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Semester:

Title: Cloud computing - impact on business

Project Period: September 2014- January 2015

Semester Theme: Master Thesis

Abstract:

The thesis project is about cloud computing and how is affecting the adoption of it in the companies. To answer this question I have made a research about cloud computing technology and I am presenting the architecture, laws and regulations that cloud has to respect, I am also talking about security of the cloud and what are the advantages and disadvantages of using this technology. I am explain why it is important to use this system and how is improving the knowledge and information management in the company, how the flow of information is improved with the help of cloud. The main competitors are in continues competitors for their products and services so that they can gain market. Cloud computing represents a good technology for companies to take over the market.

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Chapter 1 Introduction

During the past years a new solution appeared in the IT field, cloud computing, and it is impossible to ignore it, because cloud computing allows companies to outsource data, electronically mail, folders and other applications through virtual platforms through the medium of servers that are connected between them and that can be access anywhere and at any time. The only requirement is to have an available internet connection.

The impact of cloud computing brings changes not only in terms of the global performances of a company, but also in terms of internal organization, especially in the IT department. This opportunity is modifying the usual methods of back-up for data, cloud computing is bringing new tools and new perspectives of evolution for the company that is using it. [1]

The term of cloud computing means that data are stored and can be access through the Internet and not in the traditional way from the computer's hard drive. Cloud computing has his origins in the days when flowcharts and presentations, they represent the servers infrastructure of the Internet. Local storage and computing is when a data is stored or programs are run from the hard drive, so users can have access to their data easy and fast. The fact that there is a dedicated hardware server in a residence, it doesn't mean that there is a cloud computing. When we are storing data on a home or office network is doesn't mean that a cloud is used. The data needs to be access over the Internet, or at least the data needs to be synchronized with information over the Internet.

For a consumer is when we are sitting home and we are using the Internet on daily basis. For businesses is different, because some of the chose to subscribe to an application that can be access over the Internet, these is called Software-as-a-service (SaaS); there is also the option when the business creates his own custom application that can be use by everyone in the company and these is called Platform-as-a-Service (PaaS); and last is the Infrastructure-as-a-Service (IaaS) is when important players from the market, Google, Amazon, give access to a part from their infrastructure to other companies by renting. [2]

Slowly, cloud will replace all the functions that were provided by the IT department in the company, because cloud is offering a platform that is suitable for fast development, distribution. So, businesses start using cloud computing for expending their business.

1.1 Motivation

As we all know, technology has reached and plays an important level in our days. Since the appearance of the Internet, businesses use it to improve their well-functioning. In our days the Internet is used for different tasks and that is why more and more people decide to open a business in this area. Companies that are already on the market are trying to improve their performance, by adopting new technologies that are available in the market and they also try to integrate them in the companies' goals.

Cloud computing is considered a benefit for the small businesses because through it they will have access to technologies that before weren't accessible for them in terms of money spending; and these is an advantage for them because they can start competing with other small businesses or even with big ones. The cost implied for someone to come and fix/ install an application will be cut down and the company will save money, it is cheaper to use applications that are on cloud then to buy other ones, there is the possibility to use one multi-application cloud service for all the needs of the company, the applications that exist on the cloud will integrate perfectly within the company because of the API that is helping to find the application that is compatible with the companies goals. Because cloud computing is updated regularly the company doesn't need to spend money for this. Cloud computing is a way for companies to cut the expenses of the company.[3]

I have decided to make my thesis project about cloud computing, because it is easy to use and the person that is in front of the computer doesn't need to have knowledge about the infrastructure that is enabling the information required by the user. Because it is a new technology, cloud computing is growing every day and new innovations come out in terms of cloud computing and they are making the applications more mobile and collaborative. In these days the user expects to have access to the information fast and in real time. Another reason that I chose for these topic is that the work that is done on the cloud it is easy to track, because as I said the update is made in real time.

1.2 Background

The need for Internet access has increased immensely over the last few years, since new, emerging technologies allow most devices today to connect to it, offering mobility to their users. Emergence of the Internet has made the size of business to grow significantly. Internet is a very favorable environment for business and communication, combining all current technologies into a single framework, which is integrated into various electronic devices.

Even if the term cloud computing had become knownen in the recent years, the concept of more users sharing the resources of a computer is not new. In the beggining the multiple users were bringing work projects on floppy disks, cards to a computer for processing. These computer was able to fullfil only one task at a time and so they were used to complete users projects one after another. But when the operating system was developed, the computers could execute multiple tasks in the same time . Later the local area network was created and so more clients were ale to share one computing device.

Cloud computing is a evolution of the efforts described above. It became an atractive option for businesses and users, becauase the prices for storage and processing power have decrease and the speed of the internet became high.[4]

1.3 Problem definition

Main question:

What is the impact of cloud computing on the business?

Sub-question:

How is cloud computing influence the flow of information in the company?

How cloud computing will improve the revenue of the company?

How is cloud computing integrated in the company?

What are the challenges of using a cloud computing?

Do the business strategies of the company correspond with the use of cloud computing?

How can cloud computing improve knowledge and information management and how does the cloud computing infrastructure look like?

1.4 Methodology

This section will provide information about how the project will be covered in order to obtain the desired results. I will provide information about how cloud computing works, how it is integrated in the company, what are the advantages and disadvantages of using a cloud, I will also talk about cloud security and privacy, laws and regulations. The topic of standards will also be covered in my thesis. In another chapter I will have literature review and separately I will present the two companies that I interviewed.

The project will consist of both primary and secondary research. For the primary research I will conduct 2 interviews with a Danish company, Dialogue One, and a multinational company, C & A. For the secondary research I will rely on the courses that we had (Communication and Broadcast Networks; Internet Technologies and Service Architectures; Entrepreneurship, Innovation and Business models; Governance of ICT), I will also conduct web research and literature reading. The analyze chapter will be created from the interviews, specific data, the literature that I have discussed and my point of view.

1.4.1 Project process

The aim of the project is to analyze the impact of the cloud computing on the business and how it is integrated in the company, so I can come with suggestions (if necessary) on how they can reach they goals. The analysis will help companies to improve their collaboration between people and what are the week points.

After the thesis theme was chose I had to define my main question and sub-question, these part is called problem formulation. I will use two case studies based on real companies, called Dialogue One and C & A, for a better understanding on how the cloud is used. In order to address the problem, I will make a field of research based on interviewing the management department that uses the system.

The problem analysis describes the real impact that the cloud computing has on the businesses. In the suggestion chapter I will include a way on how to improve the real life situation using theoretical studies.

1.5 Limitations

Because the project had a specific period of time to be finished I had the fallowing limitations:

- Lack of time;
- The project has only two interviews;
- Because the time was limited, and the participants for interview were limited, the interviews couldn't be conducted with all the organizations as it was planned;
- Another limitation is e lack of literature for some of the topics covered in the thesis.

