of project management and less

customization are major arguments in Dhar's (2012) opinion, when the development that cloud computing delivers is compared to the benefits of traditional outsourcing methods.

Cloud computing does not deliver a new phenomenon. It is kind of an organic development of hosting and outsourcing and offers new opportunities to its users. "The main characteristics of cloud computing, from a users perspective, compared to traditional outsourcing is the flexible deployment of virtual and asset-free resources and services" (Böhm et al. 2010, p.18). So the services offered are not new, but the model, usage and combination of the services developed a new kind of computing technology. Böhm et al. (2010, p.18) remind that the comparison between cloud computing and traditional outsourcing methods give an insight "how the value chain has broken up and how fine-grained services can be offered."
The next subsection compares traditional hosting and the most related computing service, grid computing, to the so-called paradigm of cloud computing to understand, what really has changed in computing technology due to the rise of cloud computing.

3.2 New Aspects of Cloud Computing Compared to Traditional Hosting

Cloud computing offers a new method to run an enterprise. This section deals with the aspects cloud computing adds to the traditional hosting process in order to create additional value and establish a new type of business in the eyes of an overhyped IT industry.
Armbrust et al. (2010) present three core differences between traditional hardware provisioning and pricing and the model cloud computing uses. Computing resources are available on demand, to react on high-request times. An up-front commitment with the cloud provider is not necessary and there have been systems developed, where the user only pays for the capacity he gets. In contrast to traditional hosting, where the user buys defined hosting packages. Molnar and Schechter (2010) focused on the reduction of self-owned traditional hosting systems, which are replaced by leased cloud computing systems.

Reduction of infrastructure is an important point in the development of cloud computing. In its beginning, most of the services offered were built around the provision of infrastructure. Molnar and Schechter (2010) compared cloud and self-hosting based on the threats. They found out that the major threats, when adopting a cloud computing system are: infrastructure assembly, contractual threats, legal and jurisdictional threats and the availability and cost of shared resources. The problems are settled around commitment, security and legal issues. Most of them are based on the novelty of cloud computing, as traditional hosting has been established in the market for a longer time. Most issues will be solved within the next years and make cloud computing grow faster. Molnar and Schechter (2010) remind to see the systems differentiated as they see opportunities in both of them. Cloud computing offers “low up-front costs, elasticity of resources, and cost savings that result from economies of scale” (Molnar & Schechter 2010, p.15). Self-hosting in contrast enables “greater direct control over infrastructure that can be achieved when leasing shared infrastructure from the cloud” (Molnar and Schechter 2010, p.15). In the next years the shift to cloud computing systems will continue, as the security standards and confidence in the system grows through a very positive view of the IT industry.

Literature often compares cloud computing to the last important change in hosting: grid computing (Armbrust et al. 2010, Buyya et al. 2009, Dillon et al. 2010, Weinhardt et al. 2009). Dillon et al. (2010, p.29) describe grid computing as “a hardware and software infrastructure motivated by real problems appearing in advanced scientific research”. Like most hosting possibilities grid computing features major conformities with cloud computing like rising computing power, the ambition to link geographically distributed data and resources, standardization and decentralized resource control (Weinhardt et al. 2009). But grid computing has very complex structures and because of that never got as accepted as the cloud already is (Weinhardt et al. 2009). Zissis and Lekkas (2012, p.584) mention that “cloud computing has evolved from grid computing and that grid computing is the foundation for cloud computing”. Armbrust et al. (2010) warn that the related grid computing was not able to create a growing community of users, even cloud

computing seems more tightened in its actual status. But even if cloud computing is just an evolution of traditional hosting services there are differences to the system of grid computing. Buyya (2009) remarks that cloud computing combines attributes of clusters and grids, but adds its own possibilities to create a system. The new offerings of cloud computing include: virtualization, an even more dynamic offering than grid computing, storage, application services and the integration of a third party (Buyya 2009, Kopetzky et al. 2013). Dillon et al. (2010) add that in contrast to cloud computing's single owner of the physical infrastructure grid is focusing on shared resources. Grids want to offer the maximum of capacity, while cloud computing tries to save capacities through real-time requirements and the possibility to scale resources up or down.
However, "the provision of infrastructure services is still dominated by hosting providers offering traditional hosting services" (van der Zwet & in't Veld 2013, p.3). But van der Zwet and in't Veld (2013) also mention that cloud computing will conquer huge parts of the traditional hosting market.

Cloud computing features some advantages in contrast to traditional hosting, but also has to struggle with its disadvantages. Researchers are confident anyway, that cloud computing will overcome its drawbacks and lead computing to the next level (Armbrust et al. 2009, Garrison et al. 2012, Hofmann & Woods 2010, Marston et al. 2011). Cloud computing already developed, kind of gained trust and is accepted in between the IT industry, even if there is still a lot of criticism.

The next subsection shows, how cloud computing developed and what the predictions for the nearest future are.

3.3 Cloud Computing in 2014

This section offers statistics and predictions and features the hopes of the IT industry for 2014.
Since its creation the market share of cloud computing is growing from year to year. But as figure 4 by van der Zwet and in't Veld (2013, p.3) originally distributed by 451 CloudScape shows, hosting services are still dominating the market in 2014.

Figure 4: Global Hosting versus Cloud Computing (van der Zwet & in't Veld 2013, p.3)

Figure 4 illustrates that the adoption of cloud computing is on the rise. In 2010 $1.7 billion (bn) were invested in cloud computing, while the prediction for 2014 is $9.7 billion. This is a massive boost, but the figures need to be set in context. In 2010 cloud computing was new and started to become a trend, so rising numbers are not surprising. The more surprising number is that traditional hosting is still growing. Van der Zwet and in't Veld (2013) predict that cloud computing now starts to cannibalize traditional hosting markets. There is also an opportunity for traditional hosting providers to switch and conquer the cloud computing markets by selling cloud services to their existing customer base.

Cloud computing developed since it was first mentioned as the new evolution in hosting. But in contrast to the high expectations the IT industry has, the development seems more organic than exploding. Anyway, the next years have to show the real potential of cloud computing, as it is still in a status of infancy.

While the definition of cloud computing is not finished yet, the benefits are increasing. RightScale (2014a) did a study comparing the benefits cloud adopters saw in 2013, with the benefits they see in 2014. The outcomes are displayed in figure 5.

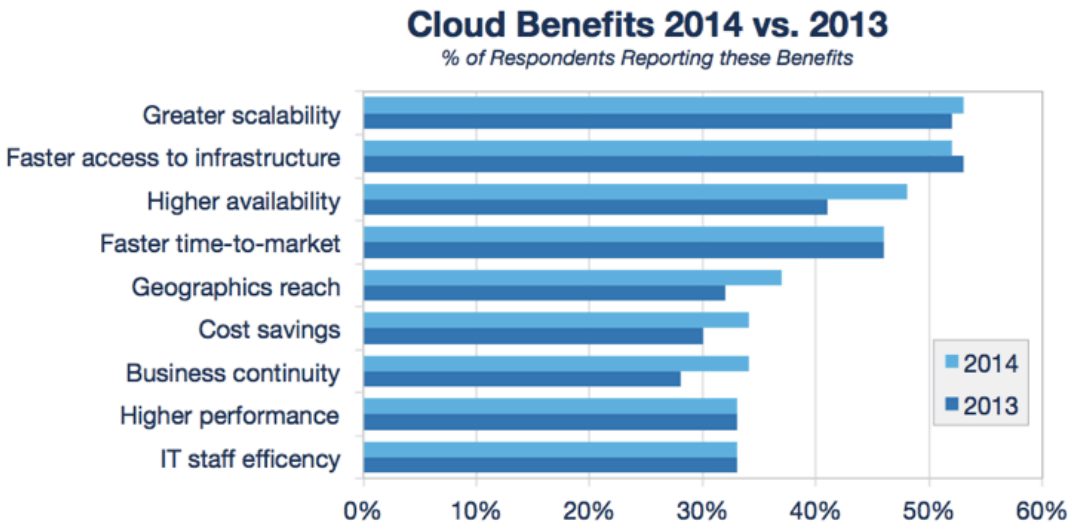

Figure 5: Cloud Benefits in 2014 (RightScale 2014a)

Most categories evolved, the best development was achieved in the availability, the geographical reach, the cost savings and the business continuity. The only decreasing category is the access to infrastructure. RightScale (2014a) reminds that cloud maturity is the most important issue in 2014, as it was in 2013, because only a mature system can offer its whole potential. Cloud services grew in the right direction, but there is still a long way to go.

Another interesting fact “is [that the] cloud computing market is [still] dominated by the US”, as van der Zwet and in’t Veld (2013, p.3) constitute. One reason for that is the fragmentation of the European hosting market. Van der Zwet and in’t Veld (2013) see local differences like the size of the market, the cultural background and the IT buying behavior as important marks, when analyzing the European hosting market. They characterize the European market as “a large number of players relative to market size, mostly with a relative low number of customers” (van der Zwet & in’t Veld 2013, p. 4). The relatively small number of customers, combined with big investments in technology and innovation, leads to the conclusion that not many companies are able to invest into hosting and cloud computing infrastructure (van der Zwet & in’t Veld 2013). Figure 6 by van der Zwet and in’t Veld (2013) summarizes the European hosting market, divided into the categories market share and size by country.

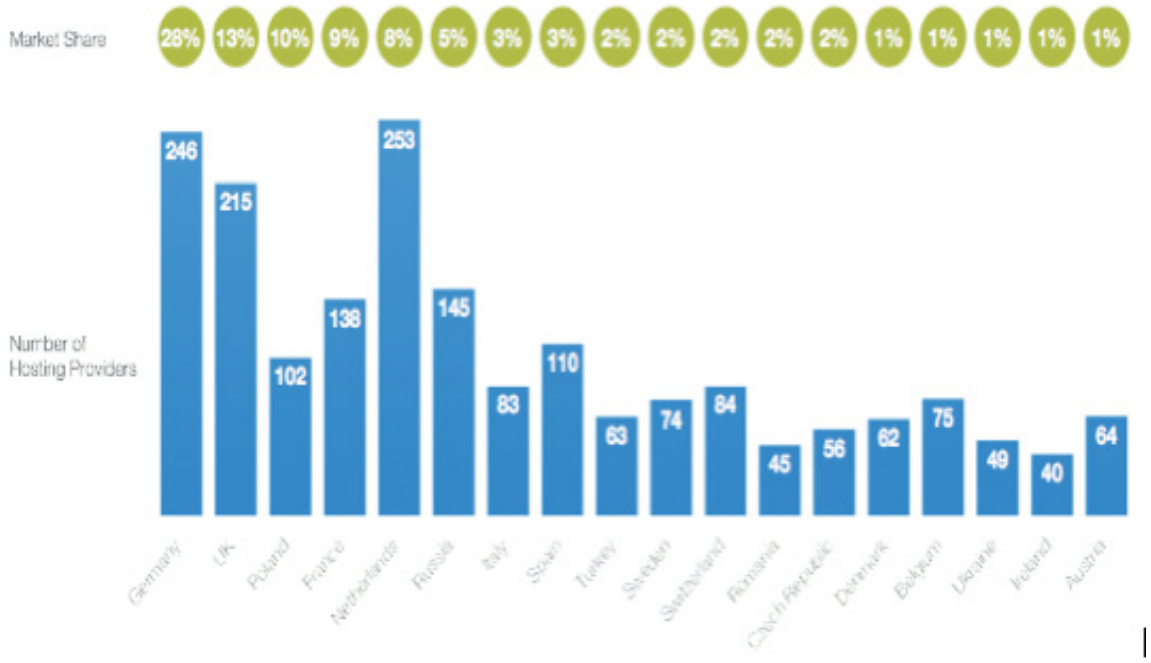

Figure 6: The European Hosting Market (van der Zwet and in't Veld 2013, p.4)

Figure 6 visualizes a highly divided European hosting market. Germany gained the biggest European market share with 28%. Behind Germany there is a huge decline in market share, positioning the UK as Europe's number two in hosting with a market share of only 13%. All other European states gained a market share of 10% or lower. In fact there is a huge fragmentation of the hosting market just as van der Zwet and in't Veld (2013) described. An interesting point in figure 6 is the number of hosting providers in the different countries, because this number is often not related to the percentage of market share of the country. This leads to the conclusion that some markets already have dominating players, while other markets are still contested.

The German cloud market constantly expanded over the last years. Enterprise use developed from 28% in 2011, to 37% in 2012 and to 40% in 2013, according to a study of BITKOM (2014). The smaller growth in 2013 is directly linked to the NSA affair. BITKOM (2014) listed the top 3 concerns in Germany about cloud computing in 2014, presented in figure 7.

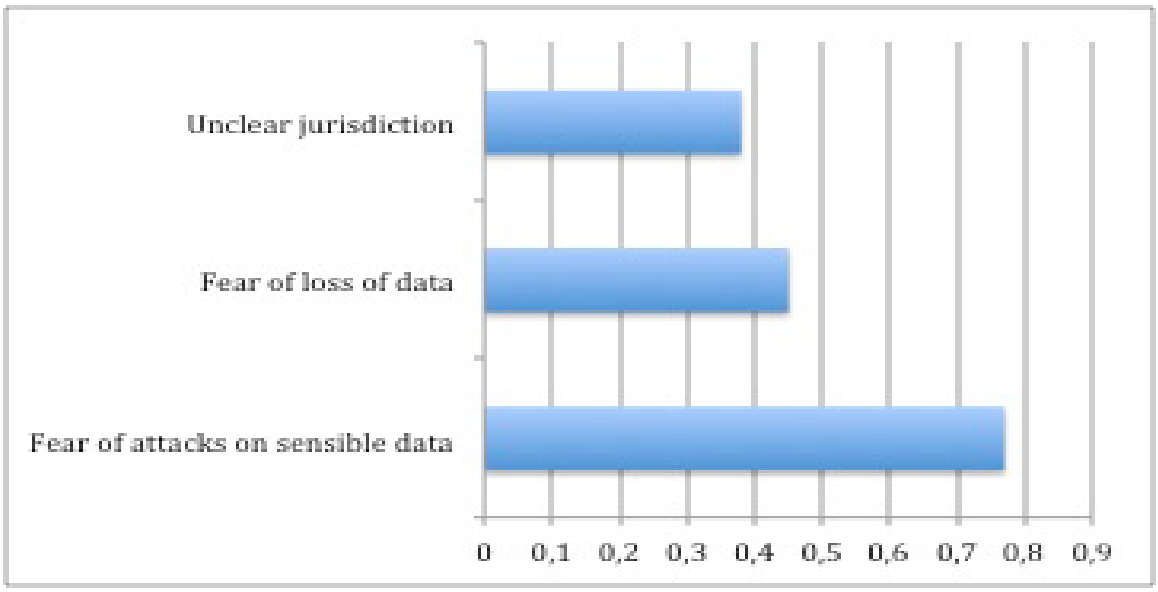

Figure 7: Cloud Computing Top 3 Concerns in 2014 (BITKOM 2014)

The data, presented in figure 7, shows that the top concerns of enterprises in 2014 are about data security, data loss and legal perspectives.

The expectations of the IT industry cannot be figured out in statistics or figures. Because of that a short overview on the predictions for cloud computing in 2014 should provide an insight into recent progresses.

“The cloud is no longer an “if” for many businesses, it’s a given”, as di Benedetto, founder of technology service provider Tribridge, got cited by Olavsrud and Florentine (2013) from CIO magazine. Di Benedetto mentions, “most businesses already work in the cloud, or store data there, or deploy applications from the cloud” (Olavsrud & Florentine 2013). In his view the cloud will be the factor in which enterprises will invest in the next few years. The article remarks a better understanding of the differences of cloud offerings in 2014 and because of that more segmentation. Small enterprises will identify the easy access to big software solutions and therefore the battle for niches will be boosted. The authors notice a further step towards IT decentralization and new cloud offerings that will lead towards completely outsourced systems (Olavsrud & Florentine 2013). Knorr (2013) from InfoWorld expects the cloud as the new hardware. He is convinced that the time of big data in the cloud is over. Optimization of structures and “systems of engagement” will dominate the future. Knorr (2013) believes in a new model of security, where security is granted through identity. As software

development is about to get the new trend, enterprises start to use Platform-as-a-Service solutions.

Golden (2013), from CIO magazine, expects the awareness of entirely new types of applications for 2014. He promises that a lot of companies will shift their focus and start to offer cloud applications. From his point of view IT begins to get into frontline and the integration of cloud computing will rise significantly. Golden (2013, p.1) also mentions a “moment of truth” for private cloud structures, because it is not the convenience of public providers, but the benefit for customers, which decides over the success of the cloud. In the provider section Golden (2013) conjures a price war, as Microsoft and Google get serious to expand their cloud offerings to launch an attack at the dominating cloud provider Amazon.

While papers and journals constitute a positive development of cloud computing, the writers of IT magazines like CIO in contrast display a revolution for the next year (Armbrust et al. 2009, Marston et al. 2011). The magazines forecasts are far away from the status cloud computing’s development really took part by now. The concerns are still present, especially in Europe, as the analysis by BITKOM (2014) presents. The cloud benefits will develop in 2014, but it is still a long way towards the cloud as new hardware, further segmentation or the “moment of truth” for private clouds (Golden 2013, p.1) (Knorr 2013, Olavsrud & Florentine 2014). As long as enterprises are not completely confident about the security and data safety of the cloud, private clouds and in-house structures will remain dominant. A move to public structures is possible, but it is a question of time, and the system is too immature to take this step in 2014.

As the figures present, cloud computing is developing and progressing, but there is a long way to go and traditional hosting remains the leading technology, at least for now. Through creating trust, transparency and security cloud providers could take the next step in 2014, and make a move towards real establishment of cloud services in IT technology.

The classification of cloud computing in 2014 gives the impulse to take a closer look at the markets of cloud computing and their segmentation.

3.4 Market Segmentation

This subsection provides a small overview on the segments cloud computing is dealing with. It should give an idea how to classify cloud computing in today's business environment. The framework to create table 2 relates to Wedel & Kamakura (2000).

As cloud computing has different requirements than traditional products, an own framework to evaluate the segments of cloud computing has been developed.

Table 2: Market Segmentation (Wedel & Kamakura 2000)

Product	Service	Customers	Behavioral	Geography
Infrastructure-as-a-Service, Platform-as-a-Service, Software-as-a-Service	Private cloud, Public cloud, Hybrid cloud	Small, Medium, Large, Global player	Pay-per-use, In-house, Service level agreements	USA, Europe, Asia

3.4.1 Product Section

The product section differentiates three major offerings: Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS) and Software-as-a-Service (SaaS). Infrastructure-as-a-Service offers infrastructure to its clients. Over the Internet access is provided to mainly processing power and storage. The software, clients are using, is provided by the client himself. There is no such offering by the provider. An enterprise using Infrastructure-as-a-Service can deploy its own software and has control about the operations executed in the cloud environment (Dahbur et al. 2011). Platform-as-a-Service is the next opportunity in cloud computing offerings. Providers do not only offer infrastructure, but a platform for the user to develop own services, as Vikas and Kavindra (2012) and Kryvinska et al. (2014b) mention. "The users of PaaS are typically the software developers, who host their applications on the platform and provide these applications to the end-users" (Vikas & Kavindra 2012, p.2).

The last major offering is Software-as-a-Service. The user can utilize a provider's proposal of cloud applications that are offered via a cloud infrastructure, as the NIST definition of cloud computing by Mell and Grance (2011) describes. The

user gets access to specific services over a web browser or an interface and “does not manage or control the underlying cloud infrastructure” (Mell & Grance 2011,p.2).

The first decision for a customer at market segmentation is getting aware of the product he wants to get through the integration of cloud computing. The market offers mainly the three described solutions to enter cloud computing. The decision for a product is essential, because nearly every segment of cloud computing is directly connected to the product section.

3.4.2 Service Section

The next part of the segmentation is the service section. Cloud providers offer different deployment models to integrate cloud computing. In combination with the product section, the service section builds the most important part of the integration of cloud computing and therefore also the most important part of the market segmentation. Three deployment models are offered to divide the market: private cloud, public cloud and hybrid cloud. Private clouds are used for the internal operations of enterprises and they are only handled by one enterprise. The structures of the cloud can be provided in-house or offered by a third party (Grossman 2009). Mell and Grance (2011) present public clouds as a service for general public use, offered by a cloud provider. In contrast to private clouds, public clouds house the data sets of various users. On an outsourced system, enterprises access to third party structures to run their business.

A hybrid cloud combines separate private and public cloud environments. The hybrid cloud proposes the best parts of private and public clouds, but also pools their negative aspects (Rountree & Castrillo 2013). Rountree and Castrillo (2013) mention complexity and expensiveness as the biggest disadvantages of hybrid clouds.

Motahari–Nezhad et al. (2009) directly connect the service segment with the customer segment, as they worked out that large businesses own private clouds in contrast to small businesses and individual consumers, which integrate public cloud structures. This outcome relates to the behavioral segment. Private clouds are more expensive to integrate and run, so small enterprises and individual consumers often do not have the possibility to afford a private cloud. The

decision whether to enter the private or public cloud segment is only up to large enterprises. Other interested parties have to figure out, which public cloud offering is suited best for them.

3.4.3 Customer Section

The customer section for cloud computing differentiates between small businesses, medium businesses, large businesses and global players. This is a result of the product and service offerings, already presented. Cloud computing tries to attract every company in need for IT infrastructure, customers are segmented to analyze what kind of product and service they need or in the mind of providers, which kind of service they can afford. Private or hybrid clouds are only affordable for large businesses and global players as Motahari–Nezhad et al. (2009) described. Small and medium businesses have to optimize their needs through the adoption of public clouds.

3.4.4 Behavioral Section

The behavioral section differs between three types of payment: the pay-per-use model, the in-house model and the service level agreement (SLA) model. The pay-per-use model is a model, where the exact costs of usage are determined and the customer pays for what he gets (Khajeh–Hosseini et al. 2010). The pay-per-use system offers more flexibility and the loss of long-term fixation for both, the customer and the provider, as Armbrust et al. (2009) remind. The system is a step forward in contrast to traditional hosting, where fixed resources are offered.

Large enterprises and global players have the possibility to develop an in-house cloud computing data center, where employees use their devices to enter a web interface hosted by the IT department. The private cloud offered through this system is limited because many advantages of a real cloud are wiped out through still running own systems and regretting on-demand structures.

For large enterprises and global players the specification of services is necessary, because of that the “details of the service to be provided in terms of metrics agreed upon by all parties, and penalties for violating the expectations” (Buyya et al. 2009, p.27) are written down in service level agreements (Mladenow

et al. 2012b). According to Buyya et al. (2009) a service level agreement offers warranty to the customer, it defines the level of maintenance and administration by the cloud provider. Marinescu (2013, p.91) defines a service level agreement as “a negotiated contract between two parties, the customer and the service provider. The agreement can be legally binding or informal and specifies the services that the customer receives rather than how the service provider delivers the services.”

Small and medium businesses in most case do not have the opportunity to get that type of service level agreement. Public cloud vendors often deliver their service based and own pre-assembled contracts adapted to their type of cloud service.

Bisong and Rhaman (2011) nourish that not only pricing costs have to be included, when integrating cloud services. There are costs for migration, implementation, integration, training and redesigning, which have to be included into considerations. Especially for small and medium enterprises, but even for large enterprises and global players this argument delivers a connection to the service and product segment. The choice of product and service directly influences the behavioral segment through the price factor.

3.4.5 Geography Section

The last important market segment is the geographical position, as van der Zwet and in’t Veld (2013) remarked that the biggest market for cloud services is the US market, while the European market is deeply divided as presented in the section Cloud Computing in 2014.

An important issue is the physical location of data centers, because clouds have to face geographic and political borders. A cloud is best located, where law coincides with the law the enterprise has to operate with (Jaeger et al. 2009). Another point to be mentioned, when talking about the location is the cost. Armbrust et al. (2009) found out that cloud providers in North America built data centers where the prices for electricity, cooling, labor, property purchase costs and taxes are low. So most cloud computing data centers are located outside urban districts and their location is tied to the low tax states in the North American example.

Blair from Techaisle (2012) released a statistic about the forecasted investments in cloud computing divided into regions for the years 2012-2016.

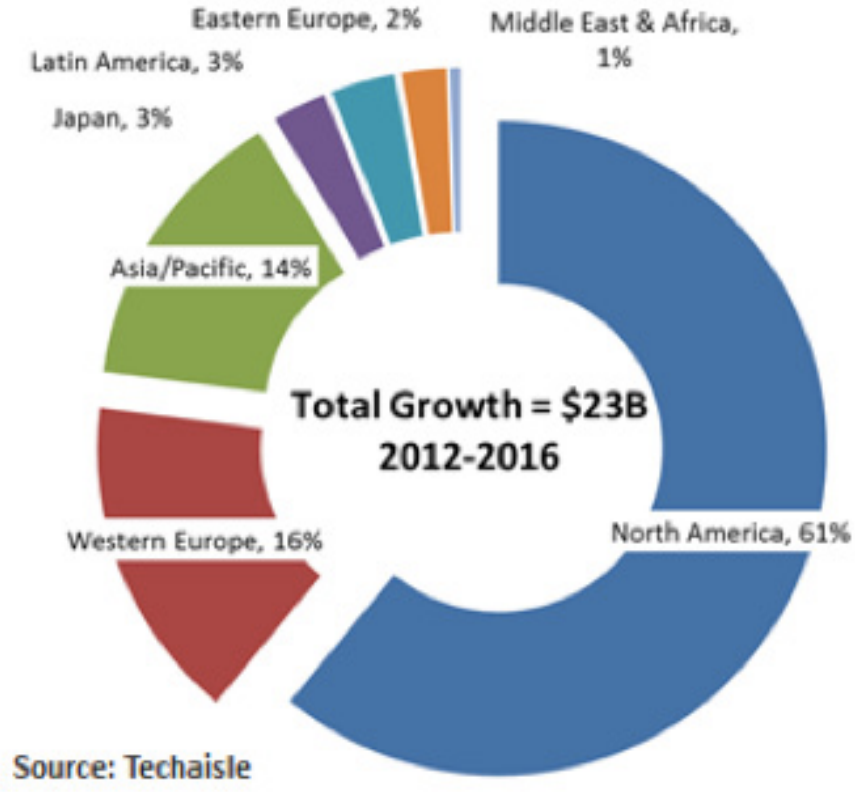

Figure 8: Global Growth in Cloud Computing (Blair 2012)

The North American market will experience the highest investments, followed by the Western European market and the Asian/Pacific market. The North American market has already been the biggest market for cloud computing and will retain its position (van der Zwet & in't Veld 2013).

This segment is least connected to the other market segments of cloud computing. The geographical section delivers an insight, where cloud providers should be interested to gain market share. The regional distribution of cloud computing growth only offers data about the investment, not about the potential to conquer a market or stretch market share. The African and Latin American market does not seem to offer a lot of potential, even if cloud computing develops into a new paradigm (Blair 2012).

Market Segmentation:

Just as the definition of cloud computing itself, the segmentation of cloud computing markets just started. There are divided market segments, but in contrast to the objective of offering strict borders between the different market segments, there are still a lot of connections in between them. A positive point is that nearly every segment already has strict and comparable attributes. As cloud computing develops, the market segmentation also will. Enterprises already enlarged their spectrum of offerings and this will continue in the future. For example Microsoft and Google intensified their operations in the cloud computing business (Golden 2013). A more differentiated market segmentation would have a positive effect on small and medium enterprises, as the services will get cheaper and the selection of software will improve, as forecasted by journals for 2014 (Olavsrud & Florentine 2013). Di Benedetto also mentions that “customers are just beginning to understand the differences between” deployment models (Olavsrud & Florentine 2013). A better understanding of the product enables greater segmentation from his point of view.

The segmentation of cloud computing will continue as the product itself quests for maturity. Enterprises will develop new service offerings to divide the market and to acclimatize with customer needs. Product evolution facilitates better-detailed future market segmentation.

The next subsection looks at the abilities and projections of cloud computing.

3.5 Area of Operations

This section explains the research projections of the thesis and sets the third chapter into context. A short characterization is offered to arrange cloud computing’s operations. The section carves out challenges and their relation to the goals of the thesis.

Most writers (CSC 2012, Durkee 2010, Mladenow et al. 2012a, Rountree & Castrillo 2013, Zhang et al. 2010a) elude the following five major characteristics

of cloud computing: On demand self-service, elasticity, resource pooling, measured service, and broad network access:

Table 3: Characteristics of Cloud Computing (CSC 2012, Durkee 2010, Kryvinska et al 2014b, Mladenow et al. 2012a, Rountree & Castrillo 2013, Zhang et al. 2010a)

On demand Self-Service	Access and fulfillment of requested data and processes are fully automated. Available resources are offered on-demand, which provides quick and easy access.
Elasticity	"Computing is provided in the amount required and disposed off when no longer needed" (Durkee 2010, p.1). The user only has to pay the amount of computing provided, not a fixed amount for a fixed bulk of resources.
Resource Pooling	A provider has a pool of resources every customer is able to access. Dynamic provision of resources to every customer using the cloud is the goal. Through scalability of resources the provider enables the offering of the same computing services and service layers to different customers without straining the structures.
Measured Service	The service cloud computing systems are offering is automatic. The system controls and optimizes the resources of the user adapted to the service. Rountree and Castrillo (2013, p.5) add that the measured service is taken to bill the customer. The usage can be quantified "using various metrics such as time used, bandwidth used, and data used."
Broad Network Access	Cloud services are typically accessed over the network. Every type of device licensed to use the cloud is able to connect to the service. Because of the network access no client or a lightweight client would be perfect to enable a stable connection.

The characteristics mentioned in table 3 define the possibilities and abilities of cloud computing. As the thesis will focus later on, the characteristics coin the advantages of cloud computing. One research implication is that the implemented enterprise value of cloud computing is far behind the expectations of the IT industry. To prove or neglect the hypothesis the conversion of characteristics and advantages in enterprises has to be checked and the impact of cloud offerings has to be examined.

This thesis tries to lead towards the real value of cloud computing in enterprises. It is necessary to clarify the challenges and issues cloud computing has to face.

Harbert (2011, p.1) from PWC did a study with 489 respondents to detect the value proposition customers expect when adopting cloud systems.

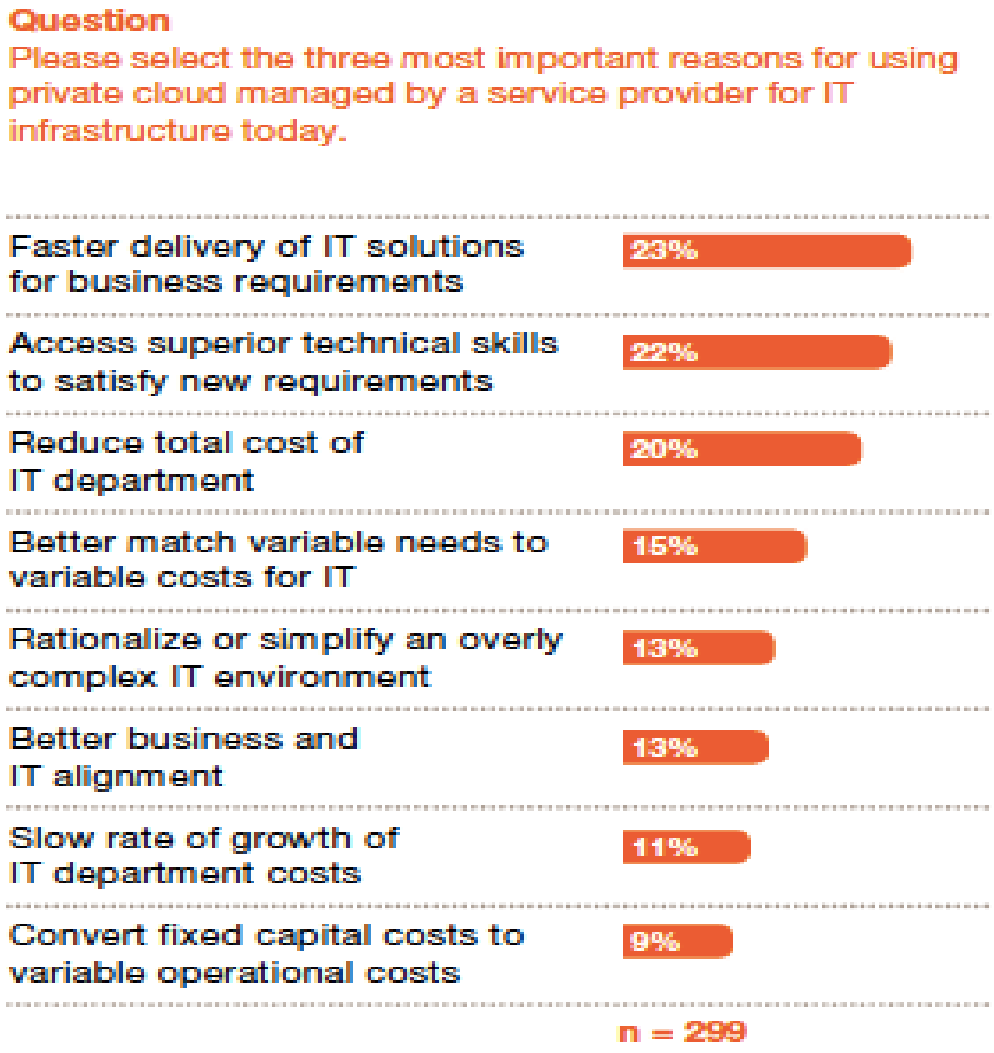

Figure 9: Private Cloud Value Proposition (Harbert 2011, p.1)

Figure 9 illustrates a very divided view on cloud computing value. Enterprises have to face the challenge to develop a consistent cloud strategy. It is necessary to identify the value proposition a specific cloud could offer to a specific enterprise. Harbert (2011) looks at cloud computing as a test of the market, a cloud could in that stadium be whatever an enterprise wants it to be. An issue of the thesis is to define the aspects how cloud computing can add value from a user's and provider's perspective and to check whether the test of the market has come to an end, or if enterprises are still on the way to define the value of cloud computing for themselves.

The definition of customer expectations is an important issue when integrating cloud computing. In the future cloud providers need to define more accurately, what their customers do expect from the cloud and they need to adapt. Georgescu and Matei (2013, p.224) name efficient “collaboration for employees and transparency in pricing and cost, a fast change and more agility in supplying application development platforms [and] a decrease in the energy use of the company” as a solution for rising customer expectations. But that projection seems to be the expectation of customers already. Cloud providers have to develop their offerings while facing a price war. As technology develops, it gets cheaper at the same time. This is a chance for providers, but at the same time a huge threat to their cloud operations. Rising expectations and a better understanding of the cloud computing system by customers puts pressure on the providers (King 2014a).

Even if cloud computing emerged over the last years, there are still a lot of challenges to be faced. Leavitt (2009) remembers the fear that comes with uncertainty and the concern about the new technology. The most important challenge is cloud security. Hofmann and Woods (2010) mention the trust enterprises have to put into the provider. Enterprises do not want to give their sensitive data to a third party.

An issue that is connected to security is control. Leavitt (2009) notices enterprise’s unwillingness to trust third party staff in control and design of the platform.

Another challenge is the interoperability, portability and migration of IT systems (Hofmann & Woods 2010). A challenge towards a unified system would benefit customers, as they would no longer be bound to one single provider. The problem is that providers want customers to stick to their system, so keeping customers locked-in can be seen as a benefit for providers.

The speed of clouds is limited to the speed of the Internet (Hofmann & Woods 2010). Intensive volumes of data when using web interfaces and the transfer of data still have to be taken into consideration.

The industry presents scalability as one of cloud computing’s most intriguing advantages. But sometimes problems cannot be solved through adding additional

capacities. Some services need different “architecture of processing, memory, and storage” (Hofmann & Woods 2010, p.92).

The challenges presented here are the most important ones in the way of the development of cloud computing.

The thesis will take a look at enterprises, which developed valuable cloud computing systems later on. A comparison between the value expected by the IT industry and real value is an important issue. The advantages and the challenges cloud computing has to face will be structured and analyzed in order to get a conclusion on whether cloud computing is developing in the right direction or not.

4. Models for the Integration of Cloud Computing

Section 4 presents cloud computing from a provider's point of view.

"Cloud computing service providers own and operate cloud computing systems to deliver service to third parties. The provider will perform the maintenance and the upgrades on the system, which consumers were in charge of when they owned the systems" (Marston et al. 2011, p.183)

The section takes a look at the objectives providers want to achieve through offering cloud structures or services. The first case study compares the most successful cloud providers and wants to find a solution for whether there is an enterprise with a unique selling proposition that leads the market.

4.1 Value Drivers

The first subsection analyzes the advantages a cloud provider is able to realize through offering cloud services.

As the advantages of cloud computing are usually described from a users point of view the thesis has to go back from the user's advantages to describe the value drivers and the intentions of cloud providers. But first a study published by Amit and Zott (2001) opens up the possibility to look at value creation in e-business from a cloud provider's point of view.

Amit and Zott (2001) defined four different sources of value creation in e-business, presented in figure 10.

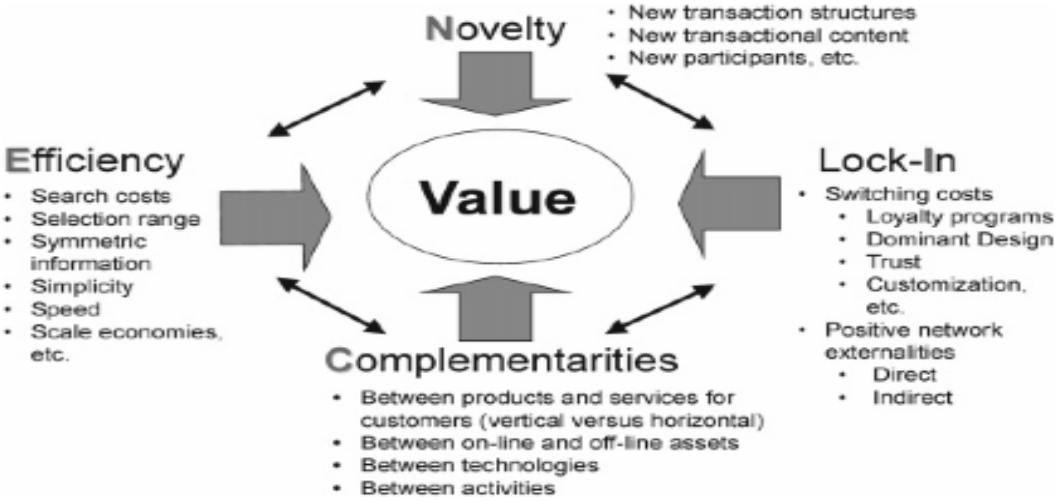

Figure 10: Sources of Value Creation in E-Business (Amit & Zott 2001)

Figure 10 illustrates the circumstances of value creation without looking on either customer or provider side. Efficiency increases through the decrease of transaction costs. Cloud computing decreases transaction costs for providers through a standardized system and service offering. In contrast to that, the speed of the Internet is still a problem for cloud providers and lowers efficiency of cloud computing systems (Amit & Zott 2001). Cloud providers can also broaden their range, simplify their systems and scale their services. Loyalty and trust are important points for cloud providers, as the cloud adopter will not decide imprudently when getting locked-in to a customized service offering (Amit & Zott 2001, Mladenow et al. 2012a, Padashetty & Kishore 2011).

The complementarity features one of the major opportunities in cloud providing. A cloud provider is able to offer the whole spectrum of services over his cloud providing system. Infrastructure, services and software can be connected to create additional value (Amit & Zott 2001).

Cloud providing offers the convenience of a data lock-in, once connected to a cloud provider it is hard to switch data to another provider because of differences in hardware and service (Amit & Zott 2001, Padashetty & Kishore 2011).

Cloud computing has not presented a new technical dawn, but the transaction methods and structures have been optimized. Cloud computing opened the hosting market for new segments of customers (Amit & Zott 2001, Kryvinska et al. 2014b, Staten 2008).

Now, the thesis will identify the most important value drivers for cloud providers and if possible connect them to the model of value creation in e-business.

In the business sector cost presents the most important factor. As already described, the potential growth of cloud services is enormous and enterprises want to benefit from this development. A study by Forrester presents cloud computing on its way becoming the biggest market in IT. Starting from $40.7 billion in 2011 the cloud computing market will rise to $241 billion in 2020 (Georgescu & Matei 2013). Enterprises with the ability to implement a cloud providing structure have an incentive to do so, to enter an afferent market, even if there is an innovative player as Amazon that led the way in the first years of cloud integration. Fast pace and rapid growth create huge competition in cloud computing markets (van der Zwet & in't Veld 2013). The problem to start cloud computing offerings is high up-front investment for cloud providers. But Weinhardt et al. (2009) ensure high costs for the multi-tenant architecture will be outweighed by the long-term income. Rountree and Castrillo (2013) notice service providers as spenders for initial hardware and software deployment. In contrast to cloud users, which benefit from the pay-per-use system, cloud providers have to offer the underlying hardware, platform or service. Because of that, cloud providing is in contrast to cloud using bound to enterprises with the ability to invest up-front. Despite a high investment to establish a cloud providing system, providers are able to save money through lower continuing investments. Once established, cloud providers have the possibility to move IT systems forward at high pace, because they can directly hit the market and do not have to wait for investment cycles (Australian Government 2011). The investment already took place by buying a cloud providing system. Dean and Saleh (2009, p.2) mention "the significant cost savings in selected situations, notably when the scale of an enterprise's computing resources is relatively small compared with that of cloud providers". Transformed to a cloud provider's point of view, this means that in contrast to fixed hosting services with high investments, providers are now able to access a new category of customers. Services are paid by the amount of consumption and no longer based on fixed contracts. Staten (2008) recognizes gigabits consumed or gigabits per second as the new system of

deduction. Small and medium enterprises are able to integrate powerful IT systems by paying for the real use of services and not for a hosted server. The additional use for providers is the flexibility of the services and the new customer segment, which could be added to the portfolio (Kopetzky et al. 2011). Staten (2008) also mentions the loss of long-term contracts. Providers can now offer unbound access to their services. Small and medium enterprises will benefit heavily through making their investment more calculable and providers again have a bargain through achieving new customer segments.

Marston et al. (2011) remark that cloud providers have the possibility to enable IT services in countries, where it was unable to offer proper IT services by now. The market segmentation has shown that Eastern Europe, Africa and the Middle East will not feature an increase in monetary growth within the next years (Blair 2012). But with the development of structures and a widespread integration at least in some parts of those regions, cloud computing could become the most important factor for business outsourcing. The possibility of a development in at least a few third-world countries in combination with the possibility to deliver service from all over the world could open up big markets in the future and some providers will at least have thought about that possibility. The real value of that development is unpredictable, because third-world countries in normal case do not even have proper Internet connections, which would be necessary to enable cloud computing.

Access to a new group of customers can open up possibilities for diversification and growth. Through the scalability of services, a cloud provider is able to benefit from economies of scale, just as cloud users do (Berman et al. 2012). The high up-front investment can be balanced with lower investments into existing systems. Cloud providers offer standardized systems when offering public clouds, so the maintenance and service is standardized in this type of cloud, too. Therefore the costs can be reduced.

Rountree and Castrillo (2013) imagine cost reduction potential in infrastructure IT personnel. The automation of IT services is growing and because of that providers reduce employees and operate on centralized platforms. After establishing cloud computing structures the reduction of employees offers big potential for cloud providers to save money.

Generating profit and attracting new groups of customers are of course the most intriguing arguments for providers to access the cloud computing market (Mladenow et al. 2012b). So there is additional value cloud computing can generate for providers.

Economies of scale do not only reduce the costs for cloud providers and cloud users as well, they also facilitate the distribution of standardized service offerings for example. The service provider is able to offer his software solution to all of his customers at the same time. The customers access through the structures of the provider and share the resources. Economies of scale can, as already mentioned, reduce capital expenditure. But they are as well able to reduce operational expenditures and time-to-market (Breiter et al. 2011). Marston et al. (2011) add that it is easier for providers to develop their services to client demand. Padashetty and Kishore (2011) acknowledge the intangibility of the physical characteristics. Security and sharing are the main opportunities from their point of view. The deployment of standardized services is fast over a cloud computing platform and easy access is granted. Cloud computing simplifies interaction between provider and customer through a standardized platform and standardized applications. IT service management can be standardized as well as products.

Another important factor is the on-demand service. An upscale or the addition of resources is easy to handle for a provider in contrast to a contract, where resources are fixed. The on-demand service works automatically, so there are no employees needed to enable new resources. The computing power and storage can be delivered rapidly in contrast to traditional hosting, where interaction is needed to offer accessory resources (Australian Government 2011). Application providers can offer new software to their customers without changes in infrastructure or a change of existing software offerings for every customer at the same time, if standardized. Service providers do not have to optimize software for every single customer. Cheaper disaster recovery and better resilience is the outcome (Staten 2008). Cloud providers can benefit from customer satisfaction and feasibility and therefore on-demand self-service and rapid elasticity is

expedient for both, cloud providers and cloud users. Additional resources generate additional income for providers and flexibility for customers (Dhar 2012). Padashetty and Kishore (2011) named customer relationships as an important issue for cloud providers. Through customer service and technical support over the Internet, providers have the possibility to be in direct contact with the customer and improve services to customer needs. The customer can be better integrated into structures and it is easier for providers to offer support in standardized systems. Employees can be trained directly to work with the specific structures the provider developed. This opportunity is offered by standardized systems. An enterprise with a private cloud, which is adjusted to its own structures will not benefit in the same way as an enterprise using a standardized system. For providers it is the same way around. A non-standardized system cannot be trained as effective to employees, as a standardized one implemented by a cloud computing solution. For the future, a value driver for cloud providers will be to reduce private clouds and elate enterprises to integrate public clouds. The motivation behind is the relationship between customer and provider, the maintenance, security and interoperability and once again the reduced cost of standardized systems (Buyya et al. 2009, Jansen & Grance 2011, Kryvinska et al. 2014a, Marston et al. 2011, Olavsrud & Florentine 2013). Golden (2013) mentioned in his forecast for the next year that the private cloud will have its moment of truth in 2014 and the advantages for cloud providers support his view as they will push towards public cloud structures. The vision from user's perspective is different, as the case study presents later on.

As worked out in the market segmentation and in the cost section, geography can play a major role for cloud providers. Despite problems with law and trust, the distribution without borders will grow over the next years. In the mind of providers the role of the geographical destination of servers will decline and the "opportunity to sell across a broader geography without investing in infrastructure" (Australian Government 2011, p.15) will rise. Cloud computing can improve the service of providers through 'quality, fastness while communication take(s) place with customers, suppliers and all stakeholders irrespective of their location (Padashetty & Kishore 2011, p.6). Padashetty and Kishore (2011, p.6)

remind the alleviation of communication and data sharing as “the key factor of business development”.

A question Berman et al. (2010, p.34) bring up is: “what if you could give customers access to your products and services anytime, anywhere and on any device?” Cloud providers are attracted by the vision of offering their whole range of services to the customer over one single platform and at top with a customer lock-in. Different cloud computing platforms today are not connected to each other and there is no interoperability (Kryvinska et al. 2014b). A value driver for cloud providers is this lock-in opportunity. Customers are not tied to their platform, but most customers will stick to the platform because switching data to a different platform is difficult and sometimes impossible. So despite the fact that customers are not fixed to a cloud computing system, they have an incentive to stick to their provider (Pearson 2012).

Armbrust et al. (2009, pp. 5,6) presented six arguments for providers, which can attract to integrate cloud computing into the operations of the company, illustrated in table 4.

Table 4: Arguments for Providers to Develop Cloud Computing Systems

(Armbrust et al. 2009, pp.5,6)

Make a Lot of Money	The costs can be amortized over many machines, economies of scale are used to offer a service well below the costs of a medium-sized company and still make a tidy profit
Leverage Existing Investment	A new revenue stream at low incremental cost, helping to amortize the large investments of datacenters
Defend a Franchise	Vendors with an established franchise in those applications would be motivated to provide a cloud option of their own
Attack an Incumbent	A company with the requisite data center and software resources might want to establish a beachhead in this space before a single “800 pound gorilla” emerges
Leverage Customer Relationships	IT service organizations have extensive customer relationships through their service offerings. Providing a branded cloud computing offering gives those customers an anxiety-free migration path that preserves both parties’ investments in the customer relationship
Become a Platform	Cloud providers can enable their customers developing their service offerings through the possibility of creating applications and other stuff.

Table 4 again presents the most important argument first, money. Armbrust et al. (2009) add some different points as arguments for providers to enter the cloud market. Enterprises with already developed hosting structures can profit through small modifications of their existing system. Customer relationship and the development of services are also in the focus of Armbrust et al. (2009) when their argumentation for providing cloud services takes part.

In the end the goals of cloud providers are highly connected to the advantages and the use customers want to see in cloud computing. Rountree and Castrillo (2013, p.124) present an “efficient, reliable, cost-effective and secure” cloud as the goal for cloud operators and users.
Figure 11, taken from Rountree and Castrillo 2013 (p.124), illustrates what cloud providers are aiming for when creating and assembling a cloud computing structure.

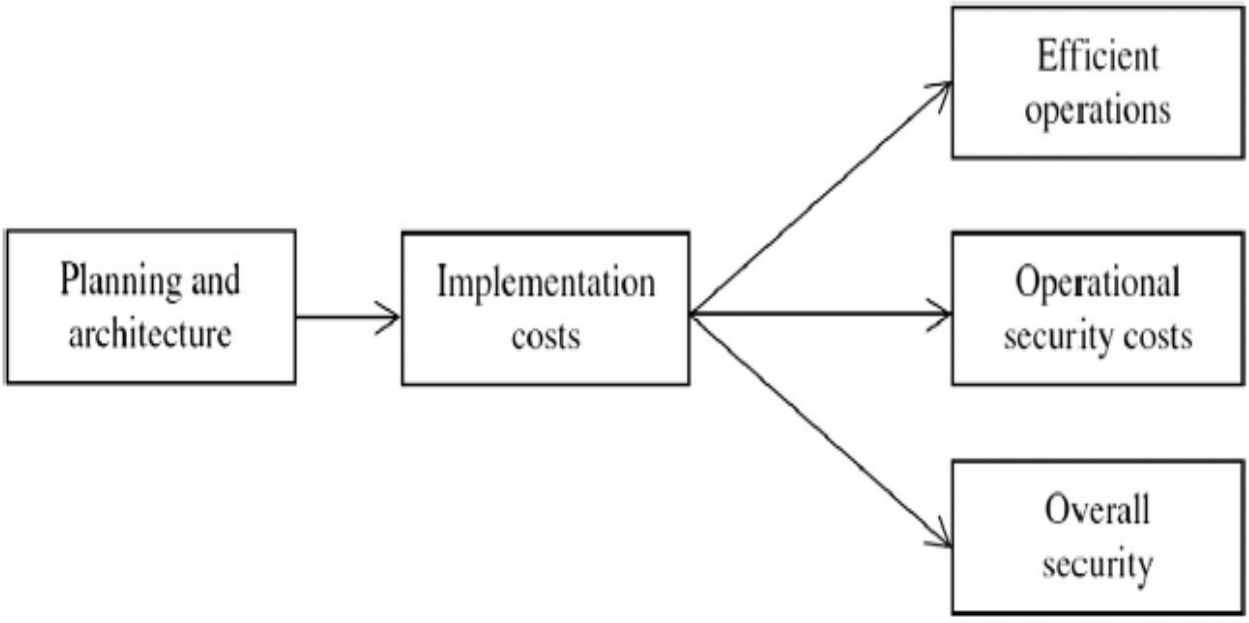

Figure 11: Construction of a Cloud (Rountree & Castrillo 2013, p.124)

Cloud computing systems are very expensive to create and therefore implementation costs are the main factor. Every objective a provider wants to achieve with the cloud is connected to the costs as first consideration. As figure 11 argues the efficiency, the operational security and the overall security are

driven by costs. Cloud computing's major advantage is that high investments for the establishment of a cloud providing structure are followed by low investment into maintenance, service, communication and distribution (Rountree & Castrillo 2013).
Cloud computing systems offer a lot of advantages for cloud providers, most of them are directly connected to the benefits of cloud users, which makes cloud computing in theory even more useful. But again most of the points mentioned are predictions for the future. Today's real value of cloud providing offerings will be discussed later on in this chapter.

After analyzing why enterprises find interest in serving cloud computing structures the next subsection will have a look at the cloud computing market from a provider's point of view.

4.2 Market Conditions

Cloud providers have a concrete vision of what cloud computing should deliver. It is all about the efficient management of IT to provide services rapidly, as Breiter et al. (2011) delineate.
Cloud computing markets are highly contested. Van der Zwet and in't Veld (2013) identify two main battlegrounds, the provision of IT infrastructure services on the one hand and the delivery of value-added services on the other hand. They present the Infrastructure-as-a-Service and the Platform-as-a-Service market as the ones with the highest competition.
From their point of view it is necessary "to work out how to grab your share of the cloud market without being drawn into a price war against these global giants [Amazon, Google, Microsoft]. Instead, you need to find a way of providing cloud services that make you stand against your competitors" (van der Zwet & in't Veld 2013, p.2)

There are a lot of established players in the cloud computing market and as building of cloud structures is a very cost intensive business, some of the players are the biggest enterprises in the IT market. Smaller cloud providers have to find their niche in the market, as the global players operate through a price war and growth strategies (Golden 2013). Golden (2013) predicts the cloud players

Google and Microsoft are just about to get serious with their cloud, so the price war will get even harder (Kopetzky et al. 2011). Van der Zwet and in't Veld (2013) also suggest a solution to the smaller enterprise's problems. Differentiation should be the key for smaller providers to stay in a competitive market and establish themselves. Customer knowledge, flexible solutions and premium quality of services are the issues to focus on when trying to refrain from a price war.

Figure 12 by Edmond (2013) shows, how the cloud market will be divided in the future.

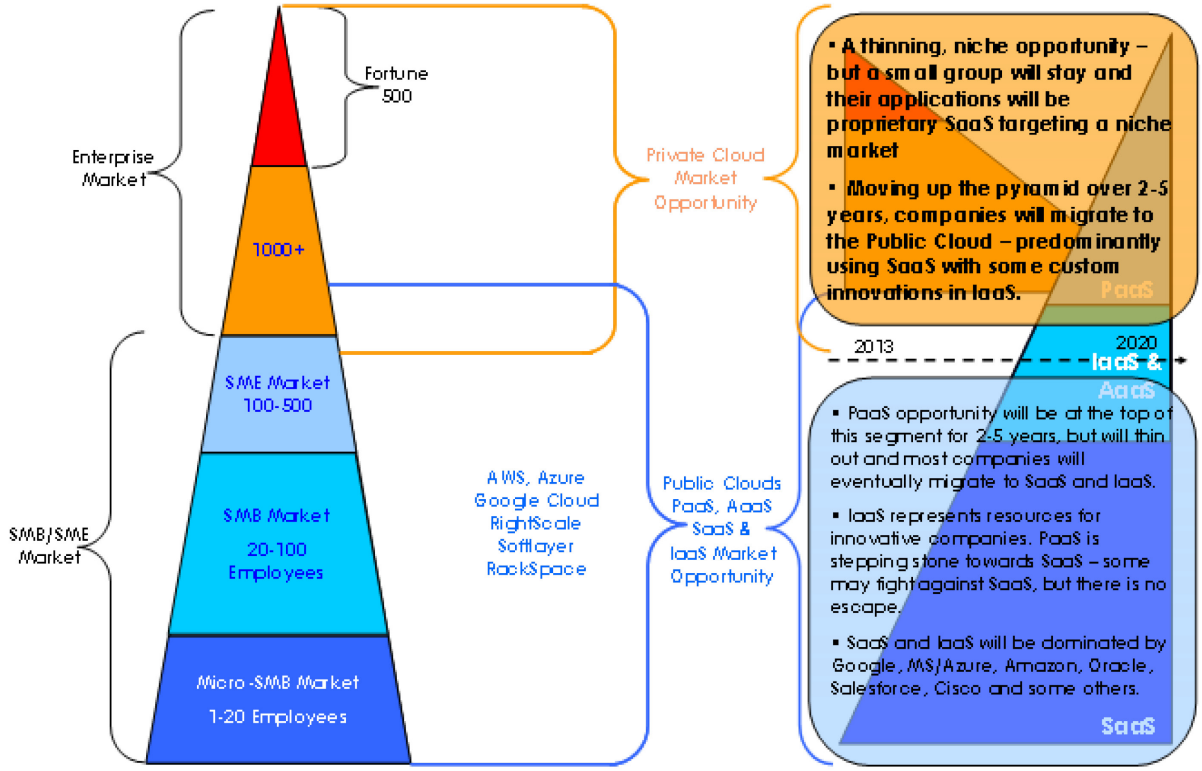

Figure 12: The Future of the Cloud Computing Market (Edmond, M. 2013)

In figure 12 Edmond (2013) describes a pyramid of the customer divided into scale and market type. On the right hand-side Edmond (2013) presents the types of clouds divided into the services customers are able to afford.

For cloud providers the diagram presents a well-done analysis of the market conditions and how they could fit into the picture. At the bottom small and micro companies are listed and on top the "Fortune 500". Depending on their service offering cloud providers are arranged into a category of customers. A broader service offering with different deployment models accompanies with a broader segment of potential customers. Edmond (2013) forecasts the private cloud

market as a “thinning niche opportunity”, where only a few companies will survive. In his view, enterprises will move to public structures in the next years. The picture presents Platform-as-a-Service as the dominating option for the next few years, before a change will happen and the customers will switch to Infrastructure-as-a-Service and Software-as-a-Service (Edmond 2013). Edmond (2013) predicts a switch because enterprises want to lower their total-cost-of-ownership and focus on their core competencies. The picture also exhibits, that the biggest market players like Amazon, Google, Microsoft and others are already focusing on the market of micro-, small- and medium players, while there are no service offerings in the market for bigger players. Private cloud structures are offered for huge enterprises by more diversified cloud providers, they are not as easy to handle and not as easy to implement. The focus of the big players in the cloud computing market is the offering of the best services available at lowest costs and therefore adjustments in private cloud structures do not fit into the service portfolio.

Harauz et al. (2009, p.61) describe the market conditions as favorably for cloud providers, as customers have to “accept the underlying premise of trust”. Trust is not the only issue cloud customers have to accept when adopting cloud systems. Cloud infrastructure, platforms and services are developed by providers customers have to approve their terms or search for a different provider. The critique of Harauz et al. (2009) focuses on public cloud structures. The only possibility to change the market conditions here is to develop an own in-house system or to create a suited private cloud in cooperation with a partner. Cloud providers develop the conditions, customers have to accept conditions in terms of securing costs or move on.

A major factor considering market conditions is globalization. “The businesses have to focus on becoming agile to counter hostile environmental changes” (Padashetty & Kishore 2011, p.6). Padashetty and Kishore (2011) present globalization, in fact global reachability, as the unique selling proposition for cloud computing. As market shares and profitability vary enterprises have to shift, too. The market conditions change very fast in the world of IT, a successful enterprise has to keep up with the changes and constantly adapt its structures to new

requirements. For cloud providers unless they are part of the big players it is the only alternative to run their service.

The cloud providing market is a very competitive market, but at the same time a market optimized for the cloud provider and not for the customer. Hofmann and Woods (2010, p. 93) describe it as “designed for maintenance, scalability and lowest common denominator functionality”. Hofmann and Woods (2010) mention cloud computing as a system that limits the abilities of the customer through creating an own self-managed offering, which is not created to offer best customer service. So the market is hard to enter, but once established, the potential is enormous. Because of big players dominating the market it is reasonable to find a niche to avoid price wars and capability fights. The requirements will be shifting within the next years. Providers need to be prepared for a switch or adaption of their structures to stay competitive.

The following section takes a look at the services cloud providers offer to their customers. The services will be separated and classified. A classification is needed to analyze the different cloud providers later on separated from their proposals.

4.3 Service Offerings

Cloud computing presents different methods to satisfy customer needs. Sosinsky (2010, p.5) mentions that service models consist “of the particular types of services that you can access on a cloud computing platform”. Cloud providers have to decide first, what spectrum of service offerings they want to render possible for their customers.

The most common cloud service models, as already mentioned, are Infrastructure-as-a-Service, Platform-as-a-Service and Software-as-a-Service. In between those service models cloud providers have to develop their own kind of service offering in context to their strengths (Sosinsky 2010).

An Infrastructure-as-a-Service offering can include “the capability to provision resources and allow the consumer to deploy and run (arbitrary) software” (Zissis & Lekkas 2012, p.584). Motahari–Nezhad et al. (2009) add that not only

hardware resources can be offered. Computing power is another service offering providers can serve to their customers. The customer is enabled to use the underlying hardware, but has to deploy his own software and system. The consumer is able to control his software and operating system. Depending on the contract with the service provider, the customer has the ability to control limited parts of the networking components (Zissis & Lekkas 2012). Mell and Grance (2011) depict additional service possibilities through Infrastructure-as-a-Service in storage, networks and other computing resources.

Platform-as-a-Service defines the next step in the possibility range of cloud computing. Platform-as-a-Service supports the development of applications in the cloud. Motahari–Nezhad et al. (2009) mention design, implementation, debugging, testing, deployment, operation and support as the most important services a cloud provider proposes to the customer, when Platform-as-a-Service is the model of choice. Zissis and Lekkas (2012, p.584) enumerate Platform-as-a-service a model “to deploy onto the cloud infrastructure”. The customer is able to deploy own services, services created by the service provider and optimized by the enterprise, or services developed by a third-party and ordered by the customer of the cloud service (Zissis & Lekkas 2012). Mell and Grance (2011) add that the control of the underlying infrastructure stays at the provider and the customer only has access to his own services and is not able to manage or control the infrastructure himself.

Software-as-a-Service is described as “the most commonly used application of cloud computing” by Vikas and Kavindra (2012, p.2). Software-as-a-Service represents a one-to-many model. The provider enables the use of his own software and applications to the customer on his cloud infrastructure (Kopetzky et al. 2013, Zissis & Lekkas 2012). An application is offered to a bunch of customers, which share the use of the application and run it on the Internet (Dahbur et al. 2011). The software is hosted and operated by the provider (Breiter et al. 2011). The underlying infrastructure is not managed or controlled by the user (Mell & Grance 2011). Orlando (2011) from IBM looks at Software-as-a-Service from a different position. The provider cannot only generate service offerings out of Software-as-a-Service, but is also able to increase the speed of

software development, ensure a faster adoption of services, decrease support requirements and ease implementation updates.

There are different models to offer services in cloud computing and in between the different services there are also various possibilities to create service offerings for cloud providers. The cloud provider has to detect the type of service he wants to offer to his customers and build an efficient structure to support the system.

Saidhbimca and Gashaw (2013) present a schedule by Cloud Tweaks of the most important types of services cloud providers offer to their customers, illustrated in figure 13.

Figure 13: Cloud Computing Service Offerings (Saidhbimca & Gashaw 2013)

Figure 13 presents a small overview of cloud computing abilities, the customer section will take a closer look at the advantages and disadvantages cloud computing serves to its users. The figure displays the types of service offerings cloud providers can use to create value in cloud computing systems. The most present and provisioned services are outsourced processes, online storage, platforms, online office and online resources (Saidhbimca & Gashaw 2013).

Berman et al. (2012, p.28) mention different business archetypes to distinguish the types of service offerings.

- “Optimizers use cloud services to incrementally enhance their customer value propositions while improving organizational efficiency

- Innovators significantly improve customer value through cloud adoption, resulting in new revenue streams or even changing their role within an existing industry ecosystem
- Disrupters rely on cloud services to create radically different value propositions, as well as generate new customer needs and segments – and even new industry value chains"

Different types of cloud providers have variable goals they want to accomplish by offering cloud computing services. Dependent on the business archetype, the type of service is designed and presented to the customer.
Based on service models, business archetype and personal specifications cloud providers develop their spectrum of service offerings. This section does not provide a complete overview, but a classification of the most important services to have a closer look at the services, different providers offer to their customers in the provider analysis, later on.
Hartman and Beck (2009, p.2) asserted that the trend of service offerings develops towards a complete system of virtual enterprises as shown in figure 14.