1.6 Project structure

My thesis documentation is divided in different chapters, where I will describe the steps mention above. The main chapters are:

1. **Introduction**- the content of the thesis is presented in this chapter and also the problem definition is established;
2. **State of the art**- cloud computing technology is presented;
3. **Cloud computing providers**- here are presented the main competitors that exist on the market;
4. **Literature review**- the new articles are presented and I am offering my critical opinion;
5. **Theoretical framework**- theories that I have found in the literature and web research, which are relevant to my thesis;
6. **Description of the interviewed companies;**
7. **Analysis**- this chapter is dedicated for answering the main question of my problem definition;
8. **Conclusion**- summary for my conclusions gathered through my thesis and future work;
9. **References**- materials that were used.

Chapter 2 State of the art

Cloud computing is a way of computing that has as main base sharing computing resources instead of having local servers or personal devices to give access to applications. The word cloud from cloud computing is used as a another name for the internet, so cloud computing means a type of internet based computing, where services are delivered to organizations with the help of the internet. [10]

In this chapter I will present how the cloud work, what are the challenging's when a company decide to transfer to a cloud, advantages and disadvantages. I will also talk about the law and regulations that need to be respected when using a cloud; security problems that appear in the cloud, standards and virtualization. This part of the thesis is dedicated for cloud computing technology, I will refer to new articles that are presenting the reasons for why companies need to start use cloud computing, how cloud computing drives innovation and what are the risks.

2.1 Architecture

The services of cloud computing are delivered and developed with the help of utility oriented data, which plays the role of the infrastructure. Any kind of cloud services (virtual hardware, development platforms, and software applications) has the routes on an infrastructure that is rented from a third part or the provider of the service is the owner. A cloud computing is built by connecting one or more datacenters, a collection of desktop PC's, workstations and servers. [R. Buyya, C. Vecchiola, S. T. Selvi, 2013]

All the achievements of cloud computing could be arranged in one layer that is roofing the entire stack from hardware applications to software systems. In most of the cases the layer is developed using a datacenter where thousands of nodes are placed together. Because of the resources used, the cloud infrastructure can be heterogeneous.

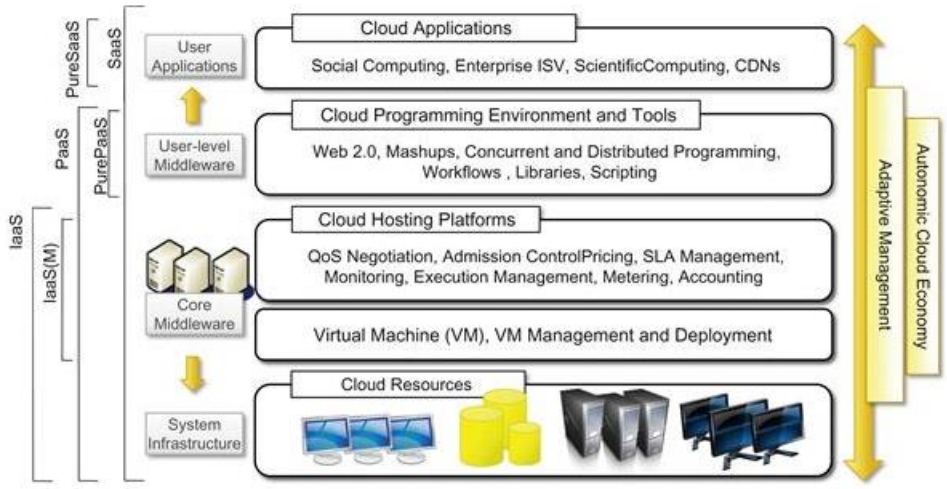

Figure 1 Cloud computing architecture [R. Buyya, C. Vecchiola, S. T. Selvi, 2013]

The core middleware is runs the physical infrastructure, which has as objectives an appropriate runtime for the applications and to utilized the resources as good as possible. Virtual technologies as used to offer a specific runtime, application isolation, quality of service. At this level the hardware virtualization is usually used. The distributed infrastructure as a collection of virtual machines is unprotected because of the hypervisors. The user requirements and applications are satisfied by using the virtual machines, because they allow to divide the hardware resources, CPU and memory; and also to virtualize some devices. The application that can be found in the cloud can be developed with a specific programming language or technology (Java, .NET, Python), so the user doesn't have to build the system from zero. The core middleware functions with the help of infrastructure management and it can support capabilities like admission control, billing, accounting, negotiation of quality of service.

2.1.1 Cloud computing service models:

Infrastructure-as-a-service (IaaS) represents the union between the cloud hosting platforms and resources. Couple of them deliver both the management layer and the physical infrastructure; others deliver only the management layer (IaaS(M)). In other cases the management layer is incorporate with IaaS solutions that deliver physical infrastructure and increase the value for them. IaaS solutions are appropriate to map out the system infrastructure, but have limited services for developing applications. IaaS) is offering to the customer a cloud

package that is giving control over an IT infrastructure. Companies that are using this type of cloud service are paying per-user basis, so they can have access to the applications and service; they also have access to the system that has images, networking, and storage environment. This type of cloud service is giving to the company their own cloud and they have the total control over it.

The user can build their own application by using the API that is provided for them at the user-level middleware. When the service offered to user is not an infrastructure, but a development platform it is known as Platform-as-a- Service (PaaS). PaaS has the infrastructure, which is a part of the service offered to the user. The Pure PaaS is offered only to the user-level middleware and in the end it has to have a virtual or physical infrastructure. It is similar with SaaS, but out of this is also providing to the customer software applications that can help the business in creating customized services.

The top layer from Figure 1 has services that are provided at application level and are known as Software-as-a- Service (SaaS); most of them are web applications that are dependent of the cloud for providing service to the end user. With the help of IaaS and PaaS solutions, the independent software vendors can use the Internet for delivering their applications. There are also applications that rely on the cloud for supporting a big amount of users. The responsibility for security is attributed to the provider of the service and is often used for services like accounting and customer management. It is a low risk service because is dealing with software and not hardware or storage. Customer decides who has access to the cloud services; and maintenance installations, upgrade are the providers' responsibilities.

One of the most important element of cloud computing is everything-as-a-Service (XaaS), because the cloud services offered by different providers can combined between them to offer a "solution that is covering all the computing stack of the system".[1] [R. Buyya, C. Vecchiola, S. T. Selvi, 2013]

[1] Rajkumar Buyya, Christian Vecchiola< S. Thamarai Selvi "Matering Cloud Computing: Foundation and application programming", 2013

2.2 Cloud computing deployment models

The infrastructure where services are developed and delivered to the customers is built by the clouds. The infrastructures can be of different types and offers details about the services provided by the cloud. There are four types of clouds:

- *Public clouds*- everyone can have access to the cloud. They were the first clouds that were developed and offered to the users. Using these kinds of clouds the cost of the IT infrastructure can be lowered. A public cloud can be used of more than one user.
- *Private cloud*- this kind of cloud was developed inside an institute and only the employees of that institute has access to the cloud. Private clouds are using a private infrastructure and provide information to internal users. Some benefits of a private cloud are: the cost of testing an application on a private cloud is lower that on the private cloud and, also, the information about the customers is better protected then the public cloud.
- *Hybrid and heterogeneous clouds*- the public and private clouds are combined and there was recognized a private cloud that was improved with resources and services that were hosted in a public cloud. Organizations can have access to IT infrastructures that already exist, maintaining sensitive information; they can delete the information when there is no need for them. There are some security issues for the public side of the cloud that can be used to perform operations.
- *Community clouds*- All three types that were presented above are helping to create a community cloud and it was specially designed for a particular industry needs. The infrastructure of the cloud is shared between few organizations that have the same mission, security requirements. The administration of the infrastructure can be done by the organizations or by a third party. Organizations that can be a part of the community cloud are: media industry, healthcare industry, energy and other core industries, public sector, scientific research.[R. Buyya, C. Vecchiola, S. T. Selvi, 2013]]

2.3 Security and privacy

Because the users of the cloud have expectations regarding the security of the data uploaded on the cloud, the service providers have to ensure the users that the service that is provided is offering the security appropriate for their needs. That is why the service providers have to have their services evaluated for the common accepted criteria.