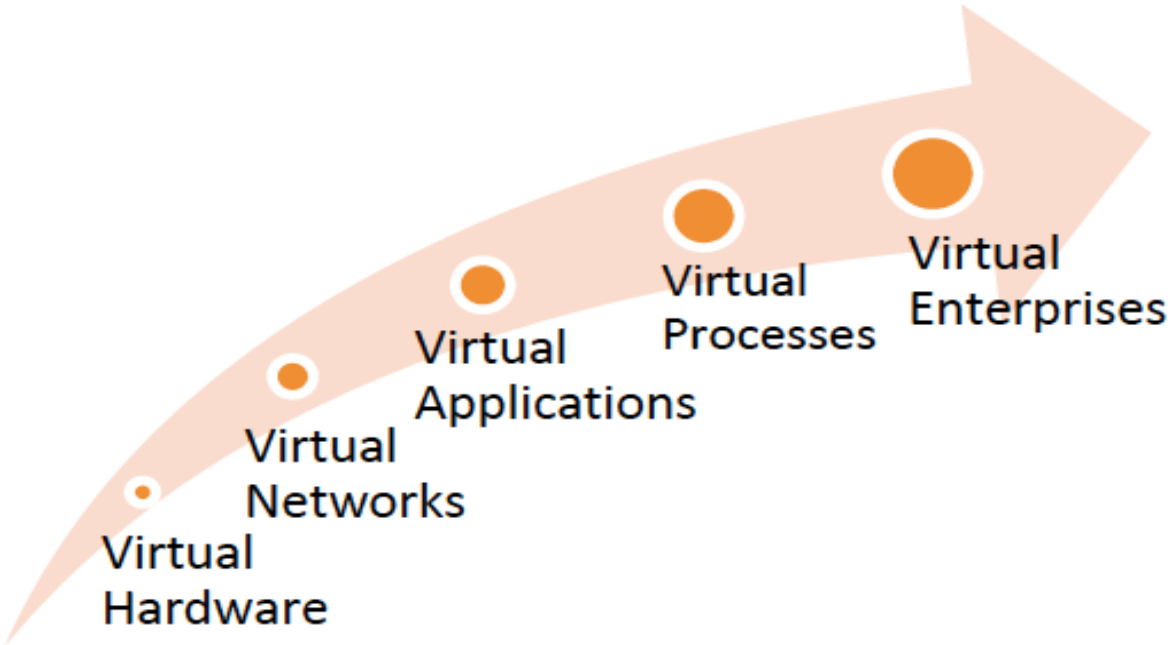

Figure 14: The Trend Towards Virtualization (Hartman & Beck 2009, p.2)

Figure 14 illustrates the development of cloud computing services. Starting with the virtualization of hardware, cloud computing evolved to extensive service

offerings. The objective of the cloud providing industry is to transform enterprises into virtual enterprises where every service is offered through the cloud. At this time the virtual enterprise in a public cloud structure is unrealistic, but depending on how cloud computing will be performing in the future cloud providers will have a closer look at the changes of providing the virtual enterprise (Hartman & Beck 2009).

Subsection 4.4 presents the different pricing systems in cloud computing. As a small overview on pricing was already served in the market segmentation, this section leads towards the real pricing design of cloud providers to guide towards the showcase.

4.4 Pricing Strategies

Cloud computing is advertised as a system of low commitment and customer-oriented solutions in the pricing sector. In an industry focused on revenue and profit and in a segment with heavy price wars, it is not customer-orientation, which leads towards decreasing prices and the development of better services (Mladenow et al. 2012b). There are two paths to follow when developing a cloud computing strategy, like in most other business sectors, too: price or differentiation (Shaked & Sutton 1982). As Porter (1985) wrote a competitive advantage can be achieved through fulfilling activities in a better or cheaper way than the competition.

4.4.1 Price

The big players in cloud computing fight a heavy price war. In 2014 experts predict a new escalation of the price war, so prices will drop again (Golden 2013). A new study from Google, discussed by King (2014a) on ZDNet, ascertained that prices in cloud computing are not falling as fast as hardware prices do. Figure 15 carves out the reduction of prices in public cloud computing and hardware resources between 2006 and 2014.

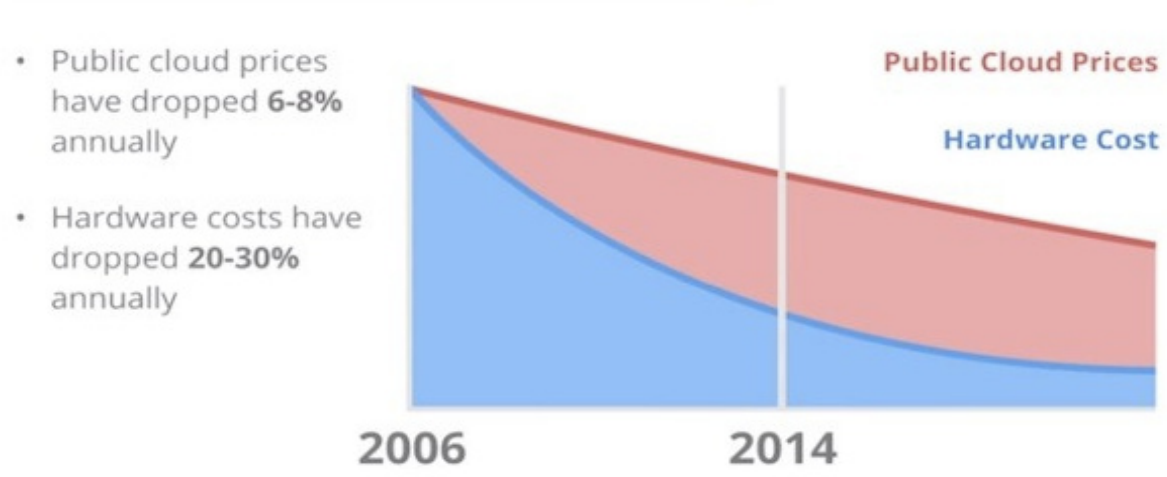

Figure 15: Price Drop in Cloud Computing (King 2014a)

Hölzle (2014) argues that the pricing of cloud computing is still too complex. Even if cloud computing is cheap, the cost of hardware drops at faster pace. Hölzle (2014) sees a lot of reduction potential, to make the cloud cheaper for its customers. A huge argument for cloud services on customer's side, even if the hardware prices are dropping to a greater extent, is the "transition from capital expense to operational expense" (Rountree & Castrillo 2013, p.7). Cloud providers have a leverage to conform prices and reduce them according to the trade-off between capital expense and operational expense and not according to sinking hardware prices.

Vouk (2008) states the question of return-on-investment and total-cost-of-ownership as a difficult one. He argues that a direct comparison between the models has not been done, yet. Dhar (2012) in contrast assures a sinking total-cost-of-ownership because of the shared infrastructure.

Cloud providers, which force a cost-leadership, reduce prices. But it is not about the customer who should get a cheaper service. The sinking prices are influenced by the price war between the big players. Competition drives prices down and customers can benefit from the price war, just as providers do from the sinking hardware prices (Golden 2013, King 2014a).

Grossman (2009) describes the pay-per-use model, where the customer pays for the service that he needs without any additional expenditures. The pay-per-use model is the most common model in the pricing section of cloud service models. Khajeh-Hosseini et al. (2010, p.4) specify three models of pay-per-use introduced by cloud providers:

Table 5: Cloud Pricing (Khajeh-Hosseini 2010, p.4)

Tiered Pricing	Different tiers each with different specifications are provided at a cost per unit time
Per-unit Pricing	The user pays for the exact resource usage
Subscription Pricing	Common at Software-as-a-Service products, the user pays a fixed monthly fee

Armbrust et al. (2009) detect simple pricing models as the future of cloud computing because of their transparency and understandability. Researchers with other opinions, like Hölzle (2014), argue in the same way and want cloud computing to be as simple as possible. Khajeh-Hosseini et al. (2010) subjoin that new pricing methods are created, too. They bring up the example of Amazon's Spot Instances, where users can bid for "unused capacity in Amazon's data centers" (Khajeh-Hosseini 2010, p.4).

4.4.2 Differentiation

Smaller providers cannot fight a price war against the global players to stay in the cloud market. But a study by Gupta et al. (2013) carved out that cost reduction and cost savings are not always the main factors, when small or medium enterprises decide to move their operations to the cloud. In their study the ease of use and convenience and security and privacy are the most important factors for small and medium businesses when deciding to integrate a cloud provider into their structures.

Smaller cloud providers have to tread a different path. They have to focus on different customer needs than price and cost reduction. A well-defined service offering can often beat the low-price offering, especially in the IT sector where security and operability play a major role. Additional services, better transparency and customer relationship can lead smaller providers to their goals, without being in competition with a global player (Kryvinska et al. 2014a). The most important issue for small cloud providers is to find the niche where they can operate with the highest profitability.

According to Garrison et al. (2012, p. 64) three categories can affect customer satisfaction and need to be recognized when enterprises are differentiating their cloud providing structures.

Table 6: Focus of Differentiation (Garrison et al. 2012, p.64, 65)

Strategic Success	Renewed focus on core business activities that can accompany a move to cloud computing when its IT functions are hosted and/or managed by a cloud vendor
Economic Success	Ability to tap the cloud vendor's expertise and technological resources to reduce in-house IT expenses
Technological Success	Access to state-of-the-art technology and skilled personnel, eliminating the risk and cost of in-house technological obsolescence

Garrison et al. (2012) argue that strategic, economic and technologic benefits can boost an enterprise and bring it in front of its competitors. Cloud providers are the leverage for an organization's boost towards better structures. Through designing valuable services in at least one of the mentioned categories cloud providers can push themselves into a better position by offering additional value to their customers and furthermore create a better relationship of trust and efficiency by reacting to customer needs.

4.4.3 Pricing Strategies

Rountree and Castrillo (2013) mention public clouds as attractive because of cost savings. An understanding of the cloud in their opinion is the most important point when deciding for a cloud computing service. "Not only the amount of savings but also the type of savings" (Rountree & Castrillo 2013, p.37) plays a major role.

The pricing strategy for global players can lead to three different decisions, operating in the low-cost sector, operating by offering differentiated products or find a combination of both. Smaller providers often do not have many options to choose from. They have to differentiate their products to be competitive in a high-frequented market.

Before preparing a case study on cloud enterprise value from provider's side, the thesis takes a look at the foundation of case study theory.

4.5 Case Study Theory

Introducing a case study has different tasks. The design of the case study is an enterprise analysis, where two case studies one on provider's side and one on customer's side should give an insight into the actual value and integration of cloud computing. The data is accumulated through different sources. The sources include interviews, direct observations including data sets on the underlying infrastructure, archival records like conference reports, reports like case studies of the providers or users and articles in IT magazines, and physical artifacts of employees' work. The analysis is based on the actual enterprise conversion, while the results should provide a framework for the requirements of a future development of cloud computing and the steps to take this development (Yin 2012).

The case study officiates as a research strategy, as it proposes the data necessary for an analysis and the data to test the research implications (Eisenhardt 1989). The research implications help to connect the expectations of the IT industry with the data analyzed in the case studies. The comparison between both leads to a generalization of the outcomes to propose the requirements and steps for the future development of cloud computing's enterprise value (Yin 2012).

The upcoming subsection offers an insight into the best performing cloud providers and their operations to see how the cloud computing market is really structured and what cloud providers in practice really offer to their customers and how they want to attract them.

4.6 Players in Cloud Service Providing

Cloud service providing offers two possibilities to become a successful player: low prices or making your product more valuable than other products. Because of that the player section will be divided into two different categories of analysis. The

first category describes the biggest players in cloud computing. The second category is about successful niche providers.

4.6.1 Players

4.6.1.1 Global Players

The global players in cloud computing markets are well-known from their other operations. Huge infrastructure investments are needed to develop cloud computing systems. Only enterprises with the possibility to afford this investment are able to compete in a market with a huge price war without looking for niches. Amazon, the world's largest online retailer, Microsoft, the leader in operating systems for personal computers and Google, the largest search engine operator, are the dominating players in the developing cloud providing industry. The huge enterprises have to create the computing infrastructure to handle the peak of demand of their operations. The average demand is smaller and the computing infrastructure can be offered to customers at that time without building additional structures (Youseff et al. 2008). Global players do not only have the possibility to build huge data centers to offer them as a service, they also have the advantage to offer their own unused infrastructure to their customers without any investment in new data centers. According to Synergy Research Group (2013) Amazon generates the biggest revenues in the cloud computing market regardless of the distribution model of services. This is presented in figure 16.

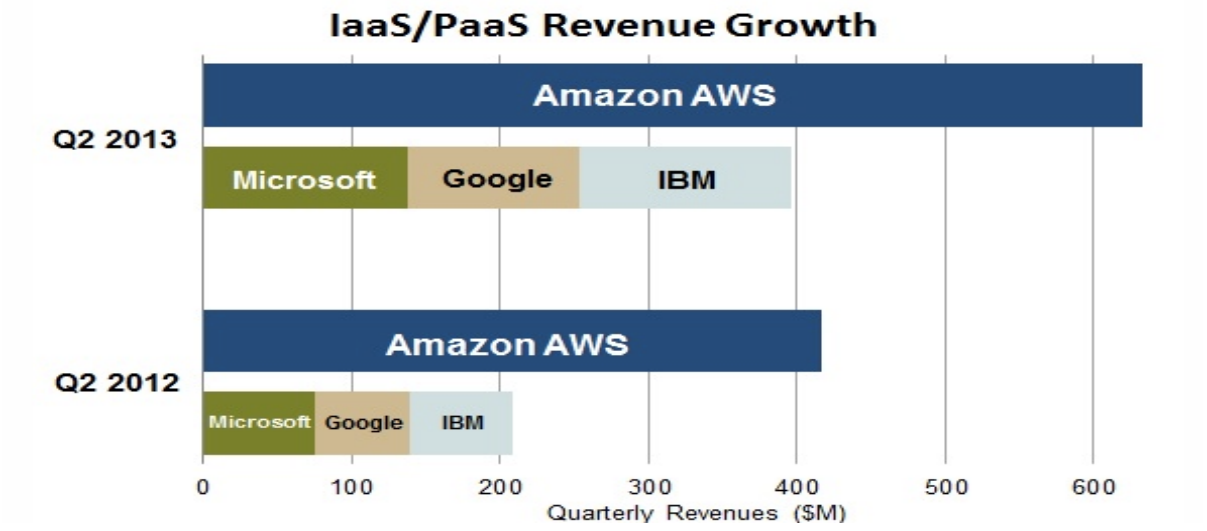

Figure 16: Global Player Revenue (Synergy Research Group 2013)

The global players in cloud providing focus on Infrastructure-as-a-Service and Platform-as-a-Service models. Amazon is by far the leader in those segments generating a higher revenue than the biggest three competitors combined. While the cloud computing market grew by 46% in the year of the analysis, Amazon grew by 55% and developed its market share (Synergy Research Group 2013). The thesis will focus on: Amazon, Microsoft and Google.

Amazon:

Established in 2006, Amazon Web Services serves a huge spectrum of Infrastructure-as-a-Service and Platform-as-a-Service offerings to its customers. Amazon started to develop infrastructure services for internal use and later offered them to external customers (Clark 2012). The company started to make "network resources available to partners and affiliates" (Sosinky 2010, p.179) and at the same time developed their internal services. Amazon's aggressive strategy is to offer services very quick and at low margins to prevent competitors from entering the market (Clark 2012). Amazon enables its customers to "create private virtual servers that you can run worldwide" (Sosinsky 2010, p.179). Amazon Web Services uses a pay-per-use model with a monthly bill. The prices can be calculated on their website and depend on different regions (Amazon 2014a).

Google:

Google started its cloud operations in 2008 with the release of the Google App Engine (Schalk 2010). After developing the Google App Engine, Google "started to offer browser-based enterprise applications" in 2009, which revolutionized the cloud computing market (Mohamed 2009). Sosinsky (2010, p.151) describes Google as "the prototypical cloud computing services company and it supports some of the largest web sites and services in the world." The Google App Engine is offered for free on a daily basis and for certain services. Exceeding the daily borders or using special services result in payments. Google's App Engine is a fully developed Platform-as-a-Service offering. At the same time Google features different additional services like a compute engine or cloud storage for example (Google 2014a). Sosinsky (2010) mentions the big range of applications. In

addition, Sosinsky (2010, p.151) writes about the variety of services Google offers to its customers, including ‘productivity applications, mobile applications, media delivery, social interactions, and many more’ and also describes the developer’s program.

Microsoft:

Microsoft was the last of the three companies in the analysis to offer a cloud computing solution. The external offering of Microsoft Windows Azure started in 2009 with a storage service and reached general availability in 2010 (Deacon 2010). Windows Azure developed and in 2010 offered computing, storage and management solutions. Developing an enormous range of services and products, Microsoft is trying to compete in cloud computing’s three big markets: Infrastructure-as-a-Service, Platform-as-a-Service and Software-as-a-Service (Deacon 2010). Experts like Raghupathi (2011) criticize Microsoft’s behavior looking at the Internet market as non-significant and therefore missing an early development of web services, including the cloud computing sector. Microsoft offers a pay-as-you-go system, too (Microsoft 2014a). The offering is very diversified. Microsoft facilitates a pricing calculator to determine the cost (Microsoft 2014b). Sosinsky (2010) describes Microsoft’s approach as software plus service, with an extensive portfolio of services.

4.6.1.2 Niche Players

“Niche markets are an attractive opportunity available to small businesses forced to compete against the scale economics that large competitors are able to achieve” (Thilmany 2008, p.1).

Competition against the big players in cloud providing is not possible for most challengers. Those enterprises developed different models to deliver additional service to their customers without being in direct competition for the customers attracted by global players. Buyya (2009) predicts a switch towards Platform-as-a-Service and Software-as-a-Service while at the same time the number of cloud platforms is on the rise. A in best-case inimitable strategy or service can boost an enterprise, fill a gap and obstruct it to competitors. At the same time niches present growing maturity of products. Cloud providers need to develop a service

adjusted to their strengths to stay competitive, because the market for standard products gets saturated or is already occupied (Nielsen 2012). Nielsen (2012) reminds security as the most promising niche in cloud computing. The most dangerous threat to niche providers is the declining cost for cloud storage. Even if the service of the niche providers offers different possibilities to its customers other products get alluring through sinking prices. In figure 17 Weichsel et al. (2012, p.6) illustrate the trend towards sinking cost of cloud storage.

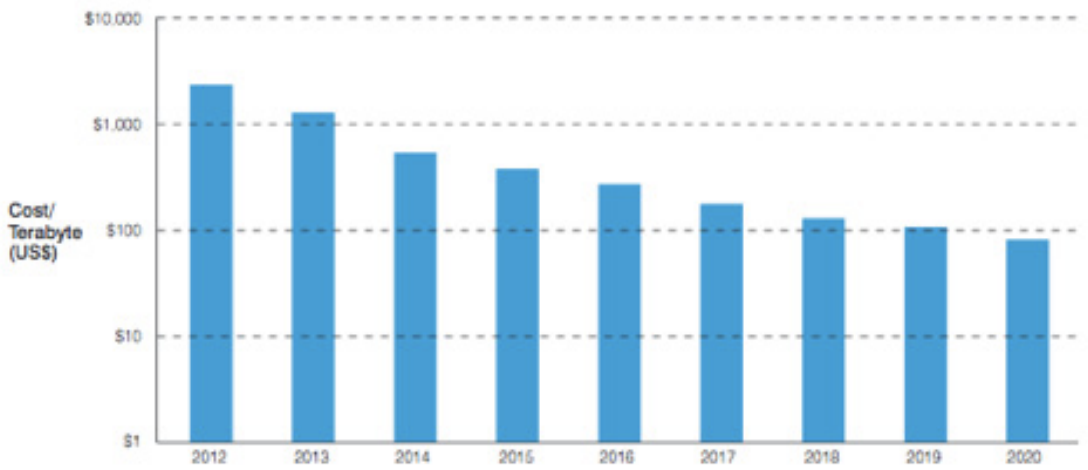

Figure 17: Provider Cost Structure Per Terabyte of Cloud Storage (Weichsel et al. 2012, p.6)

As niche providers cannot fight competition with sinking prices they have to create very specific services and make them even more valuable in the future to attract customers. “Providers must be able to continually expand and optimize every aspect of their operations, from manpower and maintenance to the sourcing of equipment, space and power” (Weichsel et al. 2012, p.6). Staying competitive in a niche market claims premium products, which are continually developed and enhanced, combined with a service package that is perfectly suited to the type of cloud service.

Salesforce:

Salesforce was founded in 1999 to deliver Software-as-a-Service as a cloud solution (Salesforceprogrammers 2014). In 2007 the company amplified its portfolio with the addition of a Platform-as-a-Service offering (Salesforce 2014f). The company presents the reinvention of customer relationship management in the cloud as its vision (Salesforce 2014a). According to Sosinsky (2010) the

principle of Salesforce's customer relationship model are: pay-as-you-go, simple use and multifunctionality. Salesforce distinguishes between two major service offerings Software-as-a-Service and Platform-as-a-Service. Under the name Salesforce.com, the company offers a web application suited to its customers. Force.com is the Platform-as-a-Service solution, which enables customers to build their own services (Sosinsky 2010). Salesforce is very active adding services to their structures, which results in the acquisition of enterprises. Figure 18 by McKnight (2012) presents the acquisitions of Salesforce since its start in 1999.

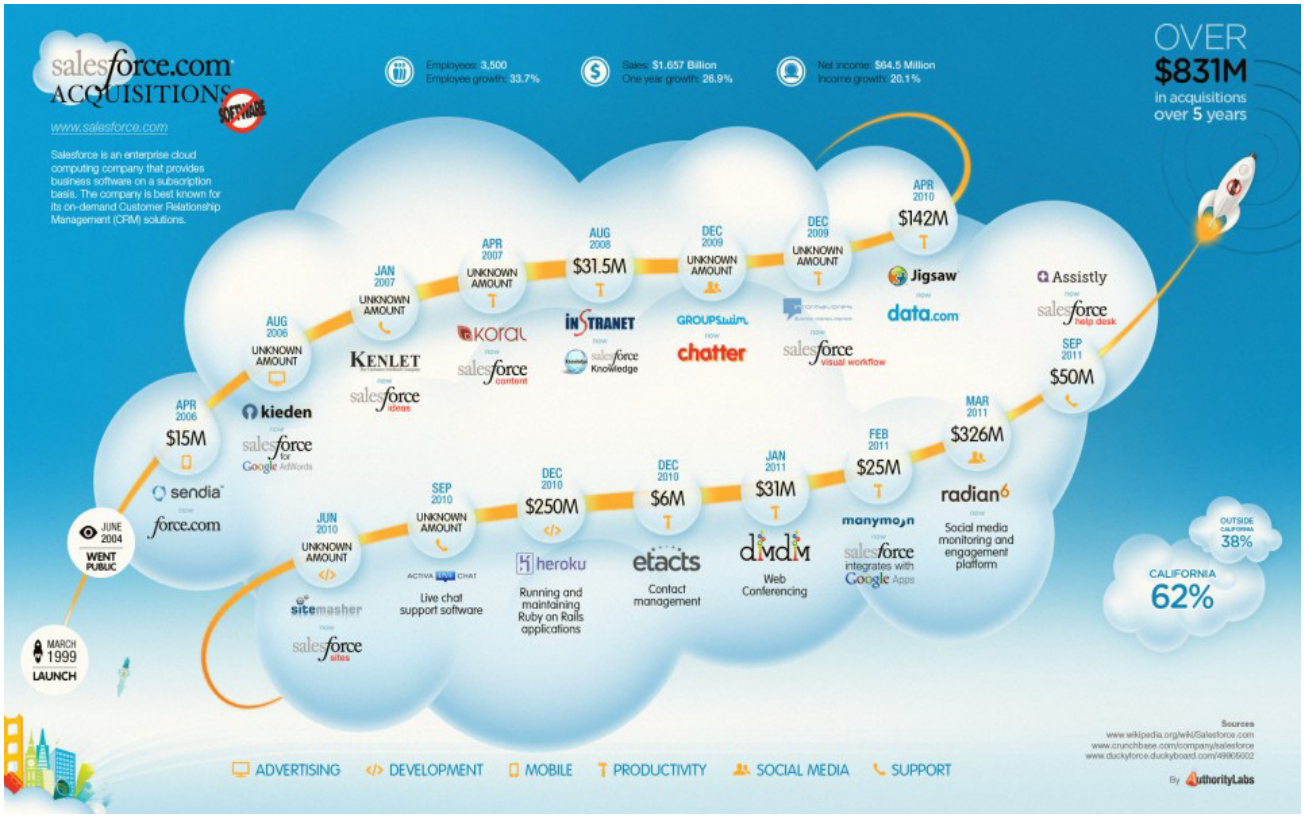

Figure 18: Salesforce's Acquisitions (McKnight 2012)

The picture illustrates that Salesforce is very aggressive in adding new enterprises to their structures to develop new service offerings. In the years from 2007-2012 Salesforce invested more than $831million in its expansion operations (McKnight 2012). Salesforce (2014b) differs pricing into four categories: sales cloud, service cloud, platform and chatter. The payment is mostly based on monthly fees. The basic package for chatters is for free while the platform section serves a contact to negotiate payments individually.

Rackspace:

Rackspace (2014a) started its operations in San Antonio, Texas in 1998. Rackspace began as a vendor of Linux-based products before entering the cloud computing market. In 2009 the enterprise started to offer cloud services. A primary objective of the enterprise is to connect their first business solution, dedicated server structures, with cloud structures especially on hybrid base. Rackspace focuses on Infrastructure-as-a-Service products and enhanced their service offering in 2014 by adding 'managed cloud' services, which means that Rackspace supports their customers in building and creating their Infrastructure-as-a-Service package (Butler 2014). Rackspace established itself as one of the leaders in cloud-enabled managed hosting in North America according to Gartner's (2014a) magic quadrant. Gartner (2014a) accents Rackspace's providing as superior and its customer service as highly satisfactory. The enterprise's intention is not to compete with global players, in contrast Rackspace wants to offer premium services and in return get a premium price for the services (Sanders 2014). Rackspace (2014b) offers a broad spectrum of cloud services. To calculate the price for their operations they facilitate a cloud calculator. The main categories in pricing are: cloud servers, cloud load balancers, cloud databases and add-ons.

VMware:

VMware is an enterprise, founded in 1998 in Palo Alto, offering server virtualization to its customers (Peacock 2013). The enterprise is the leader in server virtualization for the fifth consecutive year and kept its position in 2014 according to Gartner (2014b) (Adams 2014). In 2013 VMware launched an Infrastructure-as-a-Service offering called vCloud hybrid services. VMware's problem is the growing cloud computing market and their late start combined with a very competitive market. A fast redefinition of the enterprise's business model is needed (Gartner 2014a). VMware offers two possibilities to pay for its dedicated cloud, per month or per unit. The pay-per-month model does not feature any components of a pay-as-you-go model it is defined by certain

amounts. The virtual private cloud model offers the same payment methods (VMware 2014a).

Subsection 4.6.2 targets on the enterprise value from provider's side.

4.6.2 Case Study - Platforms and Service Offerings

The first case study provides an overview of the enterprise's abilities, before analyzing its situation, capabilities and development. The subsection can contribute through presenting what cloud providers are already offering to their customers and by analyzing the potential of cloud providers.

4.6.2.1 Global Player section

Table 7 aggregates the most important facts for the analysis of cloud providers. The table only presents the most important or most contributing offerings.

Table 7: Data on Global Players

(Amazon Web Services, 2014a, Amazon Web Services 2014b, Amazon Web Services 2014c, Amazon Web Services 2014e, Babcock 2013a, Barron's 2013, Bass 2013, Buyya 2009, Dignan 2013, p.13, Gartner 2014c, Gartner 2014d, Google 2014a, Google 2014b, Google 2014c, Google 2014d, IDC 2014, Marinescu 2013, Microsoft 2014c, Microsoft 2014d, Microsoft 2014e, Microsoft 2014f, Mirandi 2013, Tung 2014, Yahoo Finance 2014a)

	Amazon	Google	Microsoft
Focus	IaaS, PaaS	IaaS, PaaS, SaaS	IaaS, PaaS, SaaS
Service Type	Compute, Storage	Web Application	Web, Non-Web, Application
Service Offering (Extract of the most important offerings)	Compute, Networking, Storage & content, Delivery, Databases, Analytics, App Services, Deployment & management, Mobile services, Applications, AWS marketplace software	App engine, Google applications, Compute engine, Cloud storage, Cloud SQL, Cloud datastore, Big query, Prediction API, Translate API, Cloud endpoints, Cloud dns, Cloud pub/sub, Cloud deployment	Media, Media services, SQL database, Storage, Virtual machines, Websites, Automation, Back up, Media services, Mobile services, Authentication, Storage, Traffic management
Customers	Start-up, Small, Medium, Big, Global Player	Start-up, Small, Medium	Start-up, Small, Medium, Big, Global Player
Revenue (estimated) (Specific to the cloud)	Cloud Revenue 2012: $2bn Cloud Revenue 2013: $3.8bn	Cloud Revenue 2012: n.a. Cloud Revenue 2013: $1bn	Cloud Revenue 2012: $1bn Cloud Revenue 2013: $2.3-2.6bn
Geography	4 locations in North America, Ireland, Singapore, Tokyo, Sydney, Beijing,	3 locations in North America, 2 locations in Europe, 3 locations in Asia,	6 locations in North America, 2 locations in Japan, Ireland, Netherlands, Hongkong, Singapore, Sao Paulo
Gartner's Magic Quadrant	Leader IaaS	Visionary IaaS, Challenger PaaS	Leader IaaS, Leader PaaS

4.6.2.2 Niche Player Section

The niche player section provides information on three enterprises, which are already established in cloud computing niches or which are on their way to establish a valuable cloud computing offering. Salesforce presents an enterprise, which can be seen as both, a global player and a niche player. Because of its character and its difference from the other global players in cloud computing it is presented as a niche player. Table 8 illustrates the aggregated data on niche players:

Table 8: Data on Niche Players

(Babcock, 2012, Chatterjee 2014, Gartner 2014c, Gartner 2014d, Kryvinska et al. 2014a, Miller 2013, Rackspace 2014c, Rackspace 2014d, Rackspace 2014e, Rahn 2014, Salesforce 2014c, Salesforce 2014d, Salesforce 2014e, VMware 2014b, VMware 2014c, VMware 2014d, VMware 2014e, p.41, VMware 2014f, p.40, Yahoo Finance 2014b, Yahoo Finance 2014c)

	Salesforce	Rackspace	VMware
Focus	PaaS, SaaS	IaaS	IaaS
Service Type	Software, Web applications, Customer relationship, Support, Enterprise resource management (ERM)	Compute, Storage, Customer relationship, Customization	Compute, Storage, Customer relationship
Service Offering (Extract of the most important offerings)	Sales cloud, Service cloud, Exacttarget, Marketing cloud, Salesforce1 platform, Salesforce communities, Data.com, Pardot, Salesforce chatter, Work.com, Desk.com, Customer service	Servers & sites, Databases, Big Data platform, Files, Block storage, Back up, Monitoring, Queues, Load balancers, Managed hosting, servers, storage and collocation, Rack connect	Data center virtualization & cloud infrastructure, Data center & cloud management, Infrastructure-as-a-Service, Enterprise mobility management, Personal desktop, Applications and data platform, Free services
Customers	Start-up, Small, Medium, Big, Global Player	Start-up, Small, Medium	Start-up, Small, Medium, Big, Global Player
Financial Aspects (Specific to the cloud)	Revenue 2012: $2.266bn Revenue 2013: $3.050bn	Cloud Revenue 2012: $304m Cloud Revenue 2013: $420m	Cloud Revenue 2012: n.a Cloud Revenue 2013: n.a.
Geography	5 data centers: 4 locations in North America, 1 location in Japan, Planned: 3 data centers in Europe	9 data centers: Chicago, Dallas, Northern Virginia, London, Hongkong, Sydney	7 data centers: 5 locations in North America, 2 locations in Europe both settled in England
Gartner's Magic Quadrant	Leader PaaS	Niche Player IaaS	Niche Player IaaS

Subsection 4.6.3 presents an analysis of the data prepared in subsection 4.6.2 and an insight in the cloud computing enterprise value of providers.

4.6.3 Analysis - Enterprise Value

4.6.3.1 Focus

As Software-as-a-Service rises, “accounting 72% of the total public cloud services market and forecast to grow at 20% CAGR over the forecast period (until 2018)” (IDC 2014), the global players have to unlock a new market segment. The Software-as-a-Service segment is dominated by Salesforce, which could be seen as both, a niche and a global player. The only global player appearing in the Software-as-a-Service Top 5 is Microsoft, while Amazon and Google focus on Infrastructure-as-a-Service and Platform-as-a-Service (IDC 2014). Amazon leads the Platform-as-a-Service market and the Infrastructure-as-a-Service market. Google was only able to position itself in the Platform-as-a-Service Top 5, while Microsoft is the only enterprise in the analysis ranked in the Top 5 of all segments. The niche player Rackspace established itself as number two in the Top 5 of Infrastructure-as-a-Service companies, while VMware misses to place itself in any ranking at all (IDC 2014).