When a user decides to use a cloud, private or public, he will have some expectations regarding the security offered for the data. In the same time the provider of the cloud has to take care that the security measures are in place and that the standards and procedures are fallowed. The expectations and responsibilities for security can be claimed in the documents requirements. The Cloud Security Alliance Controls Matrix is using a similar approach, like the government systems (governments are using the NIST 800-53 security control), for detailing security requirements for cloud implementation.

From the readings conducted I found two aspects of security that needs to be performed in cloud implementation [D. Rountree, I. Castrillo, 2014]. The first one is regarding the presence of the control and the second one is about the effectiveness and robustness of the control. This means that a control needs to be effective not only presented. In other words, the cloud can apply an encrypted message between the user and the cloud; so if the effectiveness of the message is assessed, then the control is designed right, implemented and verified. To ensure that the controls are implemented correctly the security evaluation is playing an important role in the guidance for planning and developing security.

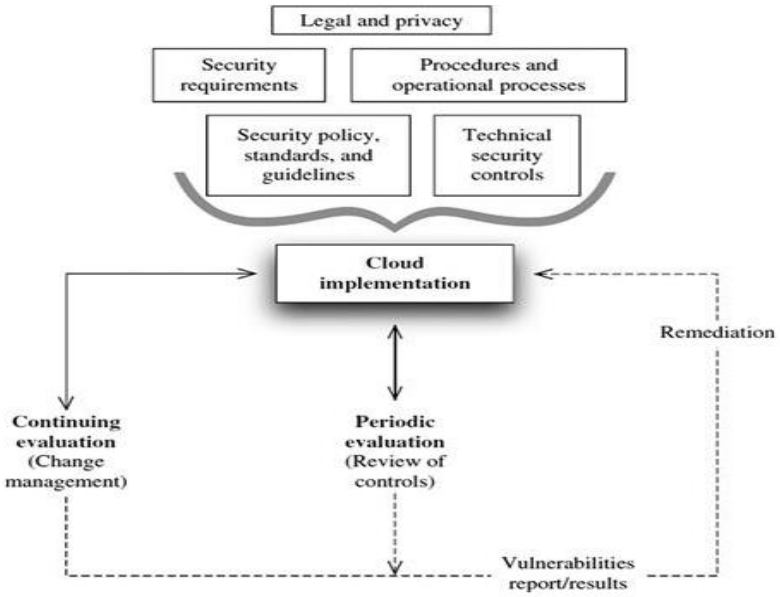

Figure 2: From Requirements and Evaluation to Ongoing Security Remediation, [D. Rountree, I. Castrillo, 2014]

Since cloud computing appeared, there has been done some efforts for offering guidance for the security of the cloud:

- *Cloud Security Alliance* (CSA) has been working for accomplishing different efforts like:
    - *Cloud Control Matrix* (CCM)- the effort was created to assist with different security principals for guiding the vendors and to assist the customers.
    - *Consensus Assessments Initiative Questionnaires*- was created for providing industry- accepted ways to register the security controls that are in IaaS, PaaS, SaaS, offering a security transparency.
    - *Security Guidance for Critical Areas of Focus in Cloud Computing*- the areas in which this effort is offering security guidance are: architecture, government, traditional security and virtualization. It was published in December 2009.
    - *Domain 12: Guidance for Identity and Access Management*- includes the main functions of identity management in relationship with cloud computing. It was published in April 2010.
    - *CloudAudit*- is it offering the tools needed to measure and compare the security of cloud service.
- *European Network and Information Agency (ENISA)*- has released couple of guiding publications for securely adopting cloud computing:
    - *Cloud Computing: Information Assurance Framework*- hand over couple criteria regarding the risk when a cloud computing is adopted.
    - *Cloud Computing: Benefits, Risks and Recommendations for Information Security.*
    - *The federal CIO council's proposed Security Assessment and Authorization for U.S. Government Cloud Computing*- The adoption of NIST 800-53R3 security control for the low and moderate risk systems in cloud computing.

- *The Trusting Computing Group (TCG)*- they founded the Trusted Multi-Tenant Infrastructure Work Group which has the purpose to develop a security framework for cloud computing.

Because the efforts presented above are relatively new they aren't accepted outside the countries where they were developed. They are considered to be a starting point for formal works that is going to a common framework for cloud security. The frameworks that exist are applied only where regulation is imposing this. But as we noticed above the efforts that took place were between 2009 and 2010; and so the cloud security is a fast moving area. [D. Rountree, I. Castrillo, 2014]

2.4 Open challenges

Since the beginning, cloud computing presented some challenges for industry and academia. In the academically area there have been conducted a significant work for identifying the challenges that appeared. In this sub-chapter of the thesis I will talk about the most important ones: interoperability between different clouds, creation of standards, security, fault tolerance and organizational aspects.

2.4.1 Cloud interoperability and standards

Cloud computing is a service based model for delivering IT infrastructures and applications. Standards and the fact that interoperability was allowed for the solutions that different vendors were offering, are a way of fulfilling the goal. The fact that the vendors are lock-in, represents an important barrier for the adoption of cloud computing. Because the vendor is lock-in, the clients cannot switch to another competitor, they will have to pay a fee and they will have to wait an amount of time that usually is specified in the contract. Usually this is happening when the service provided to the customer is not fulfilling the needs of the customer or when the vendor cannot provide the service anymore. The standards that are adopted in the cloud computing community could make space for interoperability and minimizing the risks coming from the fact that the vendor is lock-in.

2.4.2 Scalability and fault tolerance

The most important feature of cloud computing is the scale on demand. Scales are permitted by the cloud no matter if the IT resources are limited, infrastructure or application services. For this to be real, the cloud middleware needs to have in his implementation the

scalability principle. Because the cloud middleware is managing a great number of resources and users, the costs for maintenance are also huge if the quality of the services is high also. The failure is tolerate and it is essential, sometimes it is considered more important than to deliver an efficient and optimized system.

2.4.3 Security, trust and privacy

These three subjects represent an important factor for high adoptions of cloud computing. For example, we can find in the cloud applications that can have access to information that are sensitive, this kind of information are stored on the cloud with the help of a technology for cryptography that is helping to protect the data for any attempts of having access without having permission. To decrypt the data it is necessary an authorized application, because the application is located in the virtual environment it is available for the virtual machine. Because there is a lack of control over the data, a few problems stands out regarding the trust that we give to the service provider and the privacy that we desire for our data. That is why we have to decide if we can trust the provider and some regulations can be established between the user and provider regarding the level of protection for the data.

2.4.4 Organizational aspects

Cloud computing represent a way of how IT services are consumed and managed: storage, computer power, network infrastructure, applications. The acceptance of cloud computing in different departments of organizations may lead to changes regarding the business processes and organizational boundaries. Because there is a lack of control regarding the management of data and processes and create security problems, but also problems that weren't before. A huge advantage of moving the IT infrastructure and services to the cloud it that the cost of maintenance and support will be lowering and the IT staff will have to have different competencies for handling the cloud.[R. Buyya, C. Vecchiola, S. T. Selvi, 2013]

2.5 Advantages and disadvantages

In our days, organizations are looking for ways of lowering the costs, increase agility and scalability type that is interacting positive with technology and business. Cloud computing represents a way of helping the organizations to adopt the changes while transforming IT into an engine that is proper for the business. The most immediately benefit for adopting the cloud it is

represented by the fact that the user can have access to the information from any device at any time and from anywhere. Bellow I will present some other benefits of using the cloud:

- *Cost efficient*- desktop software are costing the organizations a great amount of money, they will have to pay fees for licensing for multiple users, but cloud computing can be used at cheaper value and so the organization expenses are lower.
- *Almost unlimited storage*- using a cloud will give access to a big amount of space for storage the data.
- *Backup and recovery*- it is much easier to backup and restore the important documents, then to store on a physical device. Most of the cloud providers are competing between them for recovering data.
- *Automatic software integration*- when using a cloud, the software integration is taking place immediately; this means that the user should not strive to integrate the application to his system.
- *Easy access to information*- after the user has been register in the cloud, he can have access to the information whenever he wants, regardless the location or the device that he is using.
- *Quick deployment*- after the proper method of functionality has been picked; the all system is ready for functioning in couple of minutes.

Despite the advantages of using a cloud computing, there are also some disadvantages that are more relevant for the small companies that decide to use this technology.

- *Technical issues*- even if I mention above that cloud computing can be access anytime and from any locations, there are times when the system can have some dysfunctions. If the internet connection is not proper, then the connection to the servers is not allowed.
- *Security*- as I mention above there are some security problems, because there aren't some strict regulations regarding this. So, the companies need to take in mind that when a cloud is adopted for the needs of the company, all the sensitive information are at risk. When a cloud service provider is chose, it should be the most reliable that the data is totally secure.

- *Prone to attack*- the fact that information is stored on the cloud, could make the cloud vulnerable to external hack attacks and threats. As we all know, nothing that is on the Internet is totally secure.[5]

2.6 Legislation and regulation of cloud computing

When a company decides to move to the cloud they need to have in mind technological and security issues, but also legal and regulatory issues. There are new laws that are being developed, so that the obligations of both tenants and providers are respected.

The cloud computing that is using one of the three types of cloud: public, hybrid and community "creates new dynamics in the relationship between an organization and its information, involving the presence of a third party: the cloud provider. This creates new challenges in understanding how laws apply to a wide variety of information management scenarios"[2].

This creates challenges for understanding the law that has to be applying to different players. Taking in consideration the cloud that the company is using, there are laws that need to be respected regarding the data that is stored, process or collect. If the customer of the cloud it is situated in United States or European Union, they have to respect the laws that are applied and also they have to take in consideration the regulatory requirements, like: Control Objectives for Information and related Technology; and Safe Harbor. If the data is not protected and some disclosures take place then the provider can pay fines to one or more government or industry regulatory bodies. Laws and regulatory are used for specifying who is responsible for data accuracy and security.

If the infrastructure of the cloud is provided by a service provider, then the company needs to enforce the legal and regulatory requirements, which are applied in the company, for all the suppliers as well. In this case the third party can have access illegal to the company's data, even if they are encrypted. The risk is high because it can be a number of third parties involved: provider, cloud support and management team, and other parties that are helping with the managing and supporting the applications.

When a contract is sign, there are some issues that need to have in mind:

[2] "Security Guidance for Critical Areas of Focus in Cloud Computing.", Glen Brunette, Rich Mogull

- Initial due diligence: when a company signs a contract with a cloud supplier, the needs and requirements should be verified. The scope of the services that are searched for need to be specified, also the restrictions, regulation or compliance issues that have to be pleased.
- Contract negotiation
- Implementation
- Termination
- Supplier transfer.[8]

2.7 Standards

Standards are used for reducing the complexity and variety of the services or products. For innovation to take place, standards have to be used. Because technology is moving very fast, standards also have to be developed faster. Innovation and inner confusion are a part of the standards; and the market agent that helps their growth on the market is part of them.

There are many cloud computing standard organizations that are approaching the standard issues in relation with cloud environment. Some of these organizations are:

- **Cloud security alliance**- has like objectives the promotion of best ways to offer insurance regarding the security of the cloud computing;
- **Distributed management task force** (DMTF)- provides standards for IaaS;
- **Open cloud consortium** (OCC)- the responsibilities of this organization is to develop standards for cloud computing;
- **Open grid forum** (OGF)- is a community that has as objective the adoption and evolution of distributed computing;
- **The object management group** (OMG)- develop standards for different industries;[38]

There are already standards that are available for cloud computing, that are developed for supporting the pre-cloud technologies, but there are also standards that are developed for assisting the cloud computing functions and requirements, standards as virtualization. [M Hogan, F. Liu, A. Sokol, J. Tong 2011]

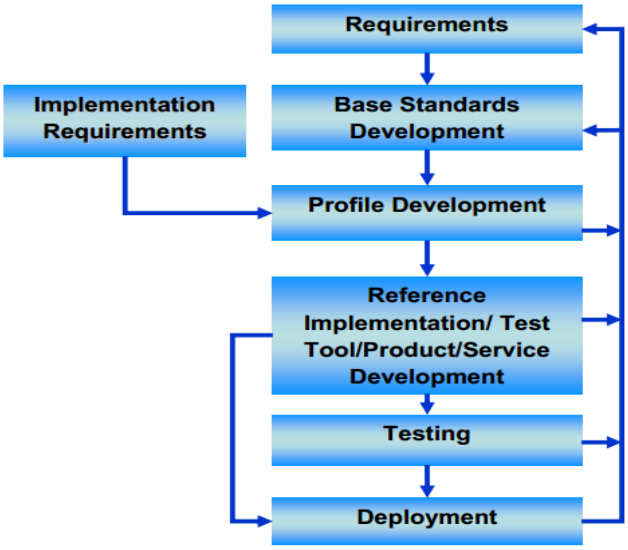

Figure 3: IT Standards Life Cycle [M Hogan, F. Liu, A. Sokol, J. Tong 2011]

Figure 3 presents the process that takes place when standards are developed. Processes like reference implementation, product, service, etc., are not taking place inside SDO(Standards Developing Organizaton) process. These processes are helping to give feedback and input that are going to make the standards better.