The challenge for the enterprises will be to keep up with the development of the industry and conform the service offering. As the market developed towards Software-as-a-Service offerings the global players have to adapt their model to stay competitive in the short run. Development into other kinds of services in the long run is already forecasted. Global players can stick to the forecasts and therefore ignore Software-as-a-Service or adapt their services to a changing environment. Niche players do not have the financial possibilities to do so. They have to develop the product with the best value for their forced range of customers. Amazon already broadened their range by adopting Platform-as-a-Service offerings after having had a start as one of the first Infrastructure-as-a-Service providers. Google and Microsoft entered the market later and already provide Software-as-a-Service offerings but their range and quality has to develop. Google has to broaden its focus, as they mostly design cloud services and neglect on-premise service offerings, which prevents mainstream companies

from an adoption. Especially if the companies just started to integrate cloud solutions (Gartner 2014d). A focus on web innovators prevented Google's services from becoming an enterprise-class application platform (Gartner 2014d). Google has to redesign its focus or try to find its niche without competition from the other global players. They already started to create more enterprise-suited solutions. The niche players do not rely as much on the Software-as-a-Service market as the global players. Salesforce is already an established player in that market, while Rackspace and VMware have a completely different niche and attract their customers through additional services in Infrastructure-as-a-Service. Salesforce's main areas of operations are cloud application and platform markets and they are leaders in both of them, offering "the longest strategic and successful presence" (Gartner 2014d). Rackspace already announced "that they will be exiting the market as a pure IaaS provider […] focusing on their core competency, managed services" (Forbes 2014). Babcock (2014) notices that VMware wants to build an ecosystem about its vCloud Hybrid Service and has "a marketplace of software from various providers" (Babcock 2014, p.2). VMWare's focus is on infrastructure. For the enterprise it does not matter, if the customer is using a virtualized service or a cloud service (Gartner 2014c). A valuable service can tie customers to an enterprise in contrast to the global players, where price and computing power are the most important services. The global players have not created a niche they could develop, yet. They have to keep up with the changes of technology.

As the focus develops and the enterprises have to fight against hard competition, cloud computing develops its potential in contrast to **research implication 2**. There is a development towards full potential, but it is still a long way to go and the markets will change and new obstacles will be on the way. The focus of the cloud providing section leads to an additional definition and additional value. Cloud providers pursuit towards full potential of cloud computing in their regard.

4.6.3.2 Service Type

The service type is a major tool for enterprises to differentiate their services. Global players normally offer a standardized variety of services, while niche players try to add additional benefit to avoid price wars. The International Data

Corporation (IDC) (2014) reported that enterprise resource management (ERM) and customer relationship management (CRM) are the top secondary markets in cloud computing and are expected to grow at high level. The niche players like Salesforce, Rackspace and VMware focus on secondary markets and align their strategy to them. Salesforce is especially active in ERM and CRM (Chatterjee 2014) and also uses collaborative applications, while Rackspace and VMware focus on CRM (IDC 2014).

Amazon and Microsoft focus on standardized products to cut prices. Google is the global player with the highest interest in conquering niche markets through integrating direct sales and support investments around their cloud platform (Mirandi 2013). Gartner (2014c) predicts that Google, as a late entrant to the market, will differentiate its products through platform and manageability services and not fight a price war against Amazon and Microsoft. A special offer Google enables its customers is the allowance for "third parties to list and sell the applications which are built on Google infrastructure" (Padashetty & Kishore 2011, p.14). New Platform-as-a-Service offerings boosted Google's standing in the competition, as they eliminated obstacles and made the Google App Engine more attractive for enterprise integration (Gartner 2014d). Salesforce is the pioneer in facilitation of CRM on-demand-software and extends its offer very fast (Forbes 2013a). They offer an enormous portfolio of services, combined with innovative products. In addition, the Software-as-a-Service segment opens up possibilities for the Platform-as-a-Service segment by connecting the services. But the successful Software-as-a-Service section creates a problem for the Platform-as-a-Service segment, as some customers view the platform as an additional but low-developed service to complement the enterprise's premium product (Gartner 2014d). Rackspace offers a system of managed cloud to avoid competition with the global players. They turned themselves from a hosting provider to a managed cloud service provider, as cloud computing is growing rapidly (Parnell 2014). A problem Gartner (2014c) mentions is the pace of innovation of Rackspace's service offering. The enterprise cannot keep up with the big players and brings in managed service, not innovation, to compete. VMware is the biggest player in server virtualization and now wants to be the same in cloud computing (Babcock 2012). The company focuses on customer

relationships through supporting their customers in virtualization. The aim is the same as Rackspace has, avoiding direct rivalry to the global players by broadening the market and creating a valuable service offering.
The pressure of staying in the market and the necessity to break into well-defined niches presents a fast developing style of cloud providing. Cloud providers have to optimize their services through innovation or adding value to stay competitive. This leads to a rapid development of cloud computing services and creates possibilities to overcome obstacles. At that moment cloud providers are on the way to differentiate their products, create new services, new service types and lead cloud providing towards higher potential. **Research implication 2** can be neglected considering the service type section, keeping in mind that cloud providing still has to develop a lot. There may be obstacles occurring in the future development of the service types, which are not discovered yet. The services can already boost an enterprise's structure through the offering of unique niche services or through high power infrastructure solutions.

4.6.3.3 Customers

Amazon focused on start-ups and small companies, but they started attracting bigger players and developed their customer range. The enterprise offers powerful systems and additional tools to bigger enterprises and global players (Dignan 2013). Amazon tries to make use of its customer base to push their services (Padashetty & Kishore 2011). Gartner (2014c) reminds Amazon's broad spectrum of use cases. Their service portfolio had to change as "price wars, the maturing of the cloud market, the rise of hybrid cloud infrastructure and increased competition could be denting" (Venkatraman 2014) the lead. Because of that Amazon added employees and "expanded the AWS infrastructure, enterprise and public sales capabilities" (Venkatraman 2014) to reach an additional range of customers.
Microsoft Azure on the other hand concentrates on the Fortune 500. Tung (2013) stated that more than half of the Fortune 500 are Microsoft Azure customers. In 2013 Microsoft had about 250 000 customers and Azure grew by 1000 new customers per day.

Google has not provided a lot of information on its customers. The customer study on their website presents a focus on start-ups, as well as small and medium companies (Google 2014b). Gartner (2014c) mentions Google as a company, which “is still learning to engage with enterprise and midmarket customers, and needs to expand its sales, solution engineering and support capabilities”.

As reported by Chatterjee (2014) enterprises like Salesforce concentrate on specific sectors to optimize their niches.
Salesforce for example invests in the healthcare sector. Through the creation of new services Salesforce tries to attract every customer segment. With its new operations small and medium sized enterprises should be added to the customer range. Salesforce is keen on tying customers to its services through delivering a lot of customer interaction (Forbes 2013a).
Rackspace focuses on managed services, as already mentioned. They “cannot compete in the never ending price reduction game and maintain the margins required to run a profitable business” (Forbes 2014). Rackspace uses its established Infrastructure-as-a-Service niche with managed services to attract a different customer group: those who are willing to pay for additional managed service to keep their own business easier. Rackspace already has a lot of customers in the managed hosting section, so they offer their cloud services to them (Gartner 2014c). Rackspace is focused on small and medium enterprises. Gartner (2014c) describes the customer profile as a solution for “small businesses seeking a replacement for low-cost mass-market hosting”. They do offer non-managed Infrastructure-as-a-Service products, but the enterprise does not specifically look for those kind of customers, as they do not fit in their niche profile (Gartner 2014c).
VMware benefits from its brand, and “addresses potential customers[,] who have already accepted VMware as the virtualization provider for the core of the enterprise data center” (Babcock 2014). Those customers are committed to the enterprise (Gartner 2014C). VMware has a lot of potential customers in mind, as their customer profile differs between small enterprises and global players (VMware 2014c).

The enterprises already defined their customer segment very well. Niche Players have very specific customers in mind and even Google tries to break into niches. While Microsoft and Amazon - as global players - want to conquer the whole market. The expectations of cloud providers in the customer section are outlined clearly but some enterprises in the showcase like VMware and Google lag behind their expectations and it will be hard to achieve them as enterprises like Amazon try to broaden their customer range. So it is the global players and well-suited niche players, who perform within their expectations, other enterprises are attracted by the possibilities of cloud providing. As a result, **research implication 1** cannot be fully condemned in the customer section, as only the best enterprises in the competition implemented their expectations. There is a connection to **research implication 2**, as the development of full potential of cloud providing can be stopped through enterprises which simply do not develop their products for a certain customer range or cannot attract a certain customer group. The main obstacle is competition, which can force providers to leave the market, if their product does not attract the customer group the enterprise had in mind.

4.6.3.4 Financial Situation

Cloud computing revenues are hard to specify. Most enterprises do not offer separate revenue data for cloud computing. This possibility exists if a revenue stream does not represent more than 10% of a company's total revenue (Schachter 2013). Regarding the financial situation cloud computing performs well. Every enterprise listed in the case study improved its revenue over the last year. Google's and VMware's performance in cloud computing was not applicable because both enterprises do not release separate data. Google's financial performance in table 7 is estimated (Google 2014d, Mirandi 2013). Salesforce's data refers to the complete enterprise, but as Salesforce nearly gets its whole income from cloud computing the data can be compared to the other players (Chatterjee 2014, Yahoo Finance 2014b). Microsoft and Amazon do not offer financial data on the cloud computing segment either, as cloud computing is pooled with other segments, Amazon for example calls the section where cloud computing is featured 'other' (Lohr 2014). Analysts were able to estimate the

revenue added by cloud computing (Babcock 2013a, Barron's 2013, Bass 2013, Dignan 2013).

Some cloud providers act in a really aggressive manner to secure their market. Salesforce generated a net loss of $116.6 million in 2013, despite new record revenues (King 2014b). This is due to heavy investments in structures and the continuous investment into acquisitions (McKnight 2012). Enterprises in the cloud computing sectors are forced to undertake heavy investments to expand and optimize their services in order to stay competitive. Forbes (2013a) described the rising pressure on Salesforce regarding their operative margins.

Amazon was the leader in cloud computing in 2012 and even improved its status in 2013 by nearly doubling its revenues (Babcock 2013a, Dignan 2013). The problems of Amazon are very low margins and their system that is designed to keep operative costs low to create cheap prices for service offerings (Venkatraman 2014). Google is expected to crack the $1 billion mark in 2013, while Microsoft already did it in 2012 and is expected to have the biggest growth in percentage of all big players in cloud computing in 2013 (Barron's 2013, Bass 2013, Mirandi 2013). Venkatraman (2014) stated that "Microsoft is a serious competitor [to Amazon and] is eating into AWS market share".

Salesforce constitutes the biggest niche player, with the highest revenue coming directly from cloud computing services (Yahoo Finance 2014b). Rackspace is small in comparison to the enterprises mentioned before, but has a constant growth and represents the major opponent of Amazon in Infrastructure-as-a-Service offerings through handling a different kind of service than the other providers (Yahoo Finance 2014c, Miller 2013). The acquisition of cloud-related enterprises could create a financial problem, as they expanded the number of developers but did not add any value by now, not in financial terms, nor in service terms (Gartner 2014c). VMware is not as competitive as the other players in the cloud computing market. In contrast to the other enterprises mentioned, VMware was not able to establish its cloud operations successfully, yet. The enterprise is still preparing the ground and in need for customers, which move to their cloud computing offerings. The revenues for cloud computing are not applicable, but server virtualization remains and will remain the dominating sector in the next years at VMware (Babcock 2012).

In contrast to **research implication 2** that claims cloud computing will not develop its full potential, the cloud computing markets are growing well and the providing players improved their revenue to a great extent. Analysts predict Amazon Web Services as a strategic asset to the company (Dignan 2013). According to Sams (2014) Microsoft is also developing its potential, as 57% of the Fortune 500 use Microsoft Azure. In contrast to other evolutions Microsoft did not miss a potential paradigm, like often performed over the last decade, by starting its operations too late. Google is expected to hit the $1 billion in 2013, but performs behind Amazon and Microsoft (Panettieri 2013). The next step towards achieving full potential is the connection of their services (Mirandi 2013). Harris (2013) mentioned that the development of full potential could be stopped by rivalry. He analyzed that Amazon is growing faster than its biggest competitor in the Infrastructure-as-a-Service market, Rackspace. In the long-term this could lead to an even bigger domination by Amazon and a trend towards cheap Infrastructure-as-a-Service products. Keeping costs at a minimum in the development of services could be counterproductive and therefore cloud computing could be prevented from developing its full potential. Another threat, which could prevent from achieving full potential and lead to financial losses, is a breakdown of the cloud. Amazon had to suffer one in 2010, when the Amazon network host service did not work for four hours. Amazon lost confidence from customers and because of that also revenue in the end (Zhang et al. 2010b). A stable system is essential for developing the full potential of cloud computing, as customers still need to be convinced to switch. This is just an example of what prevents providers from receiving their full potential. From a provider's point of view the development of cloud computing is very promising at this time and the predictions for the future are bright, even if there are obstacles in the way of their development.

Research implication 1 is not lasting for cloud providers considering financial aspects. They perform within the expectations of the industry and according to business analysts the development will continue and cloud providers will raise their revenues when performing the right way. Amazon performed over the expectations in quarter 3 of 2013 by adding 84% of Amazon's 'other' category or in figures $850 million to the balance sheet through cloud computing. This means

that Amazon doubled its revenue through cloud computing regarding quarter 3 of 2012 (Babcock 2013b). Levy (2013) from Bloomberg mentions Amazon Web Services as a separate enterprise would be worth more than two-thirds of the companies actually ranked in the Fortune 500. According to Chatterjee (2014) Salesforce had to adjust their profit and revenue forecasts for 2014 after demand on web-based sales and marketing software exploded in the first quarter. Microsoft developed its revenue from $1 billion in 2012 to estimated $2.3- $2.6 billion in 2013 (Barron's 2013, Bass 2013). Boosting its operations in the year of 2012 some magazines, for example c/net, forecast Microsoft as Amazon's hardest competitor over the next years (Kerr 2013). Rising revenues support the argumentation. Parnell (2014) describes an issue at Rackspace, which most cloud providers have to focus on. Despite rising revenues and development, the profits are flat. Cloud providers have to optimize their structures and add service offerings. Google has the same issue with investments but Mirandi (2013) forecasts, "by increasing enterprise and developer appeal in (the) cloud platform, Google is generating new opportunities for partners to develop on and resell cloud platform solutions." The expectations set into profit are the ones which are by now unfulfilled. But investment into structures and functionality offers the perspective to get beyond competitors and gain profit after establishing a developed system.

4.6.3.5 Geography

North America is the most important market for cloud computing with a market share of 68%. Western Europe has a market share of 19%. The rest of the world, especially Asia, account for the remaining 13% (IDC 2014). In consonance with an IDC (2014) analysis the market share of the US will drop to 59%, while the market share of Western Europe will rise to 23%.
Figure 19 by IDC (2014) presents market size and compound annual growth rate of the different geographic regions.

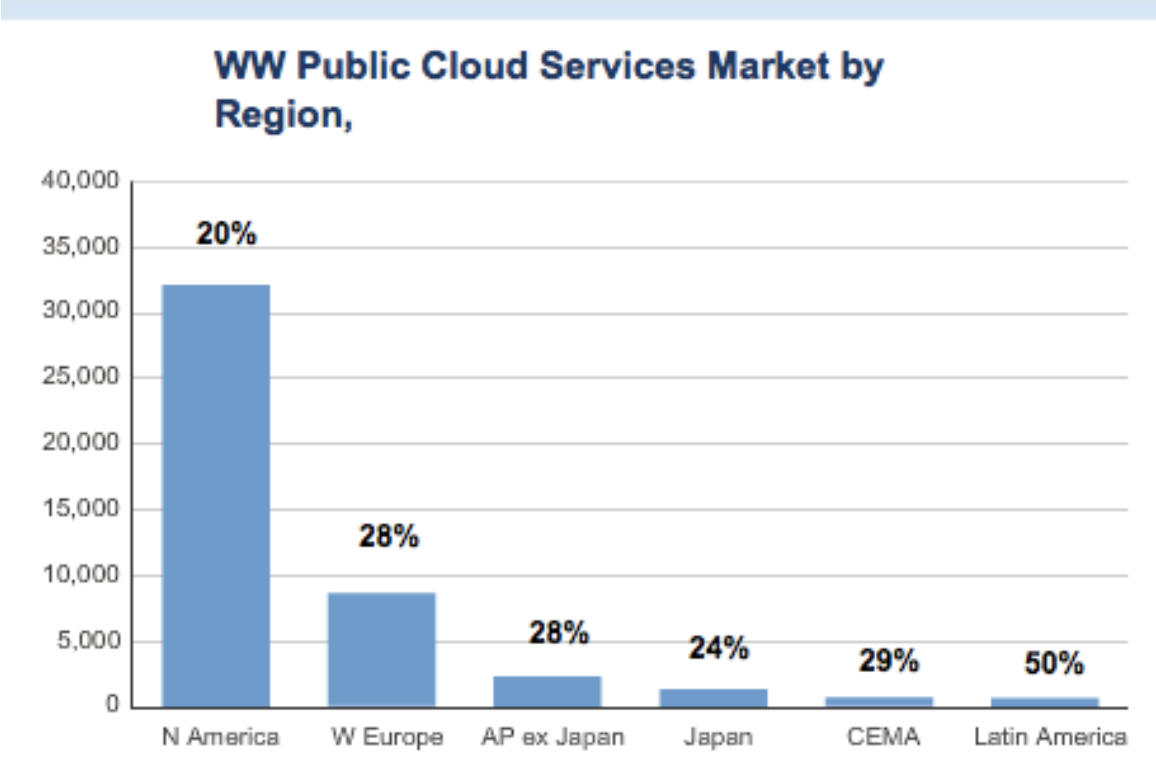

Figure 19: Market Size and Compound Annual Growth Rate (IDC 2014)

Regarding the compound annual growth rate (CAGR) presented in figure 19 enterprises have to shift their focus and build additional data centers. North America and Western Europe constitute the biggest markets, but Latin America presents an immense compound annual growth rate (IDC 2014). Microsoft (2014d) is the only global player to operate a data center in Latin America, which has an expected CAGR of 50%. None of the niche players operates a data center in Latin America, but Salesforce (2014e) has two service locations in Latin America and the Caribbean. All other regions are covered with data centers by every global or niche player, except of VMware (2014d), which does not run a data center in Asia (Amazon Web Services 2014b, Google 2014c, Microsoft 2014d, Rahn 2014, Rackspace 2014d, VMware 2014d).

A disassembling of additional regions leads towards new potentials and additional value for cloud providers. The geographical section devitalizes **research implication 2** at that moment, by unlocking new possibilities and a regional development of cloud computing. But in the future a new look at the potentials and the additional development of cloud computing regions has to be done. The regional development needs to improve and not only be an option in the mind of providers.

4.6.3.6 Enterprise Value

In some points cloud providing lags behind the expectations of the IT industry, but the expectations are very high. The analyzed companies are global or niche players and at that time they are performing well in a very competitive area. Their expectations are mostly driving them to new innovations, new services and unlocking new potentials for the industry. Cloud computing already boosted enterprise structures in the provider section, like the example of Salesforce, which developed into a global player through offering a specific cloud computing service. Other players fight a price war and because of that their margins rest low. Through developing their cloud computing system the own infrastructure can profit, too. The global players are IT giants and therefore in need for the best infrastructure available for their own operations. Amazon for example first offered parts of their unused infrastructure as a start into cloud providing. By now they enlarged their infrastructure, but still use the same infrastructure they offer to their customers (Papadimitriou et al. 2008).

Cloud providing already presents high potential, otherwise cloud providers would not integrate cloud providing into their operations. A final statement if cloud providers can develop their full potential is not possible right now. As **research implication 2** proposes, there are still a lot of obstacles to remove, but cloud providing is on a good way. The main obstacles for the analyzed providers are rapid innovation, where they have to keep up. The price war which can even lead global players into problems, because of low margins and the constant development into new types of services. Software-as-a–Service is the dominating cloud service, but Infrastructure-as-a-Service and Platform-as-a-Service are on the rise (Business Wire 2013).

Van der Zwet and in't Veld (2013, p. 6,7) mentioned six strategies to compete in the cloud providing market:

- “Geographic expansion: deliver a geographically distributed hosting service
- Develop a partner channel: create a service platform for resellers
- Up the value chain: offer cloud-based applications
- Service: make it exceptional, use your local advantage
- Hybrid clouds: integrating multiple clouds
- Customization: offer the most efficient and flexible cloud model”

Some of the projections have already been implemented by some of the analyzed enterprises, as van der Zwet and in’t Veld (2013) propose: VMware is the only provider which has not expanded to Asia yet (VMware 2014d), Google developed a platform for resellers (Padashetty & Kishore 2011), Rackspace provides a managed service (Forbes 2014), Salesforce, Rackspace and VMware customize their services for their customers (Forbes 2013a, Parnell 2014, Babcock 2012).

The development of cloud providing will continue and enterprises have to be innovative and resistant to stay in the market. The future presents many possibilities and obstacles. But it looks like cloud providing overall is on a good way to develop high potential. Achieving the expectations of the IT industry in contrast will be very difficult, as cloud computing is presented as the new dawn in IT and expectations are exaggerated.

4.6.3.7 Business Model

The framework orientates itself on the business model explanation of Teece (2010). This thesis does not describe the complete business model of the providers. However, it describes how the providers serve cloud computing markets. Table 9 displays the business model of global players in cloud computing.

Table 9: Business Model of Global Players

(Amazon Web Services 2014c, Buyya 2009, Dignan 2013, Gartner 2014c, Gartner 2014d, Google 2014b, IDC 2014, Microsoft 2014e, Mirandi 2013, Padashetty & Kishore 2011, Sanders 2014, Tung 2013)

	Amazon	Google	Microsoft
Who	Whole bandwidth of cloud computing	Mostly small to medium adopters	Concentration: Fortune 500
What	IaaS, PaaS	IaaS, PaaS, SaaS	IaaS, PaaS, SaaS
How	Standardized products, Additional tools, Use of customer base to push services, Price	Grab a niche, Differentiation, Direct sales, Support investments, Third party offerings	Standardized products, Price

Table 10 handles the business model of niche players in cloud computing.

Table 10: Business Model of Niche Players

(Babcock 2012, Babcock 2014, Chatterjee 2014, Forbes 2013a, Gartner 2014c, Gartner 2014d, IDC 2014, Miller 2013, Mladenow et al. 2012b, Parnell 2014, Rackspace 2014e, Salesforce 2014d, Sanders 2014, VMWare 2014c, Yahoo Finance 2014c)

	Salesforce	Rackspace	VMWare
Who	Whole bandwidth of cloud computing, Focus on customers in the healthcare sector	Small to medium adopters, Customers: willing to pay for service	Whole bandwidth of cloud computing, Customers committed to the enterprise
What	PaaS, SaaS	IaaS, Turn from hosting to cloud services	IaaS
How	ERM, Collaborative applications, Enormous portfolio of services, CRM on-demand,	Managed cloud, Support, Integration of services, Cooperation with customers, CRM	Additional value through service, Strong brand impact Support at virtualization, CRM

Diversified customer models mark the business models of global players, as well as niche players. Most players try to serve the whole market. Only Google and Rackspace present a focus on a certain range customers. In the service spectrum there is some differentiation visible. While the global players try to serve every deployment model, the niche players focus on a certain deployment model to enlarge their niches. Amazon and Salesforce have different strategies, as Amazon does not serve the Software-as-a-Service market while Salesforce offers services and does not provide infrastructure (Buyya 2009, Gartner 2014d, IDC 2014). The global players, except of Google are operating with standardized products to keep cost low, while niche players differentiate their services, as they cannot compete with the price war of the global players. Google wants to defuse the price war and is focusing on niche markets, too (Babcock 2014, Chatterjee 2014, Forbes 2013a, Forbes 2014, Gartner 2014d, IDC 2014, Mirandi 2013, Padashetty & Kishore 2011, Parnell 2014).

All in all, the business models present a typical profile. Global players are competing through standardization and price, while niche players try to differentiate their products to develop a niche, where they are able to compete.

The upcoming subsection handles the question if there is a unique selling proposition.

4.7 Unique Selling Proposition

Especially niche players are trying to develop a unique selling proposition in the cloud providing market, as global players force growth strategies. The niche players focus on specific value-adding services, but do not deliver anything unique. Salesforce profits from its immense portfolio of services and its customer and enterprise relationships (Gartner 2014d). Rackspace offers managed services to create a customer relationship (Parnell 2014). VMware is an established enterprise in virtualization that tries to convince its virtualization customers of its cloud service (Babcock 2012). The niche players are the best operating companies in a specialized spectrum of cloud providing, but there is no offering which cannot be copied, just like VMware that is offering a model related

to Rackspace's one. As there is no unique selling proposition the niche players have to be innovative and develop their services. As mentioned above it is hard for an enterprise like Rackspace to keep up with the pace of innovation, a global player can offer. The enterprise needs to develop its niche without a unique selling proposition (Gartner 2014c).

The global players do not have a unique selling proposition either. Amazon dominated the market since the beginning and is still dominating, but Google and especially Microsoft caught up (Dignan 2013, Babcock 2013a). This development took part, because Amazon does not have a unique selling proposition and the other global players invested heavily in their cloud providing offering (Golden 2013). To keep costs at a minimum the global players do not intend to create a unique selling proposition. They try to operate at low margins and offer the best service possible for the lowest price. Google tries to create a business sector outside the global player's price war, by trying to adapt to what niche players do. But that approach will not create a unique selling proposition, either. Google is trying to grab market share without operating at lowest margins (Mirandi 2013, Gartner 2014c, Padashetty & Kishore 2011).

The market is all about competition as there is no unique selling proposition, but different niches. The global players will keep their low-price strategy, while the niche players try to continue developing their niches. Both, global and niche players are under constant pressure to keep their position in the fast developing cloud computing industry.

In contrast to cloud providing, cloud computing itself can create a unique selling proposition. Padashetty and Kishore (2011, p.6) describe "global reach-ability to any entrepreneur with an Internet connection for even the small niche product or service" as cloud computing's major opportunity compared to competing systems. The argument that makes cloud computing unique is the connection, which enables "communication, data sharing anywhere anytime and accessibility" (Padashetty & Kishore 2011, p.6) to services from every device, everywhere an Internet connection can be provided.

Cloud providers are interested in cloud computing because of its possibilities and not to develop a unique selling proposition in the cloud computing market. The providers want to get big players in a market that can one day be a unique selling

proposition by itself. By now cloud computing has to compete with other hosting systems, but in a fast developing world it looks like cloud computing can realize its advantage and exploit its unique attributes. A development of high-speed Internet availability, the need for connectivity all over the world and an undefined need for resources enforce the dispersal of cloud computing.

5. Enterprise Value of Cloud Computing - User's Perspective

5.1 The Concept to Create Value

5.1.1 Target Audience

Table 9 and Table 10 express that different providers are targeting every market segment. Providers want to attract every possible customer. They look at cloud computing as a service suited for every company, if offered the right way. The portfolio of cloud providing customers presents the same result. Depending on the focus of the cloud provider every customer segment is represented in the cloud providing case study. The acceptance of cloud computing by a broad spectrum of users developed very fast. In a paper from 2009 Han (2009) analyzed that cloud computing customers are mainly small companies and start-ups. Staten (2008, p.10) stated that cloud adopters are mainly enterprises which search for "R&D projects, low-priority business applications and web-based collaboration systems", and use the service for short-term projects or only for a certain department (Han 2009). In 2011 Kepes (2011) already stated small and medium businesses as target audience for cloud computing. The reason to invest into cloud computing has changed, too. Investment into hardware and software licenses, as well as computing power, became an important issue to move to the cloud (Kepes 2011).

So cloud computing developed from a test market for small companies and start-ups to a possibility for every type of enterprise, even global players, to source out complete infrastructure technologies and services in best case.

The next subsection illustrates, how cloud adopters today use their cloud systems and tries to describe future cloud developments.

5.1.2 Markets and Types: How Enterprises Use the Cloud Today

The types of cloud computing have already been discussed, this section has to clarify who is using which type of cloud. Software-as-a-Service offers a complete IT structure and is mainly suited for start-ups and small to medium size enterprises which want to outsource their whole operations (Dearing 2013). Platform-as-a-Service needs an own development of services and processes, so adopters need own IT specialists to create their platform offerings. Infrastructure-as-a-Service delivers the infrastructure and computing power to build a cloud computing solution. Platform-as-a-Service is suited for medium enterprises and bigger ones, as small companies do not have the capacity or staff to manage their own platform (Iansiti & Richards 2011). Infrastructure-as-a-service is mainly suited for big enterprises and global players, as the effort to develop services and coordinate the structures is much higher than when integrating an optimized complete providing solution. Software-as-a Service is the most popular sort of cloud computing services. But Business Wire (2013) recognizes the biggest development in Infrastructure-as-a-Service solutions and forecasts Platform-as-a-Service to take the lead within the next five years. The decision to run a private, public or hybrid cloud is up to the enterprise. Start-ups, as well as small and medium enterprises will tend to integrate public cloud solutions because of the costs, while big enterprises and global players tend to integrate private clouds because of security concerns. TCS (2014) announced most enterprises are not willing to put critical applications to a public cloud, but they consider putting them into a private cloud. The study also illustrates that European enterprises are more conservative about the cloud than US enterprises are. The future will see a switch to hybrid cloud solutions by big enterprises and global players (Hammond 2014). RightScale (2014b) confirms the development and concludes that most companies already try to deploy hybrid clouds.

According to Gartner (2013) cloud computing "is growing faster than the overall enterprise IT market". But despite that evolution cloud computing is still a small part of the IT investments enterprises are spending (Gartner 2013). Business Wire (2013) published that the cloud computing market will rise to $158.8 billion in 2014, which depicts a rise of 126% since 2011. RightScale (2014b) stated that

public and private clouds are developing, but enterprise governance is lagging: "in addition the survey found as enterprise cloud maturity progresses, cloud security concerns abate and attention increasingly shifts to managing ongoing challenges of compliance, cost management, and performance" (RightScale 2014b). Petri (in Gartner 2013) reminds that cloud computing is still in a status of adoption and the existing markets may not be representative for the direction of future development in cloud computing, as the cloud market is still filled with early adopters and innovators. Nolle (2011) states that predictions adjusted from today's cloud success may not be realistic because of an unknown upside. The thesis considers this demur by analyzing how cloud computing is actually doing and not what the enterprises predict for the future based on today's development. Anyway, RightScale (2014b) analyzed that the enterprise use of cloud computing is developing, as cloud computing gets ubiquity. The enterprise adoption is maturing as most enterprises stepped out of the early adoption phase. Related to the development, workloads get bigger and following the maturing adoption status, the cloud benefits will grow in 2014. The respondents of RightScale's (2014b) study mentioned especially "higher availability, geographical reach, cost savings and business continuity" as the main stages of progress in cloud computing. Business Wire (2013) identifies agility and scalability as the major reasons, why enterprises integrate cloud computing services. Cost and mobility also enforce cloud adoption. Enterprises want to gain a competitive advantage through innovation in cloud computing areas.

Another interesting outcome of RightScale's (2014b) study is the decreasing challenges enterprises want to see in cloud computing. Users view cloud security as progressing with the experience of cloud providers. Business Wire (2013) assists this evaluation, but mentions that security is stable at the top of cloud computing concerns. In 2009 Han (2009) stated the market of cloud computing services as not contributing for enterprises. Han (2009, p.18) mentions services like "raw computer materials, CPU power, storage space [and], memories, office software toolkit, Enterprise Resource Planning (ERP) software (etc.), backup service and software change management service", which can already be delivered through cloud computing. The spectrum of these services described by Han (2009) changed and evolved. Cloud computing is now a lot more powerful

than it was in its beginnings, but it still has a long way to go. Even five years after Han's statement challenges are just decreasing and the major evolution consists of higher availability, a better geographical reach and business continuity (RightScale 2014b). A lot of companies are still worried about cloud computing that slows down adaption and evolution. The stand out argument to move to the cloud is still the same as in 2009 "a more cost-effective way to consume IT services" (Han 2009, p.18). Garrison et al. (2012) add rigid infrastructure as a problem when integrating cloud computing. Business and IT knowledge are needed to create a platform that enables competitive advantage and most adopters do not know how to gain the full potential out of cloud computing. Instead "effective technical and managerial capability might achieve performance gains and IT cost reduction" (Garrison et al. 2012, p.68). Georgescu and Matei (2013, p.226) argue in the same direction when stating "business value of cloud computing as a combination of benefits: operating instead of capital expenses, subscription to services, customers paying for outcomes not for technology and the 'pay-as-you-go' (PAYG) model". This presents the enterprise use of cloud computing as mainly cursorily and unconnected. The connection of services and empowerment of technologies could bring enterprise IT to a new level, but instead most enterprises by now only use standard technologies to complement their portfolio or save money.

A problem for cloud users is that there is no standard contract between provider and customer. The European Telecommunications Standards Institute (2013) criticizes that there are only guidelines for customers to check their provider. A development towards standardization is needed. Europe is pushing towards a standardized cloud strategy, which will include safe and fair contract terms, a standard which enables interoperability and a European Cloud partnership to implement procurement requirements (Long 2014). To enforce standardization the Cloud Select Industry group was founded, to create solutions in the areas of certification, service level agreements and code of conduct (Long 2014). Van der Zwet (2013) criticizes the market conditions in Europe as a 'jungle of standards' and accuses the regulations to be restrictive and cumbersome regarding the

growth of cloud computing. From his point of view those regulations are the major reason for the bigger cloud adoption in the US market.
Saks (2012) reported optimistically about the cloud adoption of small enterprises in Europe. He mentions time factor as the major one for small enterprises, as this time could also be invested into other segments like sales and marketing. Cook (2014) published the Top 20 services enterprises use to boost their cloud computing structures. Amazon Web Services, Office 365 and Salesforce are at the top of the publication. The players in cloud providing also offer the most deployed cloud computing applications for users. The dominating markets in the future of cloud computing will be tactical business solutions, business process services, which evolved from infrastructure services and a broader portfolio of cloud solutions (Gartner 2013).

Cloud computing creates business and enterprise use, but has a long way to go as most adopters do not really know about the possibilities of the technology. Most services are unconnected or fragmentary and therefore cannot disclose full potential. Providers and customers have to cooperate to create the best services available. The pressure is on the provider section, as users tend to integrate private or hybrid clouds rather than public clouds. Niche providers could have a major impact here, as they differentiate through additional services and support. The connection between customer and provider should be a boost for niche players as they can deliver better suited and more valuable as well as more effective cloud solutions by offering their special knowledge of the cloud and explain it to customers. Customers with specialized structures could take use of it and get a competitive advantage through a better understanding of the cloud.
The enterprise use of cloud computing is progressing but remains in a status of infancy. Services have to improve and develop, customers have to train and understand the cloud. A look at the enterprise use of today does not enforce the statement that cloud computing can develop full potential.

The next subsection addresses at the requirements, which have to be fulfilled to develop a valuable cloud-based business model that enables the possibility to lead cloud computing in the direction of its complete potential.

5.1.3 Requirements for a Cloud-Based Business Model

Even if cloud computing creates a lot of possibilities, it has to mature. Providers develop their own model or orient themselves at the circumstances of the market. Motahari–Nezhad et al. (2009, p.10) state that a business model needs an idea for enterprises to "build their businesses in a holistic way". A cloud business model has to connect the claims of possible cloud adopters to gain additional benefit for their structures. The cloud business model for certain enterprises needs to "define their services, express their requirements, find and engage cloud services that match their needs, compose services if needed, and monitor their business operations over outsourced services" (Motahari – Nezhad 2009, p.10).

The problem is the integration of services. Value of services increases with the adaption of enterprise structures but so does the price. A well-defined business integration of a cloud computing business model is possible, but consumes a lot of planning and in best case an own infrastructure to run an in-house private cloud to achieve maximum security. Private clouds are not the preferred business model for the future. The aim of cloud computing is making IT accessible for everyone at low cost with a maximum of functionality. Private clouds do not offer a maximum of functionality as they are designed to an enterprise's own needs and have problems with interoperability or customization of certain services. As a result cloud providers need to know their type of customer and create a standardized model, best developed for the needs of their kind of clients. The best case would be a public or at least hybrid solution. Nielsen (2012) forecasted that only the best players will stay in competition and his predict already became true, as the most successful and best acclimatized players dominate the market, while others struggle heavily. Those providers are leading the way to a cloud-based business model and that is why they are the most successful ones in the market. Global players lead the move towards a standardized cloud system, while niche players operate through achieving a service-oriented cloud business model.

Nenonen and Storbacka (2010, p.5) suggested five categories a business model has to contain: "customer value proposition, earning logic, value network,

resources and capabilities [and] strategic decisions". Cloud computing offers a value proposition through lower costs, scalability, outsourcing of services and depending on the enterprise and type of cloud computing several other possibilities. The earning logic is defined through a pay-per-use model or service level agreements. Value networks are an issue considering the cloud computing business model. The provider and the customer are cooperating as partners, but external companies are often not integrated into cloud computing structures because of security risks and sensitive data (Mladenow et al. 2012b). Cloud computing could offer a boost to the cooperation between enterprises (Kryvinska et al. 2009). A requirement for a better-developed cloud computing model would be a solution for the problem of external integration. Hybrid clouds already focus on that issue, but do not grant a proper solution, yet. Resources and capabilities present the next issue when creating a more valuable cloud-based business model. Cloud computing can leverage the use of resources and affect capabilities. By now, interoperability between systems and problems in the conversion of certain applications hinder the development of cloud-based business models. The move to the cloud already is a strategic decision, especially for start-ups, as well as small and medium companies. They are able to access more effective structures or software solutions and therefore push the workflow of the enterprise (Kopetzky et al. 2013, Mladenow et al. 2012b). Big companies and global players are trying to optimize and complement their existing structures through the use of cloud computing.

Mircea et al. (2011) suggested to spotlight on typical elements, which are suited for cloud computing use. A focus on non-sensitive data, services that are not affected by latency or by broadband, services with a typical resource pattern and new applications are presented as suited to create a functioning business model. Mircea et al's (2011) approach refers as a recommendation to develop a hybrid cloud, as old applications can stay in-house and critical services are also kept in-house. Vouk (2008, p.236) introduces a bunch of requirements to ensure a stable cloud business model: "reusability, substitutability, extensibility, scalability, customizability, composability, reliability, availability and security" are the components a cloud business model has to contain in his vision.

Chang et al. (2010) distinguish business models suited for different customer groups. In their publication "A Categorisation of Cloud Computing Business Models" they present various business models built around the Cloud Cube Model, a proposed framework of the Jericho Forum. The embodiment of a cloud business model in their view depends on the orientation. A service provider oriented model offers a public cloud, which the provider designs and controls in his own style. Support and service contracts offer the possibility to design a customer-oriented private solution according to customer's requests. In-house private clouds offer enterprises the possibility to keep their data in-house and therefore minimize the risk of attacks on sensitive data and maximize security. The All-In-One Enterprise Model combines the service provider model and the in-house private model. In certain areas both models overlap. Chang et al. (2010) present a lot of changing business models, for different situations. The models are very general, but can give an insight into what cloud users expect from their cloud computing business solution. Start-ups and small enterprises tend to the service provider model, as it is cheap and easy to integrate. Enterprises with more financial resources will tend to a system of support and service contracts, as they can keep their structures in a private cloud. Enterprises with great financial possibilities are able to create either an in-house cloud to keep their data secure or build a hybrid solution. The All-In-One Enterprise cloud, where sensitive data is kept inside and non-sensitive data can be transferred into a public cloud will be a popular future business model as long as enterprises do not trust the public cloud. The hybrid system offers the possibility to integrate customers or partners into the public cloud structures of the enterprise.

Chang et al.'s (2010) business models are very general, but present a good status of cloud business models to work with. By now, service models already developed. With rising maturity even bigger enterprises get interested in public clouds. The private cloud is no longer a goal to achieve, as only the public cloud can offer the whole potential of cloud computing. Private cloud solutions cannot offer scalability, pricing, substitutability, extensibility and rapid software solutions as effective as public cloud solutions (Vouk 2008). The major requirement to develop the full potential of a cloud-based business model in an enterprise is the maturity of the system, which results in confidence in cloud computing. Only

public cloud structures can offer the whole functionality of cloud computing, but at the same time present higher security issues. Cloud computing needs to develop a trusted public cloud business model and create a more cooperative business environment to make a push towards its full potential.

Contributing cloud-business models already exist, but need to be developed or sometimes erased. Lin and Chen (2012) denominate customer needs as the most important point for the adoption of cloud services.
"Enablers are already driving innovation across customer value propositions and company and industry value chains. Enterprises are applying [the] cloud to generate additional revenue streams by enhancing, extending and inventing new customer value propositions" (Berman et al. 2012, p. 31).
Business models have to focus on customer needs and not support provider needs. Fingar (2009, p.115) adds "creative methods of understanding customer requirements" as a possibility to design a valuable business model. Customers have to be integrated in the design of their cloud computing structure in a unique way, to create confidence and bond to adopt a certain business model. Private cloud computing structures can be valuable for an enterprise, but the context here is to enable the maximum value. Enterprises disclaim on several advantages to have control over their performance, reliability and security. Start-ups, as well as small and medium enterprises are already using public cloud structures. Big enterprises and global players are the requirements providers have to focus on when developing their cloud business model. These instances have to shift their activities from self-managed and sometimes even self-provided structures to public fields. Otherwise cloud computing degenerates to a better-developed in-house server farm (Zhang et al. 2010a). Linthicum (2009) defines specific requirements, a cloud-based business model has to fulfill. The business model needs to cope with the problems of the business environment, costs need to be transformed and value creation of the model has to be apparent for the customer, which includes the definition of benefits. From a customer's point of view it is necessary to develop the right enterprise culture for cloud computing. The conversion of the business model will be essential for the outcome (Fingar 2009).

The upcoming subsection presents the expectations on advantages cloud computing should enable to its customers. The section builds the initial point to the analysis of actual cloud conversion in enterprises.

5.1.4 Drivers to Create Enterprise Value

Cloud computing delivers two perspectives when talking about the creation of enterprise value. First, there are the given characteristics of cloud computing, which can if well defined benefit the enterprise's structure and evolution. Second, there are benefits and advantages, which result from the integration of cloud computing. DaSilva et al. (2013, p.2) describe cloud computing as "a breakthrough concerning how people and companies work and communicate through the Internet." The first part of the quotation already is a driver for enterprises to create value. The style of work has changed at enterprises using cloud computing. The second part is a vision, and therefore one of the most important future drivers of enterprise value in cloud computing: communication. Enterprises have totally new opportunities in connecting services and work with customers or other enterprises to enforce cooperation, workload and communication (Kryvinska et al. 2009). But right now most enterprises are not convinced to integrate these stakeholders into their systems, as concerns overwhelm. The drivers of the adoption of cloud computing have to be combined to create a holistic framework for the enterprise that is best connected to strategy, capabilities and structure.

5.1.4.1 Characteristics

The main characteristics of cloud computing have been described in section 3.5 Area of Operations. This section analyzes, how characteristics can contribute to be a driver for enterprise value, and how they can achieve enterprise value. Section 3.5 mentioned five major areas of operation. Section 5.1.4 augments the view, presenting all characterizations of cloud computing contributing to the creation of enterprise value. The section does not only present real advantages

to describe the enterprise value expected by the IT industry. It is necessary to include, what business deciders expect from cloud computing.

Table 11 introduces the expectations of the IT industry on the service possibilities of cloud computing.

Table 11: Contribution of Cloud Characteristics

(Armbrust et al. 2009, Armbrust et al. 2010, Berman et al. 2012, CSC 2012, Dhar 2012, Durkee 2010, Fingar 2009, Georgescu & Matei 2013, Kepes 2012, Kopetzky et al. 2013, Kryvinska et al. 2014a, Marston et al. 2011, Mladenow et al. 2012a, Rountree & Castrillo 2013, Weinhardt et al. 2009, Zhang et al. 2010a, Zhang et al. 2010b, Zissis & Lekkas 2012)

On-demand Self Service	The customer accesses to a certain kind of service without manual interaction. The customer does not have to install a service. He accesses it over the Internet or in-house structures. All processes of the service system are automated. Resources can be used without any delay. The use of services is alleviated through a standardized interface, where the customer can connect to his services. The on-demand self-service contributes, when services vary with time or when "demand is unknown in advance" (Armbrust et al . 2010, p.52)
Elasticity/Flexibility	Elasticity is the ability to scale resources up or down as needed. Elasticity opens up possibilities for users with seasonal peaks, whose demand is changing. Elasticity also features advantages, when demand is not defined in detail. A waste of service hours can be prevented. Through elasticity, cloud providers offer a pay-as-you-go solution, which enables customers to obtain their services at lowest possible cost while shifting risk to the provider. Self-organization enables a lot of flexibility for providers. Customers benefit from rapid changes, without downtime of servers. The immediate access to hardware resources also offers possibilities.
Resource Pooling	"Virtual resources [are] dynamically assigned and reassigned according to consumer demand" (CSC 2012, p.1). The pooling of resources facilitates flexibility and cost reduction potential, which can be relayed to customers. Unused resources can be offered to customers with extended need. If a customer's use rises he can get access to unused structures of other customers.
Measured Service	The pay-as-you-go model enables customers to pay for what they really use. There are different methods how to measure a service including time, bandwidth and data. Cost effectiveness is one of the top integration factors for cloud users. Especially start-ups, small and medium enterprises focus on it.
Broad Network Access	In theory cloud computing should enable its users access to services from everywhere an Internet connection is possible. Development of Internet speed and especially availability in certain regions can boost cloud computing and connect enterprises all over the world. The user connects to a standardized service platform with any device integrated into the enterprise structures. The processing power or type of device is no longer of substance.
Scalability	A virtualized service can be offered to many customers at the same

	time. Maintenance is deeply decreased and new versions have faster time-to-market using scalability. Rapid expansion or decrease of computing capabilities is easy to handle.
Location Independence	Customers do not need an own data center. This allows cost effectiveness through diminished up-front costs and direct availability. Customers do not have to invest time, money and workload in the construction of an own data center. Even in a region without the possibility to create a large data center computing power can be made available.
Sustainability	"Improved resource utilization, more efficient systems, and carbon neutrality" (Zissis & Lekkas 2012, p.584).
Multi-tenancy	Customers share infrastructure. The customer works with a "customized pre-configured virtual application instance" (Dhar 2012, p.667). The advantage is that the pre-configured service is easier to handle as it runs at one single data center and customers do not have to worry about updates, maintenance, the underlying hardware or installation problems. Responsibility for services is shifted to the provider in an extent depending on the service offering. The provider can manage resources efficiently and therefore gain cost advantages, which are bequeathed to the customer.
Commitment	A data center affords huge investments, while a cloud computing provider can be changed. Services that are no longer required can be eliminated without wasting any further resources.
Self-healing	The system corrects failures. A breakdown of an application will force a backup section to run the application without the customer knowing that there even was a breakdown. This feature enables work without delay because of technical problems or breakdowns.

5.1.4.2 Benefits and Advantages

Table 12 presents the benefits and advantages, the IT industry wants to achieve for its customers, through offering cloud computing services

Table 12: Cloud Computing Benefits and Advantages for Enterprises

(Bendandi 2009, Berman et al. 2012, Dhar 2012, Fingar 2009, Grossman 2009, Harbert 2011, Kryvinska et al. 2014a, Marston et al. 2011, Mladenow et al. 2012b, Molnar & Schechter 2010, Padashetty & Kishore 2011, Rountree & Castrillo 2013, Saini et al. 2011, Sosinsky 2010, Trapasso 2010, Weinhardt et al. 2009, Zhang et al. 2010b)

Costs	"Cloud networks operate at higher efficiencies, with greater utilization [and with] significant cost reductions" (Sosinsky 2010, p.17). The system of cloud computing implements a low total cost of ownership (TCO). Minimal capital expenditure is the highest goal of mainly start-ups and small businesses, who want to reduce costs. The customer can use the services of the provider but does not have to own them. Fixed costs can be reduced to achieve a variable

	cost structure. The user can reduce expenses for new services, maintenance and cut operational costs. Public clouds offer the least expensive services, as they are standardized and not optimized for customer's circumstances. Private and hybrid clouds are more expensive, as they are optimized for the customer. The reduction of cost is a major value proposition for deciders moving to the cloud. The growth rate of costs also depicts a reason for a move to the cloud, as the expansion of data centers is linked to major investments. Managers have the possibility to transform their fixed capital investment in data centers to variable expenses depending on the amount of use of cloud computing services.
Market Adaptability	Enterprises can quickly react to the changing market situation through the use of cloud computing. Changes, upgrades or new services can profit from "faster time-to-market", which will be discussed later on. Berman et al (2012, p.30) mention that "companies continuously seek ways to improve their agility so they can swiftly adjust to market demands. By enabling businesses to rapidly adjust processes, products and services to meet the changing needs of the market, the cloud model facilitates rapid prototyping and innovation and helps speed time to market"
Complexity	Reduced complexity for end-users. User knowledge does not have to increase with additional services. Upgrades and services are conducted without user participation. Business deciders expect cloud computing to reduce the complexity of their IT operations, as responsibility is sourced out to a service provider.
Low Barriers to Entry	There are no upfront costs. Costs can be monitored and the services are easy to handle and integrate.
Technical Issues	Cloud computing does not need high-end devices. Enterprises with small budgets are able to use old devices to reduce costs, as computing power is delivered by the cloud computing system. "Resources are managed through software, they can be deployed very fast as new requirements arise" (Marston et al. 2011, p.178). A technique without hardware requirements opens up new possibilities for users. Deciders expect new technical development as available and want to get access to technical skills. They expect a "better business and IT alignment" (Harbert 2011, p.1).
Connectivity/Accessibility	Cloud providers facilitate to enable integration of every type of device into their structures.
Security	A large-scale security implementation is cheaper, because it has to be done once for every service, as the service is scalable. The easy security implementation empowers effective security systems. "Large cloud providers will offer a standardized, opened interface to manage security thereby opening a market for security services" (Bendandi 2009, p.7). Scanning a standardized environment makes it easier to locate and fight attacks.
Faster Time-to-Market	The on-demand service accredits a faster break into the market, as services are already available and it just has to be defined which service the enterprise wants to use. An expectation of business deciders is that cloud computing enables "a faster delivery of IT solutions for business requirements" (Harbert 2012, p.1).

Rationalization	Data centers are sourced out. Planning, construction, maintenance and other duties are no longer part of the enterprise's operations.
Efficiency	Dynamic provisioning at demand is offered through cloud computing. Unused resources are not wasted but shared with other users.
Customer Relationship	Providers can offer "Internet-enabled customer service as well as technical support" (Padashetty & Kishore 2011, p.3). Online sales, training, marketing, etc. to support users can be managed to create a relationship.
Economies of Scale	The economies of scale are mainly an advantage for cloud providers, they can "receive bulk prices for components, better utilize specialized staff, use lower aggregate spare-capacity through sharing, and amortize up-front costs of building and administering data centers over many tenants" (Molnar & Schechter 2010, p.1). Providers use the economies of scale to enable customers the lowest price to apply their services. Economies of scale also contribute to security, business continuity and efficiency of services used.
Reliability	Global operations, "24 hours a day, seven days a week" (Fingar 2009, p.174)
Green IT	Cloud computing creates a possibility to save energy using effectively initiated systems. Green IT plays a major role considering the image of companies in today's business environment. 'Businesses that choose to run business applications in the cloud can help reduce energy consumption and carbon emissions by a net 30 percent or more versus running those same applications on their own infrastructure' (Trapasso 2010). The factors for the reduction of energy and carbon emission arise from a combination of advantages of cloud computing: 'dynamic provisioning, multi-tenancy, server utilization, data center efficiency' (Trapasso 2010). Lots of data centers that waste resources can be replaced by a few big ones, which optimize the use of resources.
Agility	"Casting off non-core competencies, deploying new functionalities, acquiring new competencies, and reconfiguring of the interface with suppliers, trading partners and customers" (Fingar 2009, p.175)
Pay-Per-Use	Customers only pay for their direct consumption, not for fixed packages. The price is static for an accounting unit. The pay-per-use system suits because of the dynamic nature of cloud computing, as users are able to scale up or down without contacting the provider.
Data sharing	Public clouds and hybrid clouds exhibit the possibility to connect with customers and partners. Hybrid clouds enable to separate sensitive data in a private cloud, while non-sensitive data is shared in a public cloud. Cooperation and communication are important features of cloud computing.

5.1.4.3 The Levels of Value

Dean and Saleh (2009, p.3) present three levels of value generated by clouds, illustrated in Table 13.

Table 13: Level of Value (Dean & Saleh 2009, p.3)

Utility Level	**Process Transformation Level**	**Business-Model-Innovation Level**
Lower costs and higher service levels through the elastic computing resources and pay-per-use models of cloud computing	Improved integration of and collaboration in business processes by leveraging the common assets of cloud computing	New business models and ecosystems through linking, sharing, and combining resources among enterprises using the scalable assets of cloud computing
- "Variabilization" of costs: capital costs become operating expenses - Lower and more predictable costs - Less time to roll out new applications	- Acceleration of business processes - Common data and process standards - Shared linkages - Requires new ways of working	- Requires an understanding of core and noncore activities, and a willingness to share data across the ecosystem - Considerable organizational and cultural implications

The classification grounds on Dean and Saleh's (2009) work with clients from the Boston Consulting Group. Utility level results come to mind first, when thinking of the advantages of cloud computing and are the main reason to shift services to the cloud. Cost advantages, power, hard and software issues are the occasions to generate utility level value. Process transformation level and business-model-innovation level values are fundamental shifts according to Dean and Saleh (2009). Benefits will result from working and creating in the cloud and getting a better understanding of the system and how it can be used. Dean and Saleh (2009) describe the process transformation level as contributing to the improvement of business processes, as the underlying technology supports sequences more effectively. The business-model-innovation level "can help power the next generation of business ecosystems by enabling the

deconstruction of value chains and the emergence of new, innovative business models" (Dean & Saleh 2009, p.5). Business-model-innovation represents an ambitioned goal for adopters of cloud computing, as most adopters still focus on the utility level.

The analysis in the upcoming subsection will discover, which advantages already transcribed by cloud adopters and if cloud computing developed from the utility level to a stage of extended value.

5.2 Enterprises with Valuable Cloud Computing Structures

This section analyzes the cloud computing structures of three enterprises, who already adopted and developed cloud computing. The enterprises use cloud computing in different ways and have various intentions to integrate it. The case study will carve out, how developed the cloud computing solutions of those enterprises already are in order to further analyze, in what extent expected value of cloud computing could already be achieved at the pioneers of cloud integration.

5.2.1 BMW

BMW has been established in 1916, when Rapp Motorenwerke transformed into Bayerische Motorenwerke GmbH and in 1918 into an AG. Since then BMW created and developed engines. In 1928 BMW started to participate in the automotive industry (BMW 2014). Today BMW is still "one of the most successful car and motorcycle manufacturers in the world", (BMW 2012) focusing on the premium segment and offering financial services to its customers (BMW 2012). The IT section has 2,600 employees working in 9 data centers and creating IT solutions for about 100.000 employees. Cloud computing should become a leverage for the existing IT processes and enforce the enterprise's possibilities (Pöschl 2012). Because of that BMW cooperates with CISCO to develop cloud structures (CISCO 2009).

5.3.2 Netflix

Netflix started its operations in 1997 as a rental service for DVDs. In 2007 Netflix started to stream movie content over the Internet (Netflix 2014a). With over 40 million subscribers in 41 countries, Netflix is the biggest online movie streaming service in the world (Pivotal 2013). Netflix does not only offer foreign content, it produces its own series (Netflix 2014b). In 2012 Netflix outsourced its whole operations to Amazon's cloud service offering, Amazon Web Services (Vaughan-Nichols 2013). Netflix is the reason for about a third of the North American Internet traffic generated by private users (Vance 2013).

5.3.3 CERN

The Conseil Européen pour la Recherche Nucléaire was founded in 1954 at the Swiss-French border (McCance 2012). The conseil houses the largest particle physics laboratory in the world and therefore processes an immense amount of data (Cass et al. 2010). "With over 8000 scientists using CERN facilities, it is the largest particle physics research center in the world" (Unesco 2014). Cloud computing is used to store and operate data and to make data accessible for 580 universities in over 85 countries, where scientists contribute to the research (Unesco 2014). CERN uses OpenStack to build its private cloud and cooperates with Rackspace to test a public cloud (McLaughlin 2013, OpenStack 2012).

5.3.4 Data

Tables 14 analyze three outrider enterprises that already developed valuable cloud structures. The analysis is divided into three tables that present different areas of pertinence.

Tables 14: Enterprises with Cloud Computing Structures

(Butler 2013a, Butler 2013b, Brodkin 2013, Cass et al. 2010, Cisco 2009, ComputerWeekly 2009, Curry 2013, Evans, 2012, Izrailevsky 2012, Kanaracus 2014, Liccardo 2011, Masters Emison 2013, McCance 2012, McLaughlin, 2013, Microsoft 2012, Mladenow et al. 2012b, Moreira 2013 Müller 2013, Open Data Center Alliance 2012, OpenStack 2014, Pivotal 2013, PR Newswire 2014, Pöschl 2012, Purcell 2014, Schwickerath 2010, Vance 2013, Vaughan-Nichols 2013, Venkatraman 2013, Witmer-Goßner 2013)

Table 14.1 presents the service models and deployment models. The section takes a look at the reasons, which convinced the outriders in the analysis to move to cloud computing structures. The last part of Table 14.1 presents where the enterprises are using cloud services.

Table 14.1: Enterprises with Cloud Computing Structures

Enterprise	BMW	Netflix	CERN
Service Models	IaaS, PaaS, Corporate SaaS	IaaS	IaaS
Deployment Models	Private Cloud (Hybrid Cloud)	Public Cloud	Private Cloud (Hybrid Cloud)
Reason to Move	"Review of the architecture and the design" (CISCO 2009, p.1), New exigencies to the hardware: cheaper, lower power, operated in-house	First mover advantage, Become experts in the cloud before others migrate and do so, Digital content: perfect business to run in the cloud	Data center reached its capacity limit, Shrinking capacity requirements, "Transistors count doubling every two years" (Schwickerath 2010, p.9)
Area of Application	IT service management, Identity management, Configuration management, Security management, Systems management, Output management, Connectivity management, Internal structure management, Employee support services	Infrastructure outsourced to Amazon in 2012: "customer information, video recommendations, digital rights management, encoding of video[…], and monitoring the performance of systems" (Vance, 2013), Automation, Management, Availability and analysis	Automation of computing pools and storage, Image, identity and dashboard services, Collision reconstructions, Information on security, monitoring and accounting systems, job management, data catalogues and data replication, Long-term storage

Table 14.2 presents an overview on strategy, vision and expectations of the outrider enterprises.

Table 14.2: Enterprises with Cloud Computing Structures

Enterprise	BMW	Netflix	CERN
Strategy	Private cloud with open source products, Optimized structures through contribution of the cloud	Moving the whole operations to Amazon Web Services, Open source input through externals	Private cloud matching with heterogeneous environment, Consistent Staff
Vision	Independence from vendors and technology, Full automation, User-productivity, Extendibility, Contribution to challenges	Critical workloads shared in public structures, Cloud computing as a movement, Enterprise able to contribute and add value	Cloud computing environment to enforce scientific collaboration, Less administration, Cooperative hybrid and/or public cloud solution
Expectations	Seamless integration into structures, Resilient and available infrastructure, Connect services with business requirements, Optimization of security aspects	Strong system without failure, Data centers as a distraction, High standard of data integration, Focus on core competencies, Differentiation	Interaction with the existing IT infrastructure and better utilization, Improved security, Automation of the data centers, Handling huge amounts of data

Table 14.3 deals with benefits the outriders achieved. A categorization of the levels of value is presented. The business model and the future agenda shall provide a look into the operations of the outriders.

Table 14.3: Enterprises with Cloud Computing Structures

Enterprise	BMW	Netflix	CERN
Benefit	Business continuity, Scalability, Cost savings, Accessibility, Efficiency, Interoperability, Complexity, Customer-orientation, BMW Sensor Platform: connects vehicles and the cloud to enable value adding services for drivers by collection, analysis and conversion of data	Scalability, Standardization, Availability, Availability zones: three availability zones, if a zone breaks down, guidance to another server, Efficiency, Community input, Shared knowledge to develop tools with externals, Cooperation with Amazon	Cooperative user community, Availability, Operational and resource efficiency Scalability, Flexibility, Self-service, Separated lifecycles of data centers, Seasonal peaks, Transfer of large-scale computer resources around the world, Using virtual machines for different purposes
Level of Value	Utility level (Business-model-innovation level)	Business-model-innovation level	Process transformation level
Business Model	IT: from a support to a leading section, Support and connection of customers through collecting data and adding services, Apps support drivers: "securely and anonymously matching the driver's preferences" (Kanaracus 2014), Cloud business model separated from technical issues	Completely outsourced structures to Amazon, Focus on core competencies, Public structures developed via open source and external developers, Access over Amazon Web Services infrastructure, Users help to develop the business model and processes in open sources	Optimization of internal processes, Enabling unrestricted access to shared resources for contributing scientists, Cooperation and integration of scientists from all over the world, Reduction of expenses for hardware and software, Scalable virtual service products
Agenda	Technological exploration, Identify upcoming trends, Building prototypes used in cars, Innovation and technology transfer between cars and infrastructure	Increase business value of cloud computing through open source development, 100% cloud: outsourcing the whole operations to Amazon's infrastructure	Managed resources transferred to the cloud, Hybrid cloud, Innovation and new markets, Solvation of storage issues, Performance Monitoring

Subsection 5.3 analyzes the data generated in subsection 5.2.

5.3 Analysis - Potential Enterprise Value of Cloud Computing

5.3.1 Basic Data Analysis on Cloud Customers

The three enterprises do offer an interesting arrangement of cloud computing structures. The upcoming section analyzes, to what extent these outriders can already keep up with the high expectations of the IT industry.

The service models distinguish between the three enterprises. BMW uses Infrastructure-as-a-Service and Platform-as-a-Service, while Netflix and CERN use solely Infrastructure-as-a-Service. Netflix and CERN are developing their own applications: CERN in cooperation with a partner while Netflix develops on its own, sometimes integrating user-developed resources (Masters Emison 2013, Moreira 2013, OpenStack 2014, Venkatraman 2013).

More interesting to look at is the deployment model of the enterprises. BMW and CERN integrated private clouds with the option to roll out a public or hybrid cloud later on, while Netflix developed a public cloud infrastructure (Butler 2013a, OpenStack 2014, Venkatraman 2013). The style of integration, as presented in **research implication 2** is one of the most important factors to achieve value from cloud computing structures. As already mentioned it is necessary to use a public cloud to gain full impact of cloud computing, but even outriders as BMW and CERN use private clouds and run own in-house servers. Netflix is an interesting pioneer in this field, as they outsourced nearly all their operations to Amazon Web Services and established themselves as the leading media content provider on the Internet (Pivotal 2013). So **research implication 2** in this context cannot be refused. There are enterprises starting to use public structures and try to remove the obstacles resulting from security, availability, lock-in and reliability. But most adopters still prefer private in-house solutions, just as BMW and CERN do. This will delay the development of cloud computing or in worst case prohibit cloud computing from removing its obstacles to achieve its full potential. Enterprises have to gain trust in public cloud systems and cooperate with cloud providers or open source developers to achieve the highest value possible.

Netflix is a pioneer here as well, developing with open source software, integrating users into processes and even launch contests to generate new service ideas or transform ideas into services (Butler 2013a).
The reason to move is mostly focused on the capacity or age of systems. BMW determined that their structure and design needed an update and created their cloud solution in partnership with CISCO (CISCO 2009). CERN faced the problem that their data centers cannot keep up with new capabilities, as "transistors count doubled every two years" (Schwickerath 2010, p.9). Scalability of services to shrink capacity requirements was the easiest solution to the problem. Netflix had other reasons for moving to the cloud, as digital content is the ideal product to move to cloud services. Digital content has massive storage needs, but is at the same time scalable and able to be requested from all over the world. Netflix saw the chance and had the vision and therefore was attired in gaining the first mover advantage (Forbes 2013b).
The area of application is too specific to analyze a special value considering the whole system of cloud computing. But the vision of cloud computing is also best implemented by Netflix trying to transfer its whole operations to the cloud to become the "largest pure cloud service" (Vaughan-Nichols 2013). The expected result is a maximum of elasticity, flexibility and scalability. The costs are highly reduced, there are no servers having to be maintained and there is an advantage in time to market and agility.

5.3.2 Strategy, Vision and Expectations

5.3.2.1 BMW

BMW has been forced to a change, as structures were getting old and the amounts of data have been constantly rising. In cooperation with CISCO, BMW developed a system optimized to support their structures (CISCO 2009). The vision of BMW was a system that helps the company to achieve independence from vendors and enables to use the advantages of the cloud computing technology (Open Data Center Alliance 2012). The vision and expectations on

the system include full automation, an increase in productivity and flexibility, seamless integration of new services and products and zero downtime (Open Data Center Alliance 2012, Pöschl 2012). Cloud computing shall create a system, which is ready for the future by permitting a move to public or hybrid structures and a contribution to actual and future services. At the same time the service must connect with the actual system. Virtualization is expected to empower security and integration of devices (Open Data Center Alliance 2012, Pöschl 2012, Venkatraman 2013).

BMW actually managed business continuity. The systems cooperate with the established infrastructure. Projects already proved that scalability and the attainment of different markets are possible using cloud computing structures (Microsoft 2012). The enterprise was also able to cut expenses and simplify maintenance while at the same time raising energy-efficiency. The expectation that downtimes will be erased progresses, as server updates do not cause server downtime any more. User-friendliness improved through standardized and easy to handle systems, which provide interoperability, less complexity and easy measurement of service (Open Data Center Alliance 2012, Pöschl 2012). Complexity is contradicting with the expectation of flexibility, as the services create high-level standardization, which makes the cloud easy to operate and avoids downtime. But also prevents one of the biggest advantages. BMW had to ponder on this point and decided not to develop structures and therefore develop the cloud computing paradigm, but integrate the easiest structures possible (CISCO 2009, Open Data Center Alliance 2012, Witmer-Goßner 2013). This enables the enterprise to save an immense amount of money. Considering the future improvement of cloud computing services, enterprises choosing the same way are a threat for the full potential of cloud computing services. They do not search for potential and only adapt the easiest alienable services (Venkatraman 2013). Despite BMW's announcement that the "IT organization is no longer just a support function" (Müller 2013), BMW tries to keep costs down adversely for cloud computing.