When innovation takes place in IT sector, means that the standards from this sector are permanently developed, approved and maintained. Before a standard is accepted SDO can ask more than two accomplishments of the standard. These accomplishments can be or not for products or services that are intended to be sailed.

2.7.1 Cloud computing standards for interoperability

Capabilities and functions are still present in the interfaces of many cloud providers. Cloud interfaces are getting more mature because of the standards, and the fact that they are more common every day; the providers for the interfaces are the ones that can assist the user to understand the important parts of the interoperability requirements and features.

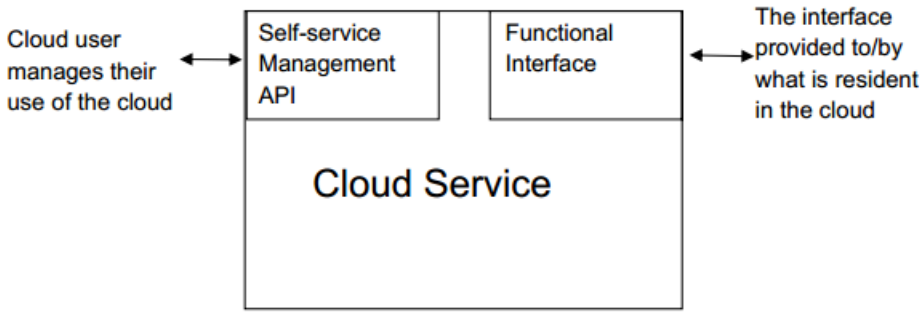

Figure 4: Cloud sevice presents an interface for each service [M Hogan, F. Liu, A. Sokol, J. Tong 2011]

The most important functions of cloud service are presented to/by what is in the cloud. It is not the same with the interface used for dealing with cloud services. Management interface it is used by the users, so they can have control over the cloud services with the help of a virtual machine. The functional interface for IaaS it is close related with the architecture of CPU (Central Processing Unit) that is virtualized. There is no specific interface for the cloud and the efforts for the jure standards for the interface are equal to zero.

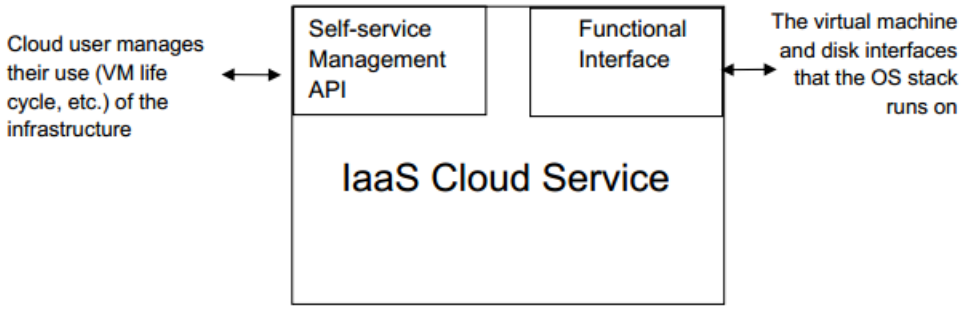

Figure 5: IaaS Interface [M Hogan, F. Liu, A. Sokol, J. Tong 2011]

Self-service management interface is a claimant for interoperability standardization and for this there were made some efforts, like: Open Cloud Computing Interface (OCCI), Cloud Data Management (CDM) standard is used for storage management interface and for storage functional interface.

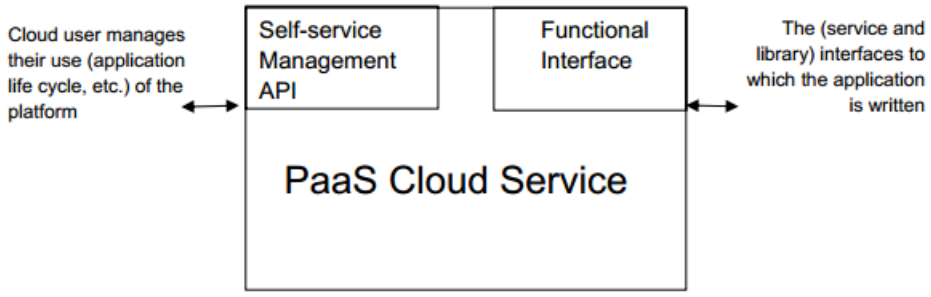

Figure 6: PaaS Interface [M Hogan, F. Liu, A. Sokol, J. Tong 2011]

For the PaaS, the functional interface is presented as libraries and components; they can be in different languages and they can use or not the standards that are available for the PaaS. The management interface of PaaS looks very much like the management interface of IaaS. PaaS self-service interface in concentrating on the life cycle of applications and the resources of the platform on which they depend. Interoperability for the PaaS self-service management interface can take place independent from the interoperability of PaaS functional interface.

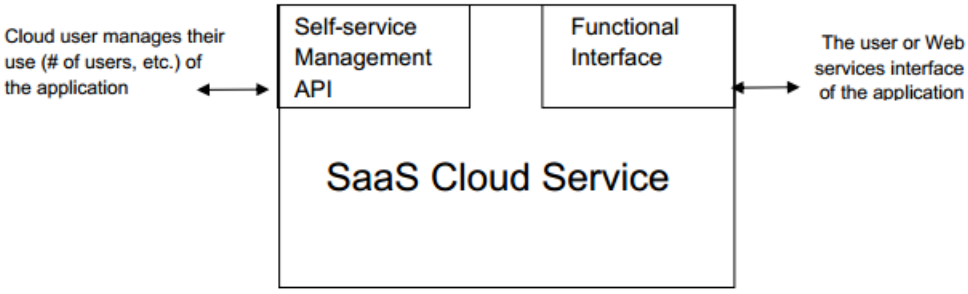

Figure 7: SaaS Interface [M Hogan, F. Liu, A. Sokol, J. Tong 2011]

The functional interface for SaaS is identical with the application interface. A lot of standards can be used when a SaaS application is access with the help of a Web Browser and these standards are used so the interoperability is accomplished. Standards as REST, JavaScript, HTML, XML, etc. are used also for the management interface, but they are not normally used for cloud services. The self-service management interface is concentrating in creating individual applications for each user. The interoperability for a SaaS self-service management interface

takes place for the Web service interfaces that have the same operations, for example: the identity of management. [M Hogan, F. Liu, A. Sokol, J. Tong 2011]

2.7.2 Cloud computing standards for security

Confidentiality, integrity and availability of information and information management are the most important aspect when we are talking about security regarding cloud computing.