An interesting issue for the development of cloud computing is BMW's project to integrate cloud computing into its cars. BMW already equips cars with cloud computing services and is trying to expand these. Applications deliver value-

adding services to customers and send data back to BMW. BMW collects data and is therefore able to expand its knowledge and create new statistics for research. The customer gets additional services regarding fuel, traffic jam and map data for example. BMW plans to extend the services to enable cooperation between customers and develop new applications to support the customer while driving (Müller 2013, Liccardo 2011). As enterprise value of the project, BMW considers three points: "customer value, third party partners (and) building an ecosystem" (Liccardo 2011, p. 10).

BMW established a valuable project equipping its cars with cloud computing, but the private in-house structure does not enforce the development of cloud computing value (Kryvinska et al. 2014a, Open Data Center Alliance 2012, Witmer-Goßner 2013). The in-house structures offer parts of the value expected by the IT industry, but misses to integrate important advantages. Flexibility is as already described detained to reduce complexity. Location independence is neglected, as BMW operates an in-house data center, which offers a private cloud. There is no potential to reduce servers through virtualization. The in-house data center also influences commitment, as it affords huge investments and at the same time it is not possible to change the provider (Venkatraman 2013). The only possibility is to change CISCO as the company, which installed the Infrastructure-as-a-Service structures, but considering the partnership BMW is not taking this into account (CISCO 2009). The cost sector does not exhaust the possibilities either. Public cloud structures are cheaper and offer better potential for virtualization, as well as for scalability. Low barriers to entry, as well as technical issues are not a major problem for a global player like BMW. They are able to afford in-house structures and high-end devices (Venkatraman 2013).

BMW achieved most of what they expected from a move to the cloud, but they are not a cloud innovator. On the one hand BMW is developing an evolutionary car cloud computing system, but on the other hand they are yet skeptical about opening their structures for at least hybrid cloud services and operating sourced out data servers. BMW definitely generates value propositions from cloud computing, but they also verify **research implication 1,** that cloud computing today is far behind the expectations of the IT industry. They do not believe in the real character of cloud computing. BMW uses the technology to boost its own

structures without contributing to the development of cloud computing itself (Kryvinska et al. 2014a, Müller 2013, Open Data Center Alliance 2012, Witmer-Goßner 2013).
Anyway BMW has a lot to deliver to boost cloud structures, by pushing its car cloud project and gaining confidence in public structures (Liccardo 2011). Reports already mention that BMW is aware that cloud computing needs a push towards the public cloud to achieve full potential and Müller (2013) confirms "when it matures further, we will use public cloud services to develop a hybrid IT infrastructure" (Venkatraman 2013). A change in the mindset of BMW could achieve real value for cloud structures, as they present innovative ideas and have a lot of financial power to improve IT systems.

5.3.2.2 Netflix

Netflix operates a strategy of outsourcing with the goal of reaching 100% outsourced infrastructure. Since 2012 nearly every operation of the enterprise is outsourced to the Infrastructure-as-a-Service offering of Amazon. The creation of services for the platform is kept internally based on open source products to use community input to improve services. The enterprise itself announces that they are focusing on the development of their products. (Butler 2013a, Ciancutti 2010, Vaughan-Nichols 2013).
The vision and expectations unmask Netflix as one of clouds' leading developers, as they outsourced nearly every critical workload to a public cloud. Netflix visions itself as contributor and benefitting player at the same time. But Masters Emison (2013) mentions that their services have no long-term focus and are no good practice as they do not develop cloud computing through old-fashioned services.
The enterprise wants to create a system without failure and avoid the distraction resulting from data centers. Scalability is a major goal of Netflix considering the character of their services. Netflix is dependent on Amazon. So it is necessary that Amazon Web Services deliver reliable structures. With the move to cloud structures the enterprise tries to focus on core competencies by outsourcing every possible solution (Butler 2013a, Ciancutti 2010, Pivotal 2013).
Netflix tailored cloud computing benefits to its needs. Scalability works as expected enabling a fast-change of service, dynamic provision and adaptions to

unpredictable amounts of subscribers, resulting from the unlimited capacity offered by Amazon. Netflix increased its availability by running its services from three of Amazon's availability zones, which results in reduced downtime. Amazon is a valuable partner to Netflix, as Netflix is their biggest customer. Amazon reacts fast to Netflix's requests and offers standard interfaces and architecture to run standardized software for a system that is easy to handle for both, customer and developer. Netflix also outsourced its infrastructure maintenance and security to Amazon Web Services, which results in cost savings in combination with the other outsourced features. Netflix uses Amazon Web Services more efficient than Amazon itself does. (Ciancutti 2010, Pivotal 2013, Vance 2013, Vaughan-Nichols 2013).

Netflix is using cloud computing as designated. Customers access through on-demand self-service structures, while scaling up and down enables flexible resources. This is especially necessary at the peaks, presented in figure 20 by Vance (2013).

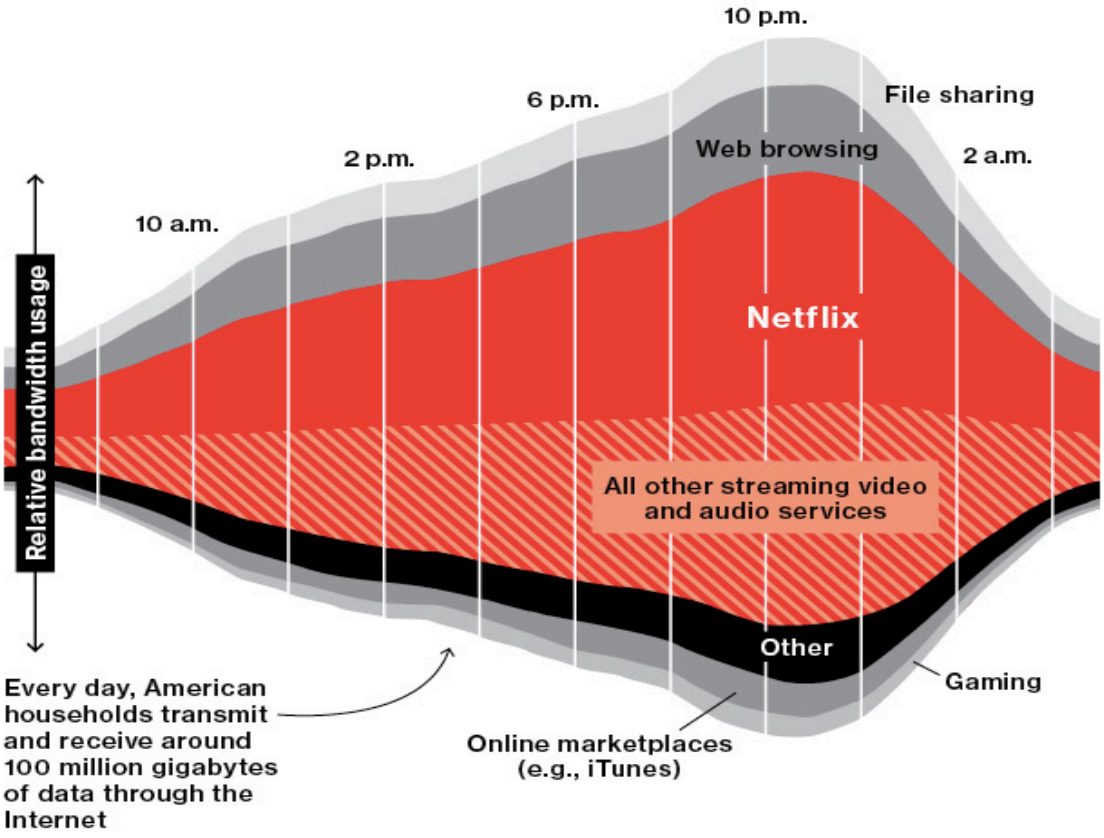

Figure 20: Share of Downstream North American Web Stream Traffic by Time of the Day (Vance 2013)

As shown in figure 20, Netflix hits its peak at about 10 pm. Through automatically scaling servers Netflix is able to save huge amounts of money (Vance 2013). Pooled resources and measured services enable Amazon's pay-as-you-go model and present high value for Netflix (Amazon 2014a, Amazon Web Services 2014d). The services are also locally independent by accessing one of three server centers of Amazon. The self-healing character of cloud computing emerges possibilities but also problems for Netflix. At Christmas Eve 2012 Amazon Web Services had a breakdown and Netflix broke down with it. In other scenarios customers where redirected to another location when a server section broke down. Despite a breakdown of the Amazon systems Netflix was still available (Vaughan-Nichols 2013). Market adaptability is high at Netflix, as nearly all their structures are centralized and Amazon is one of the leading innovators in the cloud. Centralization of services results in faster time-to-market, reduced complexity, high efficiency and reduction of technical issues. Rationalization of data centers is not a problem for Netflix, as they do not run own data centers (Vaughan-Nichols 2013).

Netflix combines nearly every possibility cloud computing offers. Despite the use of existing cloud computing structures they are not an innovator. Their services are old-fashioned and work for their structures but do not improve cloud services. Masters Emison (2013) emphasizes that they are not cloud computing's future.

Research implication 1 is not valid for Netflix. Netflix has implemented nearly every category, which is mentioned as a cloud possibility. The enterprise is running its whole business from the cloud, outsourced as a public deployment model. The problem with Netflix is that it is not supporting the development of cloud services, as they develop old-fashioned tools. The development of their structures is highly connected to the development of Amazon Web Services. **Research implication 2** is unanswered as Netflix is not dealing with the obstacles of cloud computing. Amazon is running their security system, is doing their maintenance and the content is stored at Amazon. The future development of cloud computing is often connected to the provider, when enterprises outsource their operations. Despite that Netflix would be able to develop better tools as they mention the development of their cloud services as a core competency. Highly developed open source products could cause a broader

adoption of cloud services by other enterprises and therefore influence the continuing evolution of cloud computing.

5.3.2.3 CERN

CERN saw cloud computing as a possibility when a study proved that their "transistors count [is] doubling every two years" (Schwickerath 2010, p.9). The organization recently developed a new data center in Hungary, but realized that their data processing needs are still on the rise. CERN had also in mind to run their data center with the same number of staff members. The organization developed the strategy to make its systems scalable and easier to handle whilst integrating a private infrastructure as a service solution in cooperation with OpenStack. They needed computing power optimized for their own environment (McCance 2012, OpenStack 2014). Flexibility and the reduction of administration play a major role in the vision of CERN. CERN is trying to foster innovation as they cooperate with Rackspace to develop their private cloud into a hybrid cloud (Curry 2013, McLaughlin 2013, Purcell 2014). The overall vision of the CERN cloud computing infrastructure is to create "the world's largest cloud computing environment for scientific collaboration" using open source services and collaborating with Rackspace (PR Newswire 2014). CERN wants its cloud infrastructure to interact with existing structures for an overall better utilization. As the requirements on infrastructure are highly rising CERN expects the cloud computing structures to relieve their data centers by reducing storage needs. At the same time enabling to store major amounts of data, share services and simplify security through an easier management of services. The overall expectation is an automation of CERN's data center through operational efficiency and resource efficiency as well as responsiveness (Brodkin 2013, McCance 2012, Moreira 2013, OpenStack 2012, Purcell 2014).

CERN already gains benefits from cloud computing by being more responsive in the cooperation with its users and transferring large-scale computing resources all around the world. The responsiveness created flexibility for the scientists and through scaling the resources in a cloud they are now fast available using the self-service portal. The scientists have access to the data sets of CERN from all over the world and do not have to connect over a certain device. Research

results are available for every registered user. Data sets are faster and always available and structures are faster adaptable when a new service is needed. Scientists have no delay through the virtualization of their services. They are even able to run their own operating system on the cloud infrastructure. CERN generates operational and resource efficiency through its cloud. Seasonal peaks are handled by the scalable system of pooled resources and the lifecycles of the servers are separated (OpenStack 2012, PR Newswire 2014, Purcell 2014, Schwickerath 2010). The system offers huge cost saving advantages, as it is not needed to create new data centers, but using already existing capabilities in a more effective way. Another benefit of the private or later focused hybrid structure is, that parts of the infrastructure can remain separated from the cloud computing network. CERN is able to keep sensitive data in-house (Brodkin 2013).
CERN is an interesting actor in the field of cloud computing. They implemented a lot of the characteristics and benefits cloud computing can offer in their private cloud. But in contrast to enterprises like BMW, CERN is more open and interested in hybrid and public cloud structures. CERN already uses Rackspace to deploy part of its data in public structures and they cooperate with Rackspace to develop a hybrid cloud (Curry 2013). **Research implication 1** is neglected for CERN, as they have already converted valuable structures and are about to improve their cloud systems in the following years. **Research implication 2** is interesting to look at, because it mentions that the future of cloud computing is highly connected to the style of integration, and CERN proves that it is. A private cloud has not enabled every possibility for CERN so they asked a partner to build a hybrid cloud to gain additional value from the cloud. CERN also tries to neglect **research implication 2,** as they are trying to remove the obstacles in the way of cloud computing by developing their structures. CERN has to keep its path and continue developing its cloud. Especially in an environment, where resources by now double every two years, cloud computing can deliver valuable service (Schwickerath 2010).

Subsection 5.3.3 occupies oneself with the transformation of the levels of value in the enterprise of the analysis.

5.3.3 Level of Value

The levels of value are hard to distinguish, as they sometimes overlap. The classification gives an overview, where the enterprises rank today and what their prediction for the future looks like.

5.3.3.1 BMW

BMW creates the lowest level of value considering the three outriders. They are skeptical about moving their data to a public or hybrid cloud and are most interested in the utility level advantages they can gain from cloud computing structures. BMW decided to integrate the easiest structure to operate and not the one opening the best possibilities for the development of either cloud computing or enterprise value (Open Data Center Alliance 2012, Venkatraman 2013). On the other hand the enterprise works on revolutionary car cloud computing structures, which could revolutionize the car market of the future (Liccardo 2011, Müller 2013, Pöschl 2012). So the level of value has to be separated. BMW's in-house private cloud operates at utility level, enabling the company to use the standard possibilities of cloud computing. The innovation section in contrast is operating at a higher level. Enabling "to share data across the ecosystem" (Dean & Saleh 2009, p.3) is the base of the technology, as users are cooperating between each other and with BMW to develop additional services for the customers on the road. The innovation section, if the vision can be set into progress, depicts the business-model-innovation level (Dean & Saleh 2009).

5.3.3.2 Netflix

Netflix presents the prototype of the business-model-innovation level, even if there are doubts considering the development of their services. The enterprise moved its whole operations to the cloud, creating a completely cloud-based business model with a deep understanding of core and non-core services. Core service is the creation of services and not establishing own infrastructure. The data of Netflix is completely sourced out and shared on Amazon Web Services. The organizational and cultural impact is that Netflix does not have to worry about any detail on infrastructure (Butler 2013a, Motahari-Nezhad 2009, Pivotal 2013).

Netflix only has to manage its services while cooperating with the most experienced vendor of cloud infrastructure that administers every infrastructural detail (Dean & Saleh 2009).

5.3.3.3 CERN

Today, CERN presents the process transformation level. They have required new ways of working, as their data center was no longer capable of additional resources. The organization accelerated their business processes through the virtualization of their services and enabled access from all over the world. Scientists have the opportunity to analyze, cooperate and use data sets faster and more efficiently (McLaughlin 2013, Moreira 2013). In the future CERN could transform into a business-model-innovation organization, as they are forcing the development of their cloud computing structures and are interested in new possibilities to handle the activities of their operations (Dean & Saleh 2009).

The three examples prove that **research implication 1** does not apply here. There are enterprises that already fulfill a lot of the expectations set into cloud computing. There is still a lot of potential to discharge, but enterprises are searching for innovative solutions to have the chance to achieve a lot from cloud computing. A positive aspect is that all of the three examples use open source solutions to create their system, which enables other enterprise to gain advantage from it, too (Butler 2013a, Open Data Center Alliance 2012, OpenStack 2014). These organizations are improving cloud computing in cooperation with other users and therefore develop new possibilities (Kryvinska et al. 2014a). At the same time there are problems with the intention of enterprises developing the cloud. Even the outriders have mostly their own development in mind and not the development of cloud computing itself. This could lead to slow improvement of cloud computing in the long-term.

The next subsection analyzes the business models of the outriders.

5.3.4 Business Model and Agenda

The framework orientates itself at the business model framework by Teece (2010). This thesis does not describe the complete business model of the enterprises and the organization. It describes how the enterprises and the organization act in cloud computing markets.

Table 15: Enterprise Business Model

(Butler 2013a, Ciancutti 2010, CISCO 2009, Curry 2013, Fingar 2009, Liccardo 2011, McLaughlin 2013, Mladenow et al. 2012b, Moreira 2013, Müller 2013, Motahari - Nezhad 2009, Netflix 2013, Open Data Center Alliance 2012, Purcell 2014, Venkatraman 2013)

	BMW	Netflix	CERN
Who	Employees, Customer's cars	Film fans	Contributing scientists
What	Internal processes optimized, IT as a leading section, Services for drivers	Outsourcing the whole business to Amazon Web Services, Focus on core competencies	Overcoming the limitations of traditional IT, Integration of scientists from all over the world
How	Internal private cloud, In-house structures, Partnering for the installation of systems, Integration, cooperation and support of customers	Outsourcing services to Amazon, Adaption to the circumstances of their market, Cooperation with Amazon Open source tools and integration of external users	Developing an internal private cloud, which is able to evolve into a public or hybrid cloud, Optimization of internal processes, Outsourcing of non-sensitive data

5.3.4.1 BMW

BMW wants to give its IT section a boost, as it should become a leading section (Müller 2013). BMW operates in Fingar's (2009, p.115) projection of "creative methods of understanding customer requirements", as their business model depends heavily on the integration, cooperation and support of customers. BMW is convinced of their in-house solution, as the cooperation between platform and infrastructure is one of the most promising goods (Open Data Center Alliance 2012). In the definition of Chang et al. (2010) BMW uses a system of support and service contracts to run their cloud business. But they want to develop to become

an All-in-One enterprise cloud, working at a solution to keep non-sensitive data in-house. At the same time they integrate customers into their structures to create valuable applications and give support to them (CISCO 2009, Venkatraman 2013). BMW does not apply the typical business model, presented by Nenonen and Storbacka (2010). The customer value proposition is well-defined by offering additional and valuable services to their customers. BMW is aware of the earning logic, but is still convinced to keep structures in-house (Venkatraman 2013). This keeps BMW away from maximizing profit through cloud computing. The enterprise is only cooperating with a partner to install their system, but develops its own applications and services. The value network pertains infrastructure services (CISCO 2009). Like every user, BMW presented cloud computing as a strategic decision and they are able to achieve benefits through cloud computing (Pöschl 2012). But to make it a real strategic advantage for the enterprise, the cloud business model has to develop. The agenda for achieving a strategic advantage mainly focuses on identifying new trends and developing new technological solutions to ensure additional customer value (Liccardo 2011). The evolution of the BMW cloud to become a hybrid cloud is the main focus at the development of structures (Venkatraman 2013).

BMW definitely developed a valuable business model for themselves, but the projections are not very innovative. BMW does common things rather than developing an own identity of their cloud. The agenda does not present a potentially more valuable move to public structures, which could result in financial and structural opportunities. BMW insists on in-house structures to secure the cloud. The application model in contrast is innovative and can become a leading model in the car cloud computing sector. BMW has to focus here to gain competitive advantage.

5.3.4.2 Netflix

Netflix's business model focuses on the optimization of processes. Everything able to be sourced out is or will be outsourced. The enterprise completely concentrates on its core competencies, which means a spotlight on product innovation (Ciancutti 2010). Teece (2010, p.179) describes the opportunity for Netflix as "an equally transformative effect on the cost side of the business

model". Through migration to cloud computing services, Netflix transformed its cost model into a variable cost model to improve efficiency (Teece 2010). Netflix adapted perfectly to the circumstances of their market, as they outsourced their structures to Amazon (Motahari-Nezhad 2009). Netflix defined their type of service, found out which requirements they have to fulfill - and with Amazon - engaged the cloud service that matches their needs the most, just as Motahari-Nezhad (2009) projected. Netflix's business model also matches to Nenonen and Storbacka's (2010) view of the cloud computing business model. Cheap, valuable content and fast delivery mark the customer value proposition. The earning logic is defined through monthly fees, while Amazon Web Services is paid-per-use. In cooperation with Amazon, Netflix developed its value network using open source tools to create their applications. Through offering and improving its open source tools with developers from all over the world, Netflix creates additional value. The outsourcing of resources enables to use the arising capabilities to manage the core services. Netflix acted as one of the first huge enterprises with the decision to outsource its whole structures to a public cloud (Amazon Web Services 2014d, Butler 2013a, Ciancutti 2010, Evers 2014).

Netflix went an innovative way to offer its products. Their agenda consists of developing more effective open source tools and the complete outsourcing of their structures. The goal is to run Netflix 100% from the cloud (Butler 2013a).

Netflix presents a very innovative enterprise structure, but at the same time they are being criticized for their underdeveloped applications and support structures (Masters Emison 2013). Amazon enables Netflix to spotlight on its core competencies, as they operate Netflix's security and maintenance system over their structures and the cooperation between the companies is excellent, as Amazon reacts immediately to the wishes of its biggest cloud customer (Butler 2013a, Pivotal 2013). The business model is well-defined and works excellent, but the enterprise has to set its focus on better developed applications to keep customers satisfied. The structures are already optimized and contributing, as Amazon Web Services is an experienced cloud provider (Masters Emison 2013, Vance 2013).

5.3.4.3 CERN

The cloud computing network of CERN orientates at the optimization of processes and the cooperation and integration of scientists from all over the world to work in a collaborative manner (McLaughlin 2013, Moreira 2013). The enterprise is interested in developing an innovative cloud computing business model to create an all-in-one enterprise cloud (Chang et al. 2010). In cooperation with Rackspace the enterprise is already developing its structures, planning a hybrid cloud solution. Non-sensitive data has already been shifted to Rackspace's public cloud infrastructure (Curry 2013, McLaughlin 2013, Purcell 2014). The research of CERN produces huge amounts of data and "transistors count doubling (of CPU capacities) every two years" (Schwickerath 2010, p.9) (OpenStack 2014, Schwickerath 2010). So the reduction of expenses for hardware and scalable virtual products are a relief for the in-house running server farm (McCance 2012, OpenStack 2010). Nenonen and Storbacka's (2010) definition of a business model has to be changed a bit, but fits to the structures of CERN. A customer value proposition does not exist, as there are no customers, but users. But for the users cloud computing at CERN definitely proposes value. The scientists are able to access to the data and processing power from all over the world and they can collaborate and exchange research findings. CERN does not follow the traditional earning logic as their infrastructure is kept inside, but through the cooperation with Rackspace this step might follow. The value network created between the users of the cloud is immense, as its main purpose is cooperation. Resources and capabilities have the possibility of optimization but at that time are limited by the private cloud structures. CERN's decision to move to cloud structures constituted a huge strategic effort. The decision revolutionized the whole work inside the organization and influenced expenditures in infrastructure (ComputerWeekly 2009, Curry 2013, McLaughlin 2013, Moreira 2013, OpenStack 2014, PRNewswire 2014).

The future agenda includes ambitioned goals for CERN. The managed resources shall be operated completely on OpenStack by 2015. The organization wants to use cloud structures to access new commercial markets and solve its storage issues (Brodkin 2013, Purcell 2014).

The business model of CERN is innovative and the enterprise is eager to boost its structures with new capabilities cloud computing has to offer. The next step would be to outsource the private cloud to hybrid or public structures and to move new resources to the cloud. The all-in-one enterprise cloud is the favored model for CERN.

There are a lot of advantages cloud computing can offer, not only in theory. The three examples show that today, cloud computing is not far behind the expectations. The enterprises are pioneers, of course, but they prove that there is a lot of potential to be unleashed in cloud computing. **Research implication 1** can be neglected in the view of the pioneers, but the conversion in other enterprises has not developed as fast as the IT industry expected. So **research implication 1** is valid considering the complete cloud computing business, but the expectations are high and enterprises start to keep up with them, which promises a push for the future of cloud computing.

The three examples proved that cloud computing is highly connected to the enterprise's style of integration. Netflix and CERN try to be innovative and develop the cloud, while BMW is using existing cloud abilities to boost its structures. With innovative enterprises a lot of the obstacles could be removed, so the style of integration by enterprises plays a major role for the overall development of cloud computing. If there are innovative enterprises in the field, cloud computing will be able to remove a lot of its obstacles. To answer **research implication 2** it is necessary to have a look at the following Sections. Section 5 only proves that enterprises are willing to remove the obstacles of cloud computing, but does not answer if they will be able to do so in the future.

6. Concerns on the Use of Cloud Computing

6.1 Types of Concerns on the Use of Cloud Computing

Cloud computing constitutes a new kind of service offering and therefore new problems as well as known problems emerge. Chen et al. (2010) state many of the problems arising from cloud computing as not new. The challenge is the requirement for new solutions, as the problems appear from different mechanisms of use. The objective of this section is to identify the obstacles, risks, vulnerabilities and drawbacks in the way of cloud computing.

6.1.1 Risks

Risks appear in every hosting branch, not only in the IT industry. Complete elimination is not possible, so it is necessary to develop a solution how to handle them best (Dahbur et al. 2011).

6.1.1.1 Policy and Organizational Risks

Organizational risks “may impact the structure of an organization or the business as an entity” (Dahbur et al. 2011, p. 4). An important risk for cloud computing is the absence of clear policies. Ernst & Young (2011, p.32) propose to “develop and maintain an ERM [Enterprise Risk Management] framework to manage risk to an acceptable level.” The consulting company recommends formal risk assessments to diminish organizational and policy risk in cloud computing (Ernst & Young 2011). Padashetty and Kishore (2011) mention vendor lock-in, loss of governance, compliance challenges, and cloud provider acquisition, as factors in the organization of cloud structures. Zissis and Lekkas (2012) add trust as one of the most important risks in policy and organization. The cloud environment is based on the deployment model and the governance of data and applications are no longer under the control of the cloud user. The developed system needs to be reliable and efficient, otherwise the customers will not benefit. Hence why design policies and the organization of the cloud structure play a major role in the roll out

of a cloud computing service and present a huge risk for the customer as control is being outsourced. Rountree and Castrillo (2013) notice in addition not only trust in the system, but also the provider is in focus. The provider “will have direct access to your organization’s data” (Rountree & Castrillo, p.15). Enterprises integrating cloud computing will have to set faith in the reliability of their provider, as there will always be the risk of access to sensitive data.

6.1.1.2 Technical Risks

Technical risks refer to the service and its underlying technology offered by the provider (Dahbur et al. 2011). Padashetty and Kishore (2011) list different categories of technical risks. Data Leakage, encryption keys and conflicts between the expectations of the customer and the abilities of the underlying hardware are the issues that have to be clarified in future considerations. Zissis and Lekkas (2012) remark trust when delivering the promised service. In the first place a customer cannot be sure if the provider is able to deliver the technique and security promised. Zissis and Lekkas (2012, p. 587) define five categories in between the technical system, where problems can arise: “account control, malicious insiders, management control security, data control and multi-tenancy issues”. Providers need to ensure that their systems are capable of guaranteeing an absence of these problems by installing appropriate technology. An important issue in the development of technological security is the presentation of the technological system to the customer. A risk not specific to the cloud is the distrust into new technological systems and therefore an aim of a safe technological system is a new mindset on the capabilities of cloud technology.
Dillon et al. (2010) present two issues coming up with the technology: shared resources and “reputation fate-sharing”. Cloud computing creates important advantages through shared resources. The technological problem for customers is that their data and private information is being shared on the same physical machine as the data and private information of other clients, if they do not use in-house structures. The second issue does not arise from the technology itself, but as a result of the technology being shared. Criminal users can affect the reputation of non-criminal users, as they share the same network.

6.1.1.3 Legal Risks

Borges and Schwenk (2012) state that there are already initiatives and discussions about the legal framework of cloud computing, but mostly there are only low value guidelines published to handle the legal obstacles of cloud computing. Legal risks involved in cloud computing are being differentiated. The most occurring ones are contract law, intellectual property, privacy law and taxation (Parrilli in Stanoevska-Slabeva et al. 2010). Borges and Schwenk (2012) also remind contract law and data privacy law as the most frequent issues in cloud computing, but constitute at the same time that there are various areas, where cloud computing generates new issues for the legislator. In cloud computing legal risks emerge from different processes around “data being exchanged across multiple countries that have different laws and regulations” (Dahbur et al. 2011, p. 4). Legal risks are one of the biggest barriers, cloud computing has to dissolve. In a fast developing industry, like the IT sector, jurisdiction always lags behind the development. So there are no legal decisions yet, which determine responsibility for the security of data stored in a cloud (Harauz et al. 2009). Servers are distributing services from all over the world, but there is no homogeneous legal framework to handle that. Harauz et al. (2009) therefore indicate that users want to know, where their data is stored. This is not only a legal problem it is also a problem of trust, as users want to have their data stored where a maximum of safety is guaranteed. Padashetty and Kishore (2011) add data protection and software licenses as issues in the legal context. Mircea et al. (2011) acknowledge that possible changes in the jurisdiction of countries can affect the distribution or possibility of cloud computing services. The customer has to focus on the contractual relationship with his partner. Managing the inadequate legal situation is only possible through the integration of strong agreements, which are “legally valid and enforceable” (Parrilli in Stanoevska-Slabeva et al. 2010, p.99). Parrilli (in Stanoevska-Slabeva et al. 2010, p.100-101) proposes a framework, which a sustainable contract has to include: “availability, performance, downtime and service suspension, security, fees, support services”. These points are the major ones for creating an efficient service level agreement

with a provider that ensures safety for the customer even if there is no direct legal framework to protect him.

6.1.1.4 Risks Not Specific to the Cloud

Risks not specific to the cloud deal with problems arising from the use of cloud computing, which are not the fault of the technology itself. Zissis and Lekkas (2012, p.585) mention a problem that does not result from cloud computing directly: “from the traditional viewpoint of perimeter security, the cloud appears outside the trust borderline and should be viewed with suspicion.” So even without knowing the real abilities of security in the cloud, customers think of the product as unsafe. Network problems, unauthorized access and natural disasters affect cloud computing without even being related to the technology at all (Padashetty & Kishore 2011). The points mentioned are not only problems of cloud computing, as the effects on traditional data centers are the same. The difference is that enterprises think they are better off handling problems by themselves than trusting a third party. Chen et al. (2010) notice many of the problems not related to the cloud as already existing problems. Phishing, downtime, data loss and password weaknesses are not specific to the cloud, but as the cloud developed from different hosting paradigms they also affect cloud computing.

The next subsection will discover in which context cloud computing systems are vulnerable.

6.1.2 Vulnerabilities

This thesis divides the threats to cloud computing in two different categories, vulnerabilities and drawbacks. Vulnerabilities threaten the safety of a system causing fragile systems (Pfleeger & Pfleeger 2006). First it needs to be determined, whether a vulnerability is related to the cloud or not. Dahbur et al. (2011, p.5) mentioned 4 criteria to examine if the vulnerability is related to the cloud.

- “It is intrinsic to or prevalent in a core technology of cloud computing, such as virtualization, service-oriented architecture, and cryptography
- it has its root cause in one of [the] essential cloud characteristics, such as elasticity, resource pooling, and [the] pay-as-you-go model
- it is caused by cloud innovations making exiting security controls hard or impossible to implement […]
- it is prevalent in established state-of-the-art cloud services”

Grobauer et al (2011) predict no change for cloud consumers through the appearance of cloud computing, as the consequence and cost of a vulnerable system will stay the same as using a traditional IT system. In their view it is the cloud provider who has to face different challenges, “because cloud computing systems were previously separated on the same infrastructure, a loss event could entail a considerably larger impact” (Grobauer et al. 2011). The problem in their view is the offered system. A consumer can run a system, which is safer, avoids outages and is deeply secured against attacks. In the case of cloud computing the consumer has to put faith in the security system of a third party. Grobauer et al. (2011) mention machine escape, session riding and hijacking as well as insecure cryptography as weaknesses of hosting or computing itself and therefore certainly a vulnerability for cloud computing systems. The Cloud Security Alliance (2013, p.1) published a paper where “the notorious nine” threats to cloud computing are listed and explained. This thesis focuses only on the threats itself, not on their explanation, as the threats are needed in order to discuss the enterprise value of cloud computing. The Cloud Security Alliance (2013, p.3, 4) names “data breaches, data loss, account or service traffic hijacking, insecure interfaces and APIs, denial of service, malicious insiders, abuse of cloud services, insufficient due diligence and shared technology vulnerabilities” as the most important threats when integrating or developing a cloud computing system. Grobauer et al. (2011) develop the threats definition orienting themselves at the NIST definition of cloud characteristics. They add manipulation and the vulnerability of data recovery to the top threats, while at the same time mentioning unauthorized access to management interfaces and Internet protocol vulnerabilities, which are already covered in the notorious nine

threats. The behavior of users and the limitation of authentication mechanisms have an immense effect on cloud computing vulnerability. Weak passwords for example can endanger the system, while the provider is nearly powerless to solve this issue.