The most common security issues for cloud computing are:

- The data that is stored on a cloud can be compromised by revealing the identity and integrity of it;
- Attacks that are affecting the security of the cloud and are allowing to other attacks to take place much easier;
- A user that doesn't have authorization for a specific data can access it during the maintenance;
- If more than one user has access to specific data, the data encryption can be limited;
- There can be attacks that can use the resources of the cloud;
- Attacks that can affect the privacy policies and regulations. [M Hogan, F. Liu, A. Sokol, J. Tong 2011]

When a cloud computing is implemented the developers have in mind the following objectives regarding security:

- The data that is provided by the customer needs to be protected by unauthorized access, disclosure or modification;
- They have to offer protection from supply chain;
- The infrastructure resources need to be protected for unauthorized access;
- The internet browsers have to be protected from attacks;
- The provider and customer obligations have to be well defined so that the security of the data is assured properly;
- The customers should have the possibility to create accounts and transfer data from one service provider to another, without having any difficulties.[M Hogan, F. Liu, A. Sokol, J. Tong 2011]

2.8 Cloud computing virtualization

Virtualization counts the resources, mainly as a virtual machine, and has a network connection and storage place that is intended for this. The cloud establish how the resources that are virtualized are delivered, presented. It is not necessary to use virtualization for creating a cloud environment, but it created a fast way of using resources which cannot be done in an environment that is not virtualized.[Intel, 2013]

More and more companies are virtualizing their IT environment and this is happening for years. In the beginning virtualization was used as a way of reducing the usage of computer resources and for saving money. After a while they observed that virtualization is not only helping the company to save money, but it was also good for flexibility and increase speed. Many of the cloud that exists on the market are built on infrastructures that are virtualized.

Virtualization has been used for many years, until now, like an IT strategy for reinforcing the servers. Even in our days, the main focus for virtualization is the servers. Another strategy will be using virtualization for storage and networks.

There are many challenges for a company when they want to go from virtualization to self-service cloud, challenges like management, culture, politics and operational process. There are five steps that have to be fallowed:

- *Develop a cloud strategy*- the company has to know which level they want to achieve on the market;
- *Manage organizational and business process change*- everyone has to be prepared for the changes that will take place;
- *Organize IT around service delivery*- a cloud service provider will take mainly all the roles for the IT department;
- *Put the right technology in place*- the goals need to be established for short, medium and long terms;
- *Manage a data driven cloud*- operations will have to get better by using analytics.[Intel, 2013]

Virtualization represents the first step that needs to be taken when building a cloud infrastructure. Virtualization is insulating the hardware as virtual machines and is using more

virtual machines for storage, computing and networking resources in an only environment. The resources that were virtualized are exposing the data that is coming in and going out from the cloud. Virtualization is giving some of the cloud capabilities, like: resource sharing, virtual machine isolation; which is allowing scalability, the resources can be used at a high level. [Intel, 2013]

2.9 Why companies decided to switch to cloud computing

During the years businesses tried to maximize their IT return on investments and use the functionalities at maximum. Cloud computing is offering them this possibility, more and more organizations are starting to discover the benefits that the cloud has to offer. In the last 18months the number of users that start using cloud computing increased with 27%. Businesses decide to use a service that is delivered by a third party and they do not want to have their own infrastructure, because they will have some benefits, like:

- *Costs reduction*- the equipment used for capital expenditure is less, if the IT resources are source regarding the business needs. Vendors are the clouds are those that are doing all the managing of servers and connections; and they are also ensuring the security of IT hardware. The customers are not the owners of the IT solutions that they are using, but they do not need to do this because the services are provided online at low costs.
- *Flexibility and scalability*- the cloud services are managed by the cloud subscribers, who are deciding how much of the services they are using according to how much they want to spend on this services. Because the cloud subscribers are the ones that decide for which services they want to pay, businesses also decide to pay only for the services they require. But if the needs of the business change over time, companies can pay more to have access to different services beyond the ones that they already use.
- *Mobility and agility*- users of cloud services can access their accounts from everywhere they are and from a large number of devices. They have to sign in using their account. This is possible because data that is stored I the cloud is online and they are not bundle on the system where they wore created.
- *Easier upgrades*- the responsibility regarding the upgrade of the system does not return to the customer, but to the cloud vendors. The new solutions that appear on the market are made available to the customers by the cloud vendors, by investing in them and make the

available for the users. Because the competition is high, vendors need to find ways of keeping their business up to date with the latest technologies.

- *Business continuity*- because data stored on the cloud is online, employees of a company can perform their job from everywhere and regardless the situation that the company is.
- *IT security*- the reputation of the cloud computing providers is closely related with the security offered for the data and for the services that are made available for the customers. This is the reason why they decide to invest a big amount of money in making their servers, data and connections safe.[12]

When a company becomes to feel more comfortable using cloud computing, the employees will start to enjoy the benefits using such a system and they will not see the issues so threating, because all the issues can be solved if they will have a good planning I background. Due to the fact that more companies start to have experience with the cloud, this will become to be seen as what it is: a new platform that has advantages and disadvantages.[13]

2.10 Cloud computing drives innovation

Companies are start using cloud computing for business innovation, for taking the first place between competitors. Bellow I will present some reasons why companies should start using cloud computing as a way to enable innovation.

- The main competitors are using cloud as a way of communication in the organization. Businesses can share knowledge and information between headquarters from different parts of the globe, and so this enables the innovation serendipity.
- The cloud is used in most of the main competitors for taking decisions. When companies decide to take a decision, cloud computing is offering an insight look in what is happening in the company.
- Innovation is increasing in main competitors through software as a service. Because SaaS offers the possibility for information to travel fast from one point to another permits to companies to deliver new services and change the business processes.
- Leading companies are using cloud as a way for gain access to parts of skills or knowledge that before weren't possible to rich.

- Cloud computing is also used as a way for companies to incorporate and application for mobile technologies. In our days mobile plays an important role on the market, because has an impact on both clients and employees. Cloud is offering the infrastructure needed for new applications and it also provides to the companies a way for them to incorporate the mobile applications with the system that already exists.[S. Hupfer, April 2014]

From the research conducted by IBM, research that has the name of "Cloud computing drives innovation", in 2014 we can observe that cloud computing is helping the business to grow. From the research conducted by IBM and Economist Intelligence Unit, they found that 67% of the companies that have small revenue, decided to integrate cloud in their company. Companies revealed that due to the fact that they integrated cloud in their system, they are able to share the resources that were allocated for the IT system and this represents a good way of saving money. There is also a bad effect of using cloud computing only for saving money, because they are not using the cloud at his full capacity. After a while the company that is using this strategy will do all the savings possible, but they will look to gain more benefits from somewhere else.

There are companies that are using cloud that are entering on new markets and industries or they are trying to create new revenue. Another research conducted by an IBM Institute for Business Values, "The power of cloud", discovered that 16% of the companies that participated in the research are using cloud as a tool for innovation. The efforts of using cloud as a tool for innovation it is not making easier for the business to lower the fixed costs for IT. For this the companies need to come with new ways of using the cloud.[IBM and Economist Intelligence Unit]

2.11 Risks and the actual reality

The fact that smart phones, tablets and other portable devices are ruling the market it has changed how, when and where our computing takes place. With the appearance of the cloud services our data can be access also anywhere and at any time. The fact that cloud services are flexible to bandwidth power and it is a pay-as-you-go service, has led to an interconnected and intelligent way for smart computing. Cloud computing is one of the most popular IT service, because 66% of the midsize companies are developing cloud strategies. Because cloud

computing is helping companies to minimize the IT costs and the agility is improving constantly, it can affect the security of the cloud services.[www.IBM.com; Enisa, 2012]

2.11.1 Perceived risks vs. actual risks

Companies were using services and technologies from different sources for many years, so cloud is not actually new. Providers are offering technologies, which are not located on their infrastructure, to the customer through the internet. This service can be storage, hosted email and other services as software. Because the companies give some control to the provider when they are switching to a cloud environment it does not mean that they will undermine their security.

There are 3 types of cloud services: SaaS, PaaS, IaaS. Each of this type has his own level of control for the provider and customer, but all of them can help the customer to maximize the agility and efficiency, because the company will no longer have their own IT. This is helping the companies to focus on their capabilities.

2.11.2 Questions that need to be asked for assuring the security of the cloud

Regardless the type of the cloud that is used by the company, the security is should be the same no matter if is it about a cloud based or a traditional IT infrastructure. The difference between the 3 types is that they have elements that are from external and the elements are managed by the cloud provider. The companies have to understand how the cloud is working and they have to have in mind the impact that will have in their organization regarding the security. To ensure that there will be a high level of security for their data, companies have to keep a good relationship with the provider of the cloud and the customer company should always identify themselves and be aware of the most risky information that they store on the cloud, because the security of the cloud can be affected and the company could have a leach. Companies have the same amount or even more within a cloud service than the provider.

Companies have to have control over the password, the users that have access to the cloud. Because data from a company is stored on the cloud and the competitor of the same company is using the same cloud provider, the question of data protection is raised. When the company agrees to use a specific cloud provider, they have to raise the question on how the provider is distributing the antivirus software on the systems that are exposed to virus or spyware attacks; and that the programs can detect and defend against malicious software or processes. Companies have to determine how the provider is testing and assuring the infrastructure. The

laws, regulatory and privacy requirements specify that the company and the cloud provider have to realize the rules that have to be applied so they can establish who is responsible for governance and meeting regulatory restrictions.[www.IBM.com; Enisa, 2012]

2.12 Summary

In this chapter I have discussed the most important characteristics of cloud computing and I have also presented the architecture for classifying and organizing the cloud services. In this chapter we can read about the three service models: Software-as-a-Service (SaaS), Platform-as-a-Service (PaaS) and Infrastructure-as-a-Service (IaaS), there are also information about the four types of cloud: public clouds, private clouds, community clouds and hybrid clouds.

Even if cloud computing has been adopted quit quickly, there are some open challenges that I have discussed above in this chapter: management of cloud computing systems, security, social and organizational issues.

According to how the cloud model is adopted (private, public, community and hybrid) and according to how the service is delivered (SaaS, PaaS, IaaS), cloud computing is highlighting different options. Because it is a new IT model, cloud computing will be used by the vendors and providers, customers and subscribers in such a way that is going to bring advantages to them.

Like any other technology, cloud computing can be used in such a manner that is going to be useful for the company or it can harm it if it is not used and understood properly. Standards are playing an important role in cloud computing, because they are supporting cloud technology and virtualization represent the first think that a company has to do when are creating a cloud infrastructure.

In another sub-chapter of the thesis is presented why companies decide to use cloud computing and how was this affecting the employees; what are the risks that the company is taking by making a comparison between the real risks and the ones that we perceive.

Chapter 3 Cloud computing providers

On the market there are many small and large cloud providers like: IBM, Google, Amazon, DropBox, NetSuite, Rackspace, Terremarket, SoftLayer; but in this chapter I will focus my attention on three of the most important cloud providers that exist on the market and the relevant products offered. I decided to describe some of the providers' services, because they will provide information that will help me in my project.

3.1 Google Enterprise

Google is a search engine that is offers all kind of information that is accessible and useful for the users. Google is offering numerous applications to his customers, applications that are helping them to reduce the consumption of the energy and carbon emission. Cloud computing can support an unlimited number of applications and Google Enterprise is offering some of them to their customers.

The services offered by Google Enterprise are presented below:

- Google Apps- the service includes applications as e-mail, calendar, spreadsheets, documents;
- Vault service- this service offers solution for mail security, archiving and encryption;
- Enterprise search;
- Earth and Maps- this services is offering tools to visualize information and direction about different places;
- Chromebooks- the service is used for deliver the power of the web.

Google Cloud Platform represents all the products of cloud computing offered by Google , that are using the same infrastructure as the one that Google is using for products offered to end-users, like: Google Search , YouTube.

Google Cloud Platform is composed from many products, where each of it has his own interface, command-line tool and Rest API.

- Google App Engine is a SaaS for web applications;
- Google Compute Engine is a IaaS that allows to users to enable the virtual machine when needed;

- Google Cloud Storage allows to users to store files online;
- Google Cloud DataStore offers storage for non-relational data that has a REST API;
- Google Cloud SQL is a MySQL database that exists on Google Cloud infrastructure;
- Google BigQuery is used to analyze data and is using SQL-like queries for dealing with bog data in seconds;
- Google Cloud Endpoints it is used for developing services within App Engine that can be access from IOS, Android and JavaScrip clients;
- Google Cloud DNS represents a DNS service that can be found in the infrastructure of Google Cloud.[26]

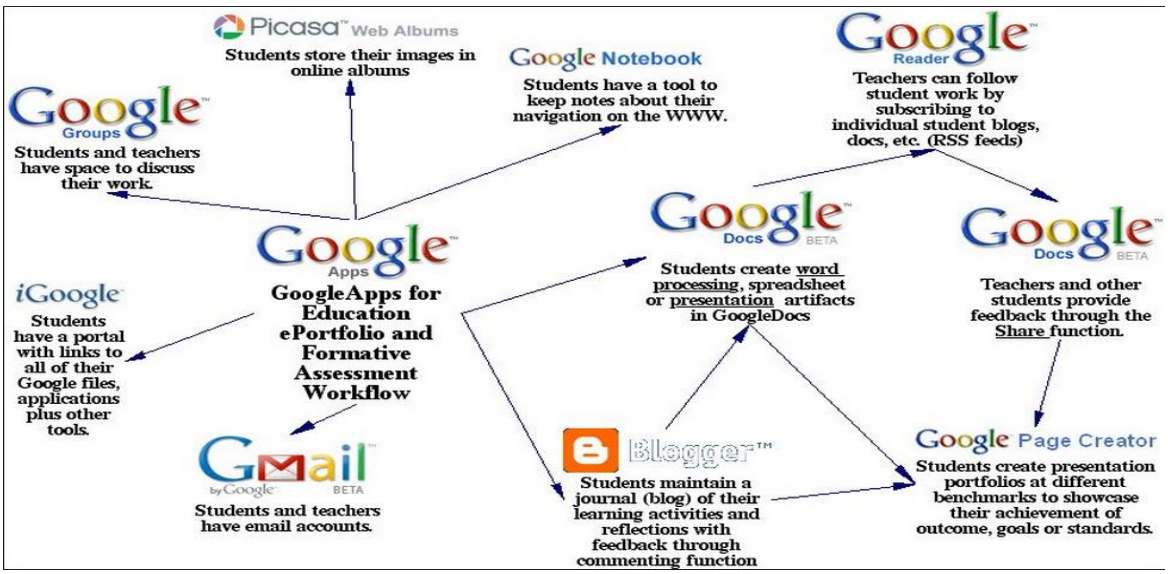

Figure 8 Google cloud [www.cloud.google.com]

I am going to talk about Google Apps because this service is relevant for my thesis, due to the fact that C&A is using applications from this service. As presented in figure 8, Google Apps has more than one service: Google groups, Picassa, Notebook, Gmail, iGoogle, Docs, Reader, Page creator and Blogger. All this applications are intended for helping the customer, to make his/her job easier. Because companies start using Google Apps, the resources are shared in Google Data centers. Because of this the company is using fewer servers, and this means that the energy and pollution is low.