Cloud computing presents a lot of vulnerabilities, but most of them can be directly connected to other hosting services, too. Data breaches, data loss, account or service hijacking, malicious insiders and insufficient due diligence are problems which affect every hosting service and are not only a cloud computing dilemma (Cloud Security Alliance 2013). Because of vulnerabilities it is especially important in a cloud environment to cooperate with a trusted third party. Zissis and Lekkas (2012, p.588) explained the opportunities of a trusted third party as the following: “low and high level confidentiality, server and client authentication, creation of security domains, cryptographic separation of data, certificate-based authorization.” The value propositions of a trusted third party cannot overcome the vulnerabilities of cloud computing, but they can create the possibility to cut down the threats to an acceptable degree.

The following subsection will present the major drawbacks connected with cloud computing to enable a further analysis of the development of cloud computing services.

6.1.3 Drawbacks

The drawback subsection presents the major threats of cloud computing, not connected to vulnerabilities and the obstacles in the way of the creation of full enterprise value. Drawbacks in cloud computing arise mainly from the security side. Listed risks and vulnerabilities already proved that the adoption of cloud computing is highly connected with the question of security.

Sosinsky (2010, p.18) describes the disadvantages of cloud computing as numerous and the advantages as “a more compelling case for small organizations than for larger ones”. This is because larger organizations have the ability to invest more into IT solutions. Sosinsky (2010) characterizes

customization, performance, privacy and security, the involvement of sensitive data and multiple jurisdictions as the drawbacks related to cloud computing.

Al Morsy et al. (2010) report on open issues, when talking about cloud computing. “Model creditability and pervasiveness, vendor lock-in, multi-tenancy and isolation, data management, service portability, elasticity engines, SLA [service level agreement] management, and cloud security” Al Morsy et al. (2010, p.2), are drawbacks of cloud computing that have to be removed to create a system contributing to the enterprise value. As some of the drawbacks directly lead to barriers or worse frontiers it is necessary to improve the system and erase barriers whenever possible. Al Morsy et al. (2010) comment that enterprises shift their security to a third party. Different customers coexist on a standardized server. A lack of security guarantees therefore is unavoidable through the design of service level agreements. They insist on a perfectly designed framework to ensure security and prevent a conflict between systems of different customers. Armbrust et al. (2010, p.54) report 10 big obstacles in the way of cloud computing: “business continuity and service availability, data lock-in, data confidentiality and auditability, data transfer bottlenecks, performance unpredictability, scalable storage, bugs in large distributed systems, scaling quickly, reputation fate sharing and software licensing”. Those obstacles are not automatically drawbacks, but a weakly designed system that does not respect the subject will create drawbacks that will likely turn into barriers and frontiers. Armbrust et al. (2009) focus mainly on technical issues in the context of trust and reliability of the provider. Business continuity and service availability, data lock-in, data confidentiality and auditability, data transfer bottlenecks and scaling quickly are issues that have to be solved by the provider. This implies that reliability is a big question and therefore a huge drawback of the technology by now. Hofmann and Woods (2010) also note interoperability, data lock-in, network limits, scalable storage, the absence of service level agreements and security as the main drawbacks of cloud computing. Rountree and Castrillo (2013) mainly draw the same conclusions as Armbrust and Hofmann and Woods. They name “SLAs, security, the lack of customization, scale out, privacy, legal and compliance issues, auditing, security, data integration, application service/integration” (Rountree & Castrillo 2013, p.12) as the main issues in cloud computing. Marston

et al. (2011) add the loss of physical control and the legal situation to the drawback section. Many countries still have not promoted regulation concepts for cloud computing. They mention a huge drawback, which creates a frontier for the cloud computing paradigm: trust. Enterprises are often not willing to put critical applications into a cloud. Aljabre (2012) mentions the constant Internet connection, which is required to have access to services. Especially speed and consistency of the Internet connection are the factors influencing cloud computing's value. Hofmann and Woods (2010) in contrast to others do not only describe unstable Internet connections as a problem. They add performance instability of the cloud providers themselves as a major drawback. Grossmann (2009) also remarks the remote of cloud computing services and the connection and speed problems of the Internet. Aljabre (2012) presents the suitability of applications as a drawback, as not every application matches for distribution in the cloud. As nearly every presented author he names trust and reliability as the most important drawbacks in the eyes of the industry. Chen et al. (2010) focus on the new drawbacks cloud services add to the existing problems. Activity patterns of enterprises might be visible for other enterprises using the same cloud, especially adverse for competitors using the same cloud provider. This directly leads to the next drawback: competitors using the same ecosystem. Chen et al. (2010, p.5) remind: "this can lead to strong conflicts of interest, and creates additional motives to access the confidential information of a competitor." Damage in terms of business reputation may appear if there are unethical activities on the provider's server, as it is hard to define who acted unethically. Jansen and Grance (2011) also bring up the shared environment in combination with a loss of control and the complexity of systems as the most important issues in cloud computing. Grossman (2009) expresses issues occurring from shared use of hardware, too. He suggests weak designed applications, which do not only affect the own sequences, but the sequence in the whole hardware system. Third party access can lead to problems in security, compliance and regulatory. Rountree and Castrillo (2013, p.12) add that "the services are not robust enough yet" and the unclear "ownership of data" (Rountree & Castrillo 2013, p.13). Especially the unclear ownership of data creates disadvantages, as customers do not know, what will happen with their outsourced data. There is no guarantee that

it is still their property and there is no legal frame for what happens with data when a provider goes out of business (Rountree & Castrillo 2013).

There are a lot of different drawbacks mentioned by the authors quoted in this subsection. The most important ones are all settled around the same issues: security, privacy, trust, reliability, technology and jurisdiction. The drawbacks directly lead to the next section as they create barriers and frontiers for the technology, which have to be removed or - in the context of frontiers - lowered to gain the highest possible value out of cloud computing.

The upcoming subsection takes a look at those barriers and frontiers to prepare for the discussion, if it is possible to remove or lower them adequately.

6.2 Barriers and Frontiers

Risks, vulnerabilities, drawbacks and obstacles create barriers and frontiers for a technology that, as already mentioned, have to be removed to gain the highest possible enterprise value from cloud computing.

6.2.1 Barriers

6.2.1.1 Lack of Control

The lack of control is a variety of concerns that make the user feel uncomfortable about his whole involvement into the system. Pearson (2012) mentions the ownership and control of the system is not in the hands of the user and that creates discomfort. The user does not have the control over the lifecycle of his data, as a third person is handling this service. A change of the provider is often hard to manage, as there are service level agreements and a lock-in of the user. The systems have a lack of interoperability and portability of data (Kryvinska et al. 2014b). This issue makes a switch of the provider or removing data hard to achieve (Avram 2013). Lewis (2010) notices that customer's control depends on the provider.

The lack of control creates a heavy barrier in the mind of adopters. The move has to be done by the providers. They have to create systems, which are transparent and make it possible to change the provider without any disadvantages. The problem is that vendor lock-in ties the customer to the provider and his services and therefore providers generate use out of it. The question will be if a transparent and non-locked system can generate higher benefit for customers and thus attract a higher range of customers. A new customer segment could be more attractive than a locked-in customer base in the mind of the providers.

6.2.1.2 Technology/Performance

Customers' faith in stability of actual cloud computing systems is a barrier to the technology. Staten (2008, p.8) explains that "most cloud vendors today do not provide availability assurances". Leavitt (2010, p.18) mentions providers who "ran short of capacity" when users came up with "transaction-oriented and other data-intensive applications" Leavitt (2010, p.18). Hofmann and Woods (2010) also named the instability of performance as a problem. They mentioned that stress tests with the systems of the global players presented "variations in performance and availability due to loads" (Hofmann & Woods 2010, p.92).

The performance problems presented are from older examinations. Technology and performance still represent barriers for data-intensive users and users that cannot tolerate outages. But performance is developing as the technology is. As the systems will mature, technology and performance will also improve and the barrier will be lowered.

6.2.1.3 Connection

Cloud computing affords a stable connection to the Internet to get access to services. Even today, it is not possible to get high-speed access everywhere, especially not in developing countries (Avram 2013).

High-speed Internet infrastructure is on the rise and mostly available in industrialized countries. This barrier must be seen in global context, as there are

still many countries that do not provide proper Internet access. The access to the Internet will develop, but the barrier will remain, as long as there is no global coverage (Mladenow et al. 2012b).

6.2.1.4 Law

Cloud computing is a relatively new introduced product. Jurisdiction always lags behind development, especially in a fast improving industry as the IT. Therefore it is not unusual that this situation creates barriers to cloud computing. Borges and Schwenk (2012) published that there are already initiatives to create a framework, but they are still in their infancy. Dahbur et al. (2011) mention data exchange through many countries as an especially threatening situation for cloud users, as they also run through different systems of jurisdiction. Mainly different systems of jurisdiction, where no framework is presented to handle cloud computing issues, yet. The most occurring problems apply contract law and data privacy law (Borges & Schwenk 2012, Parrilli in Stanoevska-Slabeva et al. 2010). Lewis (2010, p.5) adds sensitive data as the problem to solve considering regulations, not only as a jurisdictional issue but also in the context of fair information practices, data protection and international data transfer".

Law is one of the barriers with a high chance to be at least handled in the future. The problem is that keeping up in jurisdiction affords time and difficult processes. In the meantime new questions will arise and afford new jurisdiction. In a fast changing environment like cloud computing there will always be a gap between jurisdiction and actual practices, so users have to arrange themselves with the development of the service.

6.2.2 Frontiers

6.2.2.1 Reliability

Reliability connects with trust, as systems need to be available at every time and everywhere (Avram 2013). "In the event of failure or outages, contingency plans must take effect smoothly, and for disastrous or catastrophic failure, recovery plans must begin with minimum disruption" (Avram 2013, p. 532). Lewis (2010)

reminds that a lot of providers use commodity hardware that is not as reliable as it should be in order to guarantee permanent access. Even experienced providers like Amazon cannot guarantee 24/7 coverage of their service, as an outage at Christmas 2012 showed, which was the heaviest of four outages in 2012 (Babcock 2013c).

Reliability creates a frontier, as users have to rely on a third party using their services. It is a frontier - and no barrier -, as some enterprise would never rely on a third party in consideration of accessing and handling key data. Reliability cannot be guaranteed, as there are many factors influencing it, like human failure, natural disasters, etc. There will always be decision makers, which will stick to their own structures when they have to rely on something, no matter if the third party product can guarantee higher stability or better service (Kryvinska et al. 2014b).

6.2.2.2 Security/Privacy

Hofmann and Woods (2010, p.91) talk about security as a trust problem when mentioning, that “behind the firewall enterprises have control of their data. In the cloud, they must trust providers”. That is why in their view a lot of enterprises are not willing to move sensitive data (Hofmann and Woods 2010). Serving a variety of customers is a problem for potential cloud users, as everything has to be shared and that generates lower security in their view (Leavitt 2010). Cloud deniers often propagate that the use of a cloud is less secure than building own structures (Staten 2008). This is true, if the system is not secured well, which today is nearly impossible, as there is high competition in the market and a non-functioning security system of a provider would lead to the denial of customers. That is where the discussion goes back to trust issues. It is not really the security of the system that worries potential users, but again mainly the trust into a third party (Kopetzky et al. 2013). Rountree and Castrillo (2013, p.13) footnote “a lack of understanding of what the cloud is and what it offers. This lack of understanding causes fear”. They also relate the fear in security aspects to the loss of control.

Lewis (2010) presents the privacy of data as the most important issue when thinking of security. Avram (2013, p.532) states that it is unclear whether cloud security "provides adequate protection of such information, or whether organizations will be found in violation of regulations because of this new model." A study by Ernst & Young (2011) implies outsourced data as easier to access and therefore less secure. The study relates to two factors when mentioning privacy: security and law. Marinescu (2013) states the need for legislation in privacy aspects of cloud computing as well.

When well-designed, there is no problem in the security of cloud computing systems. The problem is as already mentioned related to trust issues, as the customer has to stick to a third party and rely on that system. There are security and privacy problems of course, which are a frontier, as they cannot be completely abandoned. But this is not a problem directly connected to cloud computing, as other hosting paradigms do have problems as well in terms of security and privacy. However, no one is keen about sourcing out security systems and sensitive data and there will always be the risk of malicious insiders and attacks on the system. That creates an issue cloud computing will not be able to solve.

6.2.2.3 Trust

Trust issues are linked to nearly every barrier or frontier. There is a clear frontier set by those issues. Trust issues can be improved, but never erased. Marinescu (2013) presents two circumstances, risk and interdependence, that have to exist to create trust issues. Both occur in cloud computing and providers have to concentrate on the development of those to move towards the frontier. Especially without visible partners it is hard to develop trust and therefore providers have to offer perfect solutions to create confidence in cloud computing systems. Ko et al. (2011, p.585) remind the need to understand the key components in demand to lower barriers and move towards frontiers considering trust: "security, privacy, accountability [and] auditability". These are the leverages to reduce risk and improve interdependence. Pearson (2012) remarks the problem of transparency, as often providers do not know subcontractors, which are offering services on

their structures. They may be able to run low security services. Durkee (2010) explains the importance of transparency to bring trust into a relationship. Therefore it is necessary for a trust relationship that the cloud vendor provides details on structure and functionality (Kryvinska et al. 2014a). Durkee (2010) emphasizes the role of a roadmap and objectives in this context. But he also reminds that actual systems are not designed for transparency and perhaps they never will be, as internal structures are crucial for the success of a system.

Trust is the main frontier to cloud computing. Cloud providers will never be able to create an atmosphere of trust that is so alluring that every possible user will be attracted. So the question is not how to remove trust issues, but how to advance the relationship between provider and customer to optimize the possibilities for third party integration. The combination of security, privacy, transparency, reliability and jurisdiction must be optimized as far as possible. Cloud providers need to promote their products in a better way and explain them in more detail to their customers and potential customers. Anyway, trust is the frontier cloud computing will never be able to remove and where the development of cloud computing will reach its final frontier.

Cloud computing presents a lot of risks, vulnerabilities and drawbacks. But it is an infant technology that has to evolve and erase the obstacles. The future will prove if the technology and its providers are able to compete with those challenges and if they are able to lead cloud computing to broad enterprise value. However, cloud computing has certain frontiers and barriers, which it will not be able to remove. Especially in between those frontiers cloud providers have to design the highest enterprise value possible for cloud computing to achieve.

The final section sums up and analyzes the findings of this thesis and copes once again with the research questions to give a final answer, what the real enterprise value of cloud computing is and how it will develop.

7. The Future of Cloud Computing

7.1 SWOT Analysis - Towards a Future Business Model

Cloud computing implements advantages and disadvantages. The question of the final section is to find, if cloud computing can develop full potential in between its frontiers or at least develop enough value to be widely adopted in enterprises. To clarify this issue and to lead the way towards business use, a SWOT analysis will define the points which are necessary for creating a proper business model for cloud computing.

Table 16: SWOT Analysis

(Avram 2013, Dhar 2012, Durkee 2010, Krikos 2011, LaCognata 2012, Marston et al. 2011, Mladenow et al. 2012b, Nielsen 2012, Staten 2008, Zissis & Lekkas 2012)

Strengths	Weaknesses
Decreased costs Scalability and flexibility Reduction potential and effective use Location independence	Trust Control Lock-in Reliability
Opportunities	**Threats**
Disruptive technology Green IT Complexity Virtualization New markets	Competition Standards Regulation Security Maturity

The most important factors to create a valuable business model are the opportunities. The realization of opportunities leads the way towards the future of cloud computing. An existing portfolio of strengths already defined the core values of the technology, now the opportunities can shape the real potential of cloud computing. Cloud computing as a disruptive technology is the core of the opportunity section (Kopetzky et al. 2013).

7.1.1 Strengths

The strengths of cloud computing present the framework to create value in order to boost enterprise structures. The cost-factor especially in the high-cost IT sector plays an important role in the decision making process of enterprises. On top, the price war between providers keeps prices at a low level (Australian Government: IT Industry Innovation Council 2011). Scalability and flexibility open up new possibilities considering reduction potential and again the cost factor. Flexibility influences the fixed costs, which can be translated into variable costs and therefore reduce the balance sheet. A switch of providers is another possibility (Rountree & Castrillo 2013, Staten 2008). Flexibility also influences the pricing model itself, as cloud computing focuses on pay-per-use models (Zhang et al. 2010a). Cloud computing enables the reduction of extensive services like maintenance, monitoring, management and security (Dhar 2012). Enterprises no longer depend on their in-house architecture, as access is theoretically possible from all over the world and from variable devices (Marston et al. 2011). Cloud computing has to combine these strengths with the additional opportunities the technology is able to offer, to remove obstacles and create a product, which serves customer demand.

7.1.2 Opportunities

Cloud computing already developed from the start, since it was a disruptive technology (Kopetzky et al. 2013). This makes it an even bigger threat to the existing business model. Cloud computing does not perform under the radar any more. In contrast, quite the opposite occurred, a veritable hype emerged around the new technology (Kopetzky et al. 2011). Cloud computing provides new solutions to customers and at the same time is able to offer things, other hosting technologies do, but sometimes in a less favorable way for the user. The crucial point is that cloud computing does not have to offer the same level of benefits in other categories like traditional hosting does (Krikos 2011). Krikos (2011, p.3) presents the “emergence of a disruptive technology” captured in figure 21.

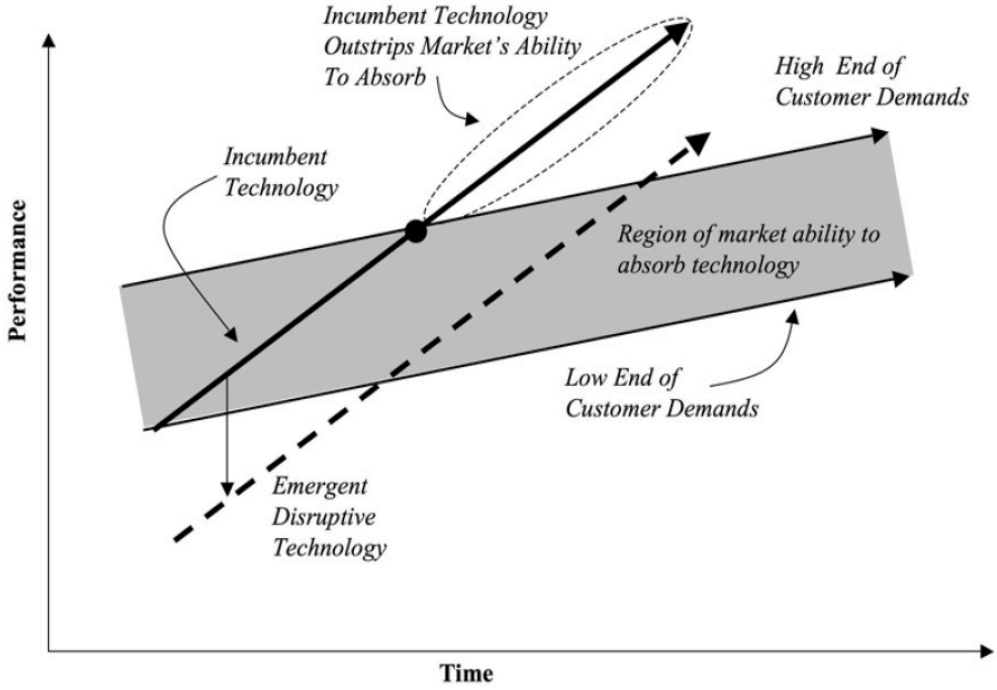

Figure 21: The Emergence of a Disruptive Technology (Krikos 2011, p.3)

There is a point in the maturity of a technology when customer demand is served, even if the technology does not offer the same possibilities in some categories as the old technology does (Krikos 2011). Cloud computing reached a high level of acceptance already, as established hosting providers like Rackspace and VMware adapted or even renewed their business models (Babcock 2014, Gartner 2014c). Established providers started to recognize the potential of the technology, compared it to their old business model offering, and decided that it is worth to create a new business model around it.

Cloud computing offers the opportunity for customers to build a business model around responsibility using green IT factors. Cloud computing is able to save resources and operate more efficiently than traditional data centers. This step improves the image of an enterprise as it contributes to a smarter use of energy in between the enterprise (Marston et al. 2011). The smarter use of technology leads to the next point: complexity. IT becomes more complex in a fast developing environment. Cloud computing enables outsourcing of technology and therefore outsourcing of complex duties to better qualified professionals, who run these structures (Avram 2013). Of course, this projection collides with some parts of the weaknesses and threats section. A special change in the environment of cloud computing must be forced to achieve the reduction of complexity. Users

need to trust providers and providers need to offer transparency on their services. This creates a high barrier for the reduction of complexity and integration of broad cloud computing systems. A possibility of cloud computing to gain trust is the fact that it does not present a new technology, but rather a strategic innovation. It combines existing technologies to “meet the technological and economic requirements of today’s demand for information technology” (Zhang et al. 2010a, p.8) (Kopetzky et al. 2013). Cloud computing is able to be a leverage for existing technologies to enforce their potential. Enterprises are already familiar with those technologies. The possibility to create a better understanding what cloud computing does is an explanation based on familiar products leading to the benefits cloud computing can add to the old business model (Zhang et al. 2010a). Virtualization establishes the possibility to serve customers directly without the installation of software on every device. Facilitated access at lower cost is the key advantage of this practice. The system is faster, updates are faster and resources are provided more efficiently (Rountree & Castrillo 2013, Staten 2008).
Cloud computing opens up new markets by offering its abilities. As already mentioned, a disruptive technology does not have to provide the full potential of an existing technology if the user does not demand the full potential. Cloud computing creates a new market for customers with lower expectations, as well as lower ability to pay (Marston et al. 2011). When the disruptive technology develops in the right way it is able to meet the demand of customers with higher expectations, too (Kopetzy et al. 2013). This is what cloud computing does right now. In the first stage of the development it served mostly small customers and improved its abilities. The case study on enterprise value of cloud computing presents that by now bigger companies and even global players are integrating cloud structures, what implies that cloud computing has reached their demand. The next step for cloud computing will be to reach the demand for public clouds rather than private clouds.

7.1.3 Weaknesses

Trust issues are the most critical weakness, which comes to mind, when talking about cloud computing. Most weaknesses and threats have linkages to trust. Control, performance, reliability, security and maturity do not only create a

weakness or threat in their own way, they also present an issue of trust. The creation of a trustful business model therefore will have highest priority in future considerations. Through the development of a higher level of trust, a cloud provider would be able to gain a real competitive advantage. Trust issues cannot be removed, a movement towards the frontier might be the highest achievement a cloud provider can reach. Nearly every category that creates discomfort for customers can be affected through progress (Ko et al.2011, Durkee 2010).

The loss of control remarks another weakness of cloud computing. Enterprises outsource their services to a cloud, where they are not able to take decisions on functionality, design, operability and other management processes. The customer usually does not know the location of the data storage or at least it is not guaranteed (Marston et al. 2011). The future business model focuses on transparency to create trust. The loss of control is not avoidable, but providers are able to give information on where data is stored and how the system works. Marston et al. (2011) already presented the possibility to connect to isolated servers, as offered by Amazon. For larger enterprises providers could be able to develop adjusted systems or provide fast reaction, as Amazon does in its cooperation with Netflix (Butler 2013a, Pivotal 2013).

A future business model will have to face the question of data lock-in. Most cloud services are not interoperable (Kryvinska et al. 2014b). If customers want to switch the provider, their data is lost or at least not able to be transferred to the new provider (Hofmann & Woods 2010). There are two possibilities considering a future business model. First, keep the path and avoid offering interoperable systems. Second, create a new path where at least a transfer of data is possible. Through lock-in cloud providers are quite sure that customers will stick to them. On the other hand lock-in is a weakness of cloud computing and prevents customers from turning their service to a cloud provider or forces them to create private cloud structures. A strategic move to a more open and interoperable system could establish a new market for cloud providers by enlarging the segment. In the short run lock-in will constitute a weakness, but providers are able to handle that issue.

Reliability is not only a question of trust. There are fields where reliability cannot be affected. Providers by now try to improve respectability, creditability and

safety, but there are entities, which they cannot handle. Providers cannot prevent natural disasters or human failure (Avram 2013). The task for providers is to give their customers an understanding of how the system will prevent outages and how the provider will react, if there is an outage to achieve fast recovery (Avram 2013). But it is clear that cloud reliability is in need for development. Enterprises cannot tolerate downtimes and as already remarked, for example, Amazon the biggest cloud provider, has to fight heavily with downtimes (Babcock 2013c).

7.1.4 Threats

The creation of a valuable future business model requires a special focus on threats, as in contrast to weaknesses there is an ability to remove most of them.
Competition is high in the cloud computing market, even if the market is relatively new. Marston et al. (2011, p.182) fear a “backlash from entrenched incumbents”. Indeed, incumbents are moving towards the new technology and adapt their business model. The examples of Rackspace and VMware illustrate that traditional hosting providers are forcing a move towards the cloud to generate new customers or more important retain their existing customer base and offer additional services (Babcock 2012, Forbes 2014, Gartner 2014c, Parnell 2014). The high competition forces two business models, one competing on price the other one leading to differentiation of products (Shaked & Sutton 1982). Surviving in the competition is only possible for differentiated enterprises, as the price drivers are enterprises with huge assets, like Amazon and Microsoft. A business model for entrants or others than the global players will focus on the creation of niches and the struggle to retain them (Thilmany 2008).
Standards and regulation enforce the acceptance of cloud computing. The unclear legal situation keeps cloud computing back from achieving additional value (Borges & Schwenk 2012, Kryvinska et al. 2014b). A future legal framework can boost cloud computing and erase many occurring issues. In the context of business models, a legal framework enables transparency and therefore trust and reliability. The threat to cloud computing is that acceptance will never take place in complete extent, as legislation always lags behind development and cloud computing is progressing fast.

Security threatens cloud computing as adopters have to rely on a third party. Security again presents an issue of trust. Zissis and Lekkas (2012, p. 585) present security benefits of cloud computing “due to its architectural design and characteristics [in] centralization of security, data and process segmentation, redundancy and high availability”. Weakly designed systems are the fear of cloud adopters. A change already happened, as the cloud market is very competitive and weak players with poor standards will automatically fail. In most considerations, cloud security is a problem of third party integration and that is where cloud providers have to apply. System security has to become a matter of course in the mind of the customer (Hofmann & Woods 2010, Leavitt 2010, Staten 2008).
Experts often talk about the infancy of cloud computing (Calheiros et al. 2011, Cloud Security Alliance 2012). Enterprises, especially big companies, do not want to rely on infant systems. Time is the important factor here. Cloud computing has to develop and provide signs of maturity to be attractive for a special range of customers (Nielsen 2012). Nielsen (2012) published signs of maturity, as niches appear, traditional providers complement their business models, commoditization started and weak providers had to leave the market. Cloud computing is heading towards maturity and potential adopters have to decide, when or if the cloud is mature enough to integrate it into operations.

The SWOT analysis verifies **research implication 2.** Cloud success really depends on the style of integration and how it is translated into future business models. The full development of potential has its most important frontier in trust, which connects to nearly every issue in cloud computing. The task of cloud computing is to improve its services and opportunities and develop full potential within its frontiers. Some of the obstacles will always remain. Therefore, the definition of a consistent business model, depending on the kind of service the enterprise has in mind, plays an important role.

Thus, the next subsection will translate the explored outcomes into statements.

7.2 Discussion - The Real Value of Cloud Computing

Value of cloud computing emerges from two perspectives: the provider's side and the user's side. The discussion on the real value of cloud computing must be separated into those two categories.

7.2.1 Provider's Side

Cloud providers identified a lot of potential in cloud computing. There is a multitude of established players in the market, which serve well-defined cloud solutions. Cloud computing matures on provider's side, as niches established with players offering differentiated services. The focus of cloud providers evolved creating niches as a reaction to hard competition and price war. Through the need of differentiation, the services started to improve and broadened. Cloud providers look for new service types and products to keep or stretch their niche (Amazon Web Services 2014b, Amazon Web Services 2014e, Deacon 2010, Gartner 2014a, Google 2014a, IDC 2014, McKnight 2012, Microsoft 2014c, Nielsen 2012, Rackspace 2014b, Rackspace 2014c, Salesforce 2014c, VMWare 2014b). Customers depict an issue in the further process of cloud computing. Even some of the biggest players lag behind their expectations in customer acquisition and competition is getting harder (Babcock 2012, Gartner 2014a, Gartner 2014c, Gartner 2014d, Panettieri 2013). This could lead to discharge of enterprises that search for differentiated and innovative solutions in cloud computing. Global players with standardized and non-innovative, but cheap solutions might be the winners and lead cloud computing towards an era of low price, low service and low innovation (McKnight 2012, Mirandi 2013, Venkatraman 2014). The orientation of cloud providers is important for the acceptance of customers, as bigger enterprises and global players are mostly adopting non-standardized systems, which are optimized to their needs. The emergence of low-cost products with minor service will force them towards keeping structures in-house. Niche players are essential for the rise of cloud computing, as they have to improve the cloud to deliver a premium product to avoid competition with global players (Forbes 2014, Gartner 2014c, IDC 2014, Nielsen 2012). From a financial point of view cloud computing promises high incomes to successful providers (Babcock 2013a, Barron's 2013, Bass 2013,

Dignan 2013, King 2014b, Miller 2013, Mirandi 2013, Yahoo 2014b, Yahoo 2014c). Hosting providers like Rackspace (2014a) or VMware (Gartner 2014c) started to realize the possibilities of cloud computing, too. They started to develop a new business model to extend their actual one (Babcock 2012, Butler 2014, Parnell 2014). There are various enterprises starting to offer cloud computing to enlarge their business model (Armbrust et al. 2010, Leavitt 2009). Financial incomes are promising for cloud providers. As long as the segment stays lucrative the appeal and therefore the value for a provider to serve the market is given. The problem considering financial income is the unique selling proposition (Gartner 2014c). At that time niche players differentiated, but others are able to copy their model. VMware did this with a supported cloud offering, just like Rackspace has one (Parnell 2014). A niche player has to create a certain service, which he can offer better than the competition is able to do it. Once established a unique service, it is harder to contest for competitors in that niche. As competition is rising, global players do have to invest into their portfolio of service offerings, too (Venkatraman 2014). But their focus is still on standardization and low price (Clark 2012, Weichsel et al. 2012).

Research implication 1 drawn to provider's side can be neglected, partly. The major expectation from a provider's point of view is revenue. Successful providers, as presented in the case study, improved their revenues in cloud computing and therefore the enterprises perform within the expectations. Conversion also improves, as enterprises are differentiating to create niches and are innovate to keep them. Other competitors do not perform within the expectations, they are attracted by the potential of cloud computing and want to establish themselves in the market. If they do not create a valuable product and find their spot in competition, they will be forced out of the market as successful providers try to lead the market into their direction.

Research implication 2 is more related to the user section, as they are the ones that cause the obstacles the providers have to remove. But the analysis already proved that providers are not able to solve every obstacle, as there are important frontiers and high barriers. **Research implication 2** is verified, as cloud providers

have to deal with frontiers and barriers to create full potential within those obstacles. In between their own development providers try to move towards full potential through innovation as a result of rivalry, investments to keep up with competitors and new service offerings to expand and satisfy the market (Weichsel et al. 2012).

Cloud computing definitely creates value for cloud providers, as the major objective is the creation of revenue and profit. But, the competition is high and will only get harder over the next years. The interesting point of the analysis will be the value cloud computing created for users, as they are the ones who force providers to improve and develop it.

7.2.2 User's Side

There are enterprises with profitable cloud computing structures on user's side, as presented in the case study. The question is whether they achieved full potential from cloud computing and the answer is 'no'. Today enterprises are using cloud computing to complement their services. The enterprises analyzed in the case study do integrate the parts of cloud computing they need to boost their own offering. For the enterprises in the case study the integrated parts already worked well and created additional value for the organizations and their customers (Butler 2013a, Open Data Center Alliance 2012, OpenStack 2014, Vance 2013, Vaughan-Nichols 2013). All of the three organizations use open source technology to develop their system. Open source enables other users to avail of the innovations of the group. Cloud computing can benefit highly from shared resources when searching for full potential (Butler 2013a, OpenStack 2014). The organizations created efficient business models around cloud computing and use the parts which contribute to their systems. It is interesting that the enterprises do not focus on the best all-around performance. The business model of BMW is heavily related to the improvement of their existing strengths and does not create new strengths in an approach to achieve an own cloud identity (Müller 2013, Open Data Center Alliance 2012, Venkatraman 2013). But, a strategic component of BMW's cloud structure is already in development (Liccardo 2011, Open Data Center Alliance 2012). Netflix focuses

on the reduction of complexity and puts a spotlight on core competencies to reduce expenditures (Ciancutti 2010). CERN set the focus of its business model on the optimization of processes, the integration of scientists and innovative ways of using the cloud (McLaughlin 2013, Moreira 2013). Creation of value especially stops when infrastructure needs to be outsourced. Two of the three organizations still use private in-house cloud structures. While CERN is keen on improving its structures and move services to a public or hybrid cloud BMW tends to keep sensitive data in-house. Netflix presents the vision of cloud providers, when they are talking about the full potential of cloud computing. The enterprise moved nearly its whole structures to a cloud provider to optimize them (Moreira 2013, Open Data Center Alliance 2012, OpenStack 2014, Pivotal 2013). Today most moves to the cloud are related to the optimization of own structures, as BMW and CERN proved. BMW realized that their infrastructure needed an update, while CERN got problems with capacity (CISCO 2009, Schwickerath 2010). Netflix was the only enterprise in the analysis that truly had the vision to gain additional value from a move to a cloud model (Forbes 2013b). These adopters are outriders. But even they do no use the full potential cloud computing has to offer. BMW and Netflix in some parts try to integrate the easiest structures possible. Cloud computing has to improve and enterprises, which stick to the basics, prevent cloud technology from achieving full potential (Masters Emison 2013, Venkatraman 2013). The enterprises are able to save money, but the technology rests at lower status. Reliability is still a concern derogating the value of cloud computing. Especially Netflix had to suffer from downtimes of their provider and a 24/7 service as expected cannot be guaranteed due to natural disasters, human errors and other non-projectable situations (Kryvinska et al. 2014b, Vaughan-Nichols 2013). An important factor is that users are only able to achieve full potential, if the provider is able to achieve full potential. Cloud computing produces a high dependence between user and provider. Two parties have to connect their strengths to improve value. CERN is operating with Rackspace to do exactly that. Netflix is partnering with Amazon and integrates open source developers. BMW involved the Open Data Center Alliance (CISCO 2009, Curry 2013, McLaughlin 2013, Open Data Center Alliance 2012, Pivotal 2013, Purcell 2014). There is still a long way to go, in contrast to Golden (2013) and others,

2014 is not the year of the final step towards public structures in a higher degree. 2014 does not present the moment of truth for private cloud structures, yet.

Research question 1 cannot be neglected from a user's point of view. The outriders discover that it is possible to create a system tailored to own needs using cloud services. The enterprises and the organization analyzed in the thesis created superior services in contrast to other users, so the possibility to do so is already given. The organizations picked those parts from the portfolio of expectations by the IT industry, which suited best to their requirements. They needed to improve their system and converted it into useful structures. Enterprise adoption lags behind in the public categories. Providers have to find a solution to convince the enterprises to move to public structures. By now only outriders produce useful cloud solutions, others want to use the basics, but do not want to contribute to the development of cloud computing. As long as there is no widespread acceptance of cloud computing, it lags behind the expectations of the IT industry. This does not mean that cloud computing is not performing satisfactorily. The expectations of the IT industry are excessive, as cloud computing is a relatively new technology and has to experience a phase of acceptance and integration right now.

The enterprises in the case study have verified that the future of cloud computing is highly connected to the style of integration. They have also proved that there is a long way to go because of obstacles. Reliability, weak structures, bad design, a focus only on cost reduction and other factors slowed down the establishment of cloud computing even in the outrider enterprises (Venkatraman 2013). There are high barriers to remove and frontiers to move towards, to achieve the highest potential possible. If cloud computing can develop full potential, it will only be able to develop full potential within its frontiers. Some frontiers, which hinder the real potential of cloud computing simply cannot be removed. Especially the ones related to trust, transparency, third party integration and security. **Research implication 2** applies, as there are frontiers that prevent cloud computing from achieving the real potential value.

Cloud computing “has gone beyond” basics (Lin & Chen 2012, p.534). But, there is still a lot of improvement needed to become a mature technology. Cloud computing is on that way, but the obstacles on the way avoid from creating its expected value, yet. Anyway, cloud computing is already capable of improving enterprise structures and the way enterprises act.

The next subsection takes a closer look at what has to be done to receive a better conversion of cloud computing.

7.3 Challenges for a Future Development

7.3.1 Development of Cloud Computing

The development of cloud computing and its services is the most important challenge to face. The development of services, technology, security and other factors is necessary to achieve widespread enterprise acceptance. Ried et al. (2010) remind that not only the creation of value for customers is important. Simultaneously the prospects are a challenging question. In detail Ried et al. (2010) propose positioning, competition, and a disruptive change as possibilities to modify within the technology. Cloud computing has not reached the widespread acceptance providers want to achieve, yet, so they have to analyze those possibilities and integrate them into their own development.

Marston et al. (2011) present the issues of standardization, manageability and best-of-breed operations as most occurring issues for the development of cloud computing. As already mentioned, there is a lack of standards in cloud computing (Borges and Schwenk 2012). Standards and the advent of jurisdiction could lead to broader acceptance. As cloud providers are not able to force jurisdiction, they have to enforce the creation of standards. Cloud computing must get transparent, easier and reliable for customers. The style of handling the system leads to the next point, manageability. Customers want an easy system that they can handle by themselves without a lot of training or ambiguities. The design of cloud computing services and hardware offerings has to develop to meet the demand of a bigger customer group. Design also includes other aspects like interoperability. Providers often focus on interoperability as a threat to customer relationship, but if a customer is satisfied with the offering, he will retain anyway

(Avram 2013, Pearson 2012). The last point Marston et al. (2011) mention improves by itself. Cloud computing is already a very competitive market and only successful players survive, no matter if niche or global player. The market mechanism automatically leads to a survival of the fittest, no matter if adapted and designed or as a lowest priced model. Even in the low price section there is so much competition that only the best will survive. As long as no provider developed a unique selling proposition, the development of cloud computing will benefit from competition (Mirandi 2013, Gartner 2014c, Padashetty & Kishore 2011).

Dean & Saleh (2009) add that it is necessary for providers to understand the drivers of development. The enterprises have to define, which needs are immediate and which are considerable in the future development of cloud computing. Dean & Saleh (2009) mentioned that it is necessary to define a certain culture. Enterprises need to be aware of which markets they are targeting. Successful providers took this step, and defined their business models to the needs of certain customer groups.

Garrison et al. (2012) mention interorganizational relationships as a source for development. Trust can lower cost of negotiations and prevent conflicts. The cooperation between the parties would benefit and through trust cloud computing would be able to achieve new frontiers. But as described, trust is a major issue. The development of trust will take time and cannot be fully removed (Ko et al. 2011, Marinescu 2013). Cloud providers and cloud customers need to develop an acceptable level of trust. Cooperative services are more contributing than non-cooperative ones, they are a potential that is able to boost cloud computing to a new stage. An acceptable degree of trust creates the possibility to enable the ability to change the complete business environment. As trust cannot be removed the question is how far acceptance can develop to change the business environment (Durkee 2010, Ko et al. 2011).

The lack of business knowledge in IT is a source of development that Garrison et al. (2010) footnote in their findings. Customers need to become aware of how cloud computing really operates to realize its potential. Providers and potential customers need to work together to develop a better understanding of cloud computing.

Staten (2008) describes a point of adoption cloud computing has to pass. In 2008 he introduced enterprises using the cloud to run business-critical operations. He also noticed that there was not enough evidence to prove widespread acceptance. Until 2014 development continued. By now there is enough evidence, that enterprises put business-critical operations to the cloud. But, there are still a lot of enterprises, mainly bigger ones, which are not ready to put their data into a cloud. So advancement of cloud computing took part, but widespread acceptance in most interests is still a long way to go. The most important progress is the involvement of big enterprises and global players in cloud computing (Curry 2013, McLaughlin 2013, Pivotal 2013, Purcell 2014). This expansion states a huge success, as Staten in 2008 presented small companies and start-ups as the main consumers of cloud computing.

On the way for development of cloud computing providers and customers need to face a variety of challenges. Most of them arise from risks, vulnerabilities, concerns and obstacles. A proper development of cloud computing enables dealing with challenging and providing solutions and the questions they create. Most researchers discover the same challenges or only variations of the same challenges (Dhar 2012, Dillon et al. 2010, Leavitt 2010). Dhar (2012, p.671) lists 4 categories of challenges ‘security and privacy, maturity and performance, compliance and data sovereignty, lack of standards’. Dillon et al. (2010) add in-house integration into IT systems and the return to in-house systems to the challenges. Leavitt (2010) has the same concerns as Dhar (2012) and adds lock-in, bandwidth cost and transparency to the challenges side. These are the most important issues cloud computing creates. It is visible that cloud computing already defined its way to progress as challenges mainly focus around the 4 categories Dhar (2012) published. Providers will focus on those categories to develop their service offering and customers will look at those categories, when they decide to integrate a cloud provider into their business structures. Maturity and performance and compliance and data sovereignty are the challenges cloud providers can easier cope with than the other ones. This is due to the fact that it is up to the providers to develop those issues and to achieve better conversion. Maturity and performance nearly develop by themselves, as the system is progressing in a competitive environment. Compliance and data sovereignty

illustrate attributes that are in theory easy to handle for providers and attract customers. Therefore cloud providers will focus on those attributes. Lock-in is a matter of cooperation between providers and if they agree on standards, interoperability can be created. This directly connects to the integration and return of IT systems. If there are standards it will be possible to return data, if necessary. Providers have to negotiate to develop cloud computing (Pearson 2012). Theoretically the barrier is easy to handle but in practice cloud providers want to keep the actual status to lock customers. Pressure from the customer base might be the solution here, as service should always be optimized to customer needs. Bandwidth costs execute themselves, as cloud providers are fighting a price war. Customers who prefer cheap solutions, will be able to get those, now and in the future (Gartner 2014c, Padashetty & Kishore 2011). Transparency is a trust related issue and an issue of business. No cloud provider wants competitors to get an insight into their structures. Plumbing the borders between transparency and safety of business secrecy is an issue that will occupy providers over the next years. They have to find a way to make cloud computing transparent and at the same time secure their business identity.
Security, privacy and the lack of standards are the challenges, where providers are mostly unable to react. Security and privacy are matters of trust, so providers are only able to enforce customer relations. Cloud computing will only improve as much as the relation between provider and customer does (Hofmann and Woods 2010, Rountree & Castrillo 2013). The lack of standards is related to two issues: standardization, which must be in between systems, and jurisdiction (Avram 2013, Borges and Schwenk 2012). Providers are able to force standardization and that is where they have to charge. Responsibility of the government to force standardization is important. The government must define terms of references a provider has to stick to. Jurisdiction, as already mentioned, always lags behind the progress of technology. Neither cloud providers, nor customers are able to improve the development of legislation. It is up to the legislator to force it (Harauz et al. 2009).

The development of cloud computing and its challenges prove **research implication 2**. Well-designed and customer-oriented solutions that handle

obstacles best and face challenges will experience better progress in the cloud computing market. Differentiated products have to be developed, as well as low-cost products, as cloud computing is still defining itself. The challenges also prove that there is no possibility to remove obstacles completely to achieve the full potential of cloud computing. Again the solution is to perform best within the frontiers of cloud computing.

Subsection 7.3.2 further discusses the requirements for the development of cloud computing.

7.3.2 Requirements to Lead the Way

Cloud computing is not a mature technology yet. Adopters have to cope with a lot of uncertainties considering the technology and its providers. Therefore, it is necessary to improve the customer situation in cloud computing markets. Customers need guidance towards a valuable service offering that fits to their needs while being affordable and easy to handle.

Metheny (2013) explores the Federal Risk and Authorization Management Program. The agency proposes a framework to verify security and privacy in cloud computing. Frameworks will be necessary to establish cloud computing especially in the mentioned area of privacy and security. The customer gets to know, which requirements are important and is to some extent able to check provider's abilities by himself according to the framework. Governmental agencies should create an overall guidance framework for cloud adopters to check their possibilities, become aware of what cloud computing really is and how it can contribute to their own business. It is important that independent agencies generate the framework and not cloud providers. Cloud providers can help to understand cloud computing, but a framework built by them should not be accepted as autonomous. Swanson & Guttman (1996) created a framework for security in information technology that can help implementing the security requirements of cloud computing. The most important points to consider are that security has to support the mission of the enterprise. It should be cost-effective. Furthermore, there are responsibilities outside the own organization, responsibility and accountability need to be made explicit, a comprehensive and

integrated approach is necessary, periodic reassessment and societal factors. A well-designed security system exhibits these characteristics and combines them in a way, which supports the technology. Cloud providers can use it as a guideline to design their system. But anyway, there is the requirement for concrete guidelines for cloud computing security design. Pearson (2009, p.47) developed a framework to overcome privacy challenges. The central points are “openness and transparency, choice, consent and control, scope [and] minimization, access and accuracy, security safeguards, compliance, purpose, limiting use and accountability”. The user should become aware of which information gets collected, how and for what purpose. Usage of data is only allowed to fulfill the purpose of the system. Data must be anonymized as well as possible. Third party contact needs permission and privacy policies have to be integrated. The customer must be integrated into the decision, if certain data will be collected. He needs to have access to stored data. Unauthorized access must be impossible. A relationship of trust is unavoidable (Kryvinska et al. 2014a). Providers need to observe privacy policies (Pearson 2009). Governments need to evaluate those approaches and build a framework to guide cloud adopters. Every regulation or jurisdiction can give a boost to cloud computing as the technology will be defined clearer and issues will be removed (Borges and Schwenk 2012).

Marston et al. (2011, p.186) mention a research agenda divided into five categories that could deliver a clue, which categories have to be taken into consideration when designing a framework: “cloud computing economics, cloud computing and IT strategy/policy issues (including security), technology adoption and implementation issues, cloud computing and green IT, and regulatory issue”.

A research study from Claranet (2014) footnotes that already 74% of the businesses in the UK are using cloud computing in some way. This depicts that cloud computing gained acceptance. The problem of cloud computing is how the enterprises are using it. Most enterprises are running in-house solutions or keep non-sensitive data in the cloud environment (OpenStack 2014, Venkatraman 2013). Claranet (2014) proposes experience with the system as the catalyst for cloud adoption. Cloud providers have to facilitate their customers an understanding of what they are really able to deliver. They need a progress towards trust, as acceptance of services in general is already given. Experience

with the system as a catalyst may be one option here, but developing customer relations can boost cloud adoption. Support of cloud adopters and assistance for the development of their visions for cloud computing is not a new option. It is an option that played out well for some niche players. Easy access, better understanding and transparency are criteria that enforce cloud computing. Breiter et al. (2011) developed a service management concept that could help boosting cloud computing. The services shape around the categories of “service strategy, service design, service transition, service operation and continual service improvement” (Breiter et al. 2011, p.168). A framework should pick up those categories, identify the special needs of customers and create a contributing value proposition.

The most important issue is to define every category of cloud computing and propose a clear structure. Maturity, definition and understanding are the core requirements to achieve, the creation of a functioning framework is important. Time defines the other requirement to lead the way, as regulation, jurisdiction and acceptance will need time to progress and improve. As Claranet (2014, p.9) depicts “experience will be a catalyst to cloud computing”.

The next subsection will present which steps cloud computing has to take to arouse its potential and how services must be designed to achieve that goal.

7.3.3 Steps to Take

Cloud computing already developed from a disruptive technology and whipped up hype in the IT industry. But, the technology still has issues and requirements to fulfill to become established. By now a lot of enterprises struggle with the question whether to move to the cloud or not. Rountree & Castrillo (2013) describe that a move is connected to the problem the enterprise is trying to solve, technical or functional issues, services or capacity. Cloud providers want to overcome the integration of cloud computing based on only integrating certain advantages. They want to create an overall enterprise system, for every customer available. Therefore they have to improve the service attributes of cloud computing and take the next step in the evolution of the technology.

Providers have to understand the requirements of stakeholders. They have to cooperate with their customers to create efficient systems. Niche players discovered enormous potential in tailoring systems to the needs of enterprises. Those systems rise with a maturing cloud technology (Khajeh-Hosseini et al. 2010).

Interoperability and availability are important issues in future considerations. Khajeh-Hosseini et al. (2010) mentioned those points, but the step still has to be taken. Providers remind data lock-in as an opportunity to keep customers, but the future reality should be a system of relation and support, where customers stick to their provider because of satisfaction with the service offering and not because they have to. Full availability of Internet access is important for the cloud to develop. But a cloud provider cannot influence the Internet provider downtime and outages not related to the cloud. An outage of the Internet provider means the same for the customer as an outage of the cloud provider: no service availability. As already mentioned, there are factors that providers cannot influence like natural disasters, but otherwise the system has to work fluently. In the event of those disasters recovery must start immediately (Avram 2013, Lewis 2010). The author of the thesis tested the Netflix service offering in September and October. Within this period the service had two major outages. For a consumer-oriented service like Netflix outages are not as fatal as for an enterprise-oriented one. If there is an outage in an enterprise cloud network, nobody will be able to work, data gets lost and the enterprise loses a lot of money. Netflix loses subscriptions, if customers are dissatisfied, but from an own point of view, they accept short outages as they rely on Amazon Web Services that suffered major outages over the last years (Vaughan-Nichols 2013).

Providers have to optimize their systems and keep availability at the limit. A progress has to be initiated here. Providers are already dealing with a range of solutions, like Amazon, which is guiding Netflix through 3 different regions. If one region breaks down, the service guides the customer to another region. Even using this system there have been several major breakdowns (Vaughan-Nichols 2013). The vision of complete enterprise implementation of cloud computing is based on full availability and a maximum of reliability. The system has to be

improved to guarantee that. If cloud computing will take those steps, it will be a boost to enterprise integration and trust, as availability creates reliability.

Van der Zwet and In't Veld (2013) explored areas, which have to advance to take the next step. Cloud computing by now is mostly nationally oriented. But it offers the technology to make services available all over the world. There is a chance for providers to enter bigger markets. Even enterprises like Amazon for example offer regionally distributed services. The problem in geographic expansion again is trust, as customers want to know where their data is stored. Jurisdiction also plays a role here, as data has to surpass different countries, with different law (Jaeger et al. 2009).

A move from private cloud services to public cloud services will be necessary. The thesis explained, that the full potential can only be achieved through the integration of public clouds, as they offer several advantages, private clouds are not able to offer. Customers have to take the step to the public cloud to get full advantage. But, this is not only an issue for the customer to overcome. The barrier in mind is a process of cooperation and relation between customer and provider. Clouds have to mature to create confidence. It is the demand for providers to force a move to public structures. Customers have to cooperate and connect with their provider. They have to understand the cloud, its opportunities and drawbacks.

Changes to take further focus on are settled around the concerns of cloud computing. The most important step to take is that cloud providers engage with risks, vulnerabilities, threats and drawbacks. Especially the attempt to remove barriers and the move towards frontiers will define the future of cloud computing. Technology and performance will mature by themselves. It is a process and a step, but kind of an organic growth. Law constitutes a barrier, which cloud providers are unable to move. Development claims the legislator to act. Legislation will improve, as technology matures and time goes by, but the lack of legislation will always remain a step to take, as it will never keep up with the evolution of technology (Borges & Schwenk 2012). The lack of control is an

issue, where steps can definitely take part. The customer will not be able to control the system, but he could be able to have a transparent view of how the system is running, what the provider is doing and he could get involved into the development of the system. In this context lock-in, as already mentioned, is one of the steps, which would be most easy to handle for providers. Easy in this context means, that they have the possibility to handle this position. The realization will be hard anyway, as providers have to restructure their systems (Pearson 2012).

An interesting subject for steps to take are the frontiers of cloud computing. They cannot be erased, but cloud computing is able to move towards them. As cloud computing is not a mature technology there is potential for taking steps towards the frontiers and therefore improve the technology. Customer relationship, stability, improvement of services and reliability are the leverages to work with to move towards the most important frontier, trust. Reliability as already mentioned is still a question, as systems do have outages. Security issues as well are a problem of trust (Avram 2013, Babcock 2013c). So cloud providers have to take the same steps here to move on. Metheny (2013) proposes a first framework for how risk management can improve security. It involves the provider, as well as the customer. The customer assigns risk management to the provider. Both regard security management as an ongoing activity. The provider guarantees security of his system, while the customer manages access security. The risk management is a process that applies to the whole organization. Everyone is involved, the provider as well as the customer. The integration of that model forces cooperation between customer and provider and creates a relationship. It implies a possibility to take the step towards the optimization of security and proposes that security is not only a question of the provider (Kryvinska et al 2009). The customer also has to contribute to enable a maximum of security. Privacy in contrast is not only a question of trust. Providers have the ability to be transparent and ensure privacy. It is a trade-off between the privacy of provider's infrastructure and the customer's data. Providers have to find a solution that guarantees data privacy and transparency for the customer and at the same time defends business secrets of the provider. Technology matures and therefore this section will experience development, but it is the task of providers to cut down

outages to a minimum now and not as technology develops. There are possibilities like control, choice of locations and stability instead of variability to attack those issue and providers need to find a way to push evolution forward.

The case study exposed that enterprises today are targeting certain value propositions of cloud computing. The technology has to progress to deliver an overall package that fits better to the needs of customers. Disruptive technologies evolve to the point where they meet the needs of the mass market. Cloud computing is on the way to meet those needs, but has to take a step to finally hit broad enterprise acceptance for its complete package of service attributes (Kopetzky et al. 2013, Krikos 2011).
Achievements of cloud users mainly present a few aspects of the whole technology. Customers need to become aware of the potential of the technology and that is a task for providers. There are several aspects of cloud computing like self-service, elasticity, flexibility, scalability, broad network access, cost, technological issues, green IT and the pay-per-use system, which are well-known by customers (Armbrust et al. 2010, Harbert 2011, Kryvinska et al. 2014b, Sosinsky 2010, Trapasso 2010). Other service attributes did not come up in the analysis of enterprise integration or are neglected because enterprises did not want to take that step at the moment. Location independence is maybe the best example here. CERN and BMW developed valuable cloud structures but they are in-house (Open Data Center Alliance 2012, OpenStack 2014). The location of the servers stays in between the enterprise and cloud computing loses one of its attributes. While CERN plans to improve its services and moves to public structures BMW is confident to stay in-house in the short run (Curry 2013, Marston et al. 2011, McCance 2012, McLaughlin 2013, OpenStack 2014, Open Data Center Alliance 2012, Purcell 2014, Venkatraman 2013). The interesting point is that the enterprises already consider moving to public structures, again maturity of technology is the answer. Multi-tenancy and therefore shared infrastructure is the next issue related to maturity. As long as providers do not share infrastructure, they lose the potential of saving computing power (Dhar 2012, Marston et al. 2011). Agility offers the possibility to focus on core

competencies, but if structures are kept in-house there is still management and maintenance for non-core competencies needed (Fingar 2009, Sosinsky 2010). Customers do not see the possibility to reduce commitment, as mostly there is no possibility to move to different cloud structures (Armbrust et al. 2010). Reduced complexity does not unfold its potential, customers still struggle to understand the technology and its abilities and sometimes mention it as hard to handle. But in reality the provider is able to execute services for the customer that include maintenance, upgrading and market availability (Sosinsky 2010).

All in all, there are several possibilities for cloud computing to take the next step in its evolution. Not every step mentioned is necessary to be dealt with right away, but cloud computing should focus on a set of steps to push towards the next level. The requirement section presented that especially a framework combined with guidelines is necessary to define cloud computing and enforce its services. Possible steps arise from different requirements. The move to the public cloud, removal of barriers and harmonization of frontiers will be the steps in spotlight, as they offer the most obvious potential. The improvement of value propositions is another interesting point. It is deeply connected to the kind of service offering, as mainly niche players target customer relations and improvement of certain services. Their special challenge will be the elucidation of customers and support with the integration of systems. Promotion of security, trust and transparency are issues, customers and providers have to improve together. Experience with the system will help to reach the frontier (Kryvinska et al. 2009).

The following subsection tries to find an answer to the question, whether cloud computing really presents a new paradigm or if it is just a hype that will never ignite its potential.

7.4 A New Paradigm?

Opinions on cloud computing differ heavily. The best-known controversy is the one of Ellison and Benioff. It illustrates perfectly the range of enterprise's thoughts on cloud computing. Larry Ellison, the CEO of Oracle, does not think of

cloud computing as a revolution. He does not even call it an innovation. "Cloud computing is not only the future of computing, it is the present and the entire past of computing... All it is is a computer attached to a network... Our industry is so bizarre. They change a term and think they've invented a technology" (Oracle 2014). In his view cloud computing is only the combination of existing technologies and does not do anything different than existing services already did. Marc Benioff, founder of Salesforce.com and former executive of Oracle, has a completely different opinion on cloud computing: "our definition of cloud computing is multi-tenant, it's faster, half the cost, pay-as-you-go, it grows as you grow or shrinks as you shrink. It is extremely efficient" (CBR 2010). He mentions opportunities other computing services are not able to offer in the same way cloud computing is doing it.

Cloud computing is of course not a technology, which is revolutionizing the market, as it developed from other computing paradigms (Zhang et al. 2010a). But not only technological innovation can revolutionize markets. The cloud is a strategic innovation, which started as a disruptive technology. It does not offer many new value propositions, but it combines them in a way that makes the product more valuable and better usable for its customers. The combination of services is unique and offers new possibilities and therefore cloud computing is not only a development (Kopetzky et al. 2011, Kopetzky et al. 2013). Cloud computing changed the market and its operations. Apple for example, under the direction of Steve Jobs, did that kind of innovation a lot of times. With the iPod, they changed the music industry. The iPhone changed telecommunication. The iPad revolutionized reading and evolved a new type of computer. Those strategic innovations were not new, but they offered their service attributes in the way customers wanted to have them.

Cloud computing developed from Grid computing, which has already been mentioned as too difficult to handle as a result of its structures (Weinhardt et al. 2009). Because of that grid computing never got fully accepted by a broader range of customers (Armbrust et al. 2010). Cloud computing in contrast combined the service attributes of different hosting paradigms in the way customers accepted it or at least start to accept it.

Cloud computing by now is not a new paradigm. It is on the way to become a paradigm, but it has to cope with its risks, vulnerabilities, threats and drawbacks to make the most of its potential. There is a long way to go to achieve full acceptance in all potential markets (Kryvinska et al. 2014b). If cloud computing is able to hit the mass markets and does not rest as a service for small companies and start-ups and a support solution for big enterprises and global players it will become the new hosting paradigm. The future looks bright, as bigger enterprises and global players start to accept and integrate cloud computing. But the examples of BMW and CERN also show that it is a long way to go, as most of those enterprises and organizations still trust in-house structures and do not implement the whole service abilities (Open Data Center Alliance 2012, OpenStack 2014).

8. Conclusion

Cloud computing develops from different perspectives. Providers and users want different things that often cumber each other. On the one hand, this slows down the adoption of cloud computing services by creating barriers. On the other hand, those barriers are not irremovable. Users and providers have to cooperate to make the most out of cloud computing.

The research implications presented different outcomes for providers and users. **Research implication 1** presented well-suited providers, which are performing in between the expectations of the IT industry. But also providers, who are only attracted by the potential of cloud computing and the alluring revenues, but perform behind the expectations. In the long-run well-suited providers will confirm their position and others will be forced out of the market. The user section presents a different status on **research implication 1**. There are enterprises, which are already using the possibilities cloud computing is able to offer to them. But most enterprises, even outriders, who introduced valuable cloud computing systems, fear the move to public structures, integration of third parties and new services. Therefore cloud computing was not able to develop in between the expectations of the IT industry, from a user's point of view.

Providers are able to handle the obstacles of cloud computing for themselves, in contrast to **research implication 2** from today's point of view. But they are not able to handle all of the barriers and frontiers the obstacles create for cloud users. The obstacles for users are directly connected to trust and third party integration. Because of that the obstacles of users are also obstacles providers have to deal with. **Research implication 2** generates a connection between user and provider, as they have to cooperate to perform best within the frontiers of cloud computing. Cloud computing will not be able to remove the obstacles occurring from various issues. Therefore it is necessary to design the best possible framework to perform within the frontiers and to create the maximum of performance.

There are two sides of enterprise value of cloud computing. But the two sides have to cooperate to improve cloud computing. As there are borders in between them, the issues of trust will always remain and therefore prevent cloud computing from developing its full potential. At some points neither providers, nor users have influence on the development of cloud computing. Jurisdiction and Internet connection are the main issues, where development is limited by the operations of governments and service providers, which mostly do not offer a cloud computing solution (Avram 2013, Borges & Schwenk 2012).

All in all **research implication 1**, lags from the providers perspective, when we take the best-performing players into consideration. For the users **research implication 1** mostly applies as only single outriders already fulfill the expectations of the IT industry.
Research implication 2 cannot be neglected for both sides. Cloud providers are able to handle their obstacles. But their performance is connected to the obstacles of users and in these fields they are not able to control the obstacles.

So cloud computing today can already deliver a boost for enterprises. In contrast to the high expectations of the IT industry, it is still a long way to become the new hosting paradigm. There are barriers and frontiers in that way and cloud computing will only develop as far as it can cope with them. The potential improvement is strictly limited by those barriers and frontiers.

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Appendix

Abstract English

Cloud computing is presented as the future hosting paradigm. The IT industry has high expectations and visions for the establishing paradigm, especially in the domain of enterprise integration. This thesis focuses on the conversion of the real enterprise integration today compared to the expectations of the IT industry and the obstacles in the way of broad acceptance at enterprise level. Defining those issues the thesis leads towards the requirements to develop the cloud in the best appropriate way and makes projections for the future. Two case studies on successful providers and users and their business models carve out the actual enterprise conversion, to compare it to the expectations of an overhyped industry and test if the enterprises are capable of handling the obstacles in the way of cloud computing. The forecasts of the IT industry are too optimistic. Cloud computing is developing, but does not perform the intended steps, at least not yet. In contrast to an industry, which demands for direct conversion of the expected enterprise value right now, there are certain barriers and frontiers that enterprises are not able to handle. Some of them can be removed but some will remain and denote the ending of cloud computing evolution.

Keywords: Cloud Computing, Enterprise Value, Cloud Provider, Cloud User, Case Study, Barriers & Frontiers, Challenges of Cloud Computing

Abstract Deutsch

Cloud Computing wird als das zukünftige Hosting Paradigma dargestellt. Die IT Industrie hat hohe Erwartungen und Visionen bei der Umsetzung von Cloud Computing, speziell im Bereich der Unternehmensintegration. Diese Masterarbeit stellt die aktuelle Umsetzung im Unternehmensbereich im Vergleich zu den Erwartungen der IT Industrie dar, genauso wie Hindernisse im Weg zu einer umfassenden Akzeptanz durch Unternehmen. Durch die Definition dieser Bereiche erarbeitet diese Masterarbeit die Anforderungen einer bestmöglichen zukünftigen Entwicklung der Cloud und erstellt Ansätze für zukünftige Optimierungen. Zwei Case Studies über erfolgreiche Provider und Nutzer und deren Geschäftsmodelle stellen die aktuelle Unternehmensumsetzung von Cloud Computing dar. Diese wird mit den „gehypten“ Erwartungen der IT Industrie verglichen um festzustellen, ob die Unternehmen in der Lage sein werden die Hindernisse im Wege der Umsetzung von Cloud Computing zu beheben. Die Prognosen der IT Industrie sind hierbei zu positiv. Cloud Computing entwickelt sich, kann aber die prognostizierten Entwicklungsschritte nicht vollziehen, zumindest momentan noch nicht und nicht in der erwarteten Geschwindigkeit. Gegenteilig einer Industrie deren Erwartungen auf eine komplette Umsetzung des prognostizierten Unternehmenswerts von Cloud Computing zusteuert, offenbaren sich Barrieren und Grenzen für die Technologie, die nicht gehandhabt werden können. Manche dieser Barrieren können ausgelöscht werden, andere werden verbleiben. Spezifische Grenzen offenbaren den Endpunkt der Evolution von Cloud Computing.

Schlüsselwörter: Cloud Computing, Unternehmenswert, Cloud Provider, Cloud Nutzer, Case Study, Barrieren & Grenzen, Herausforderungen von Cloud Computing

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