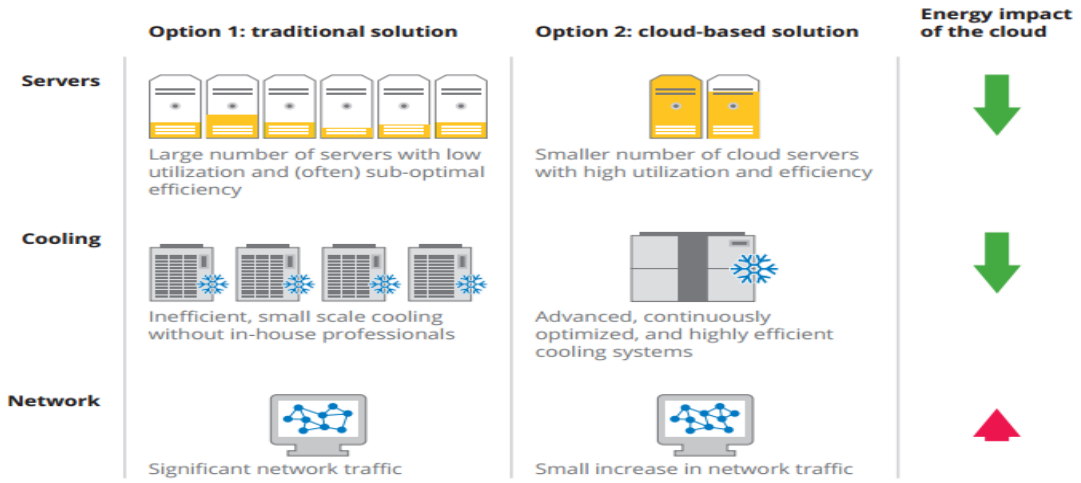

Figure 9: Why is cloud more energy efficient [Google Apps: Energy Efficiency in the Cloud]

The figure presented above presents two models of computing: the traditional solution and the cloud solution, from where we can observe that the cloud solution is offering a lower usage of energy, because the equipment needed is less. The fact that the company decides to move to Google Apps platform can affect the consumption of energy in three ways:

- *The energy dedicated for servers is reduced with 70-90 %*: fewer servers are used for doing operations and Google's servers are more efficient. If a company owns his IT services, then they have to take care that the servers are not going to fail and the capacity is not reached. The servers are using the same amount of energy regardless if they are busy or not, and this generates a high amount of energy that is used.
- *The energy used for cooling servers is reduced by 70-90%:* because the servers are heating while they are running, the air conditioner is working at his full capacity to try to cool the servers.
- *Increase energy 2-3%from use of Google servers and more network traffic:* even if there is the energy saving presented above, they are not free. When a cloud service is used there is some energy consumption that comes from Google's servers and the traffic for the internet is increasing. From analysis that were conducted I had noticed that the increase was for 2-3% in energy consumption for the office computing that transferred to the cloud computing.[9]

Air pollution represents a significant problem for the capital of developed and emerging countries. The fact that the air pollution represents an important matter in our days, led the international authorities and organizations to emit Guidelines and Directives on air and pollution. Google have developed a device that is using a GPRS modem to store the pollution level to a Pollution Server. This Pollution Server stores the data and by using Google Map he can indicate the level of pollution to which the user is exposed to in that specific area.

NoxDroid Android application is responsible with the connection to IOIO board, GPS location is saved and the data are uploaded to a web service at Google App Engine. The feedback that is send from the NoxDroid device is also controlled by it.[A. B. Andersen, P. Krogholt, S. Bierre, A. Tabard, 2012]

3.2 Amazon

Amazon is an internet-based company that has the headquarter in Seattle , U.S.A. when they first appeared on the market they were selling books, but now they are selling all kind of products from DVD's, Cd's to software, video games, furniture, etc. They are also offering to the customer their own electronic products like: Amazon Kindle e-reader, fire phone, Kindle Fire tablets, Fire TV and it is one of the main providers of cloud computing.

Amazon Web Services (AWS) is offering IT resources through the internet at low costs and they have pay-as-you-go pricing. Because they are a big company that is offering different services they can offer products at low prices, and they are giving access to the costumer to platforms without any extra costs.

Amazon Web Services is offering a large set of global compute, storage, database, analytics, application and deployment services that are helping the organizations to increase their development, it is helping to lower the IT costs and scale applications. All the services presented are having the trust of big enterprises, because they are using them in web and mobile applications, data processing and warehousing, archive.

- *Websites*: AWS is offering cloud website hosting solutions that are helping the organizations to deliver their websites and web applications at low cost. The benefits of using this service is that the customer can use the website server and the software that he wants; they have to pay only for what they are using; they are

allowing the customer to create his website according to his demands; and he has access to global resources immediately.

- *Backup and recovery*: AWS is offering the possibility of storing information in the cloud, so that the customer can avoid the managing of the hardware. This can be added to the infrastructure that already exists and the security and durability of the data will increase in the same time. The benefits of using this service are: data is stored in multiple copies; the customer has to pay only for what he is using; data is encrypted for security reasons and there can be use the infrastructure that already exists.
- *Archiving*: storage is offered at low prices. The price for one GB is of 0.01$ per month; there are multiple copies of the data; data is kept save because it is encrypted and it is integrating with the archiving software that already exists.
- *Disaster recovery*: AWS has different tools that it is helping the customer to recover data from critical IT system that is keeping data save for when the customer doesn't need it and it is available when he does. The benefits of this service are: data is secured offsite; multiple copies are done automatically; the files are back-up and restore.
- *Development and test*: is created for customers that need to develop applications and also to test them. The customer that is using this service will have instant access to new resources, the machine used can be configured for the customer's needs and the customer is paying only what he is using.[11]

3.3 IBM

The International Business Machines Corporation (IBM) is one of the biggest hardware and software manufacture in the world, which is offering infrastructure, hosting and consulting in area like mainframe computers and nanotechnology. The headquarter of the company is located in New York , U.S.A.

IBM cloud computing represents various services that are provided by the IT Company IBM. All this products can be found under the name of IBM SmartCloud, which has: IaaS, SaaS, PaaS provided through private, public and hybrid cloud delivery models. Which are standing under the names: SmarCloud Foundation, SmartCloud Services and SmartCloud Solutions.

SmartCloud Foundation has infrastructure, hardware, management, integration and security that act as a bases for private and hybrid cloud. SmartCloud Services is formed from the foundational components, PaaS, IaaS and back-up services. SmartCloud Solution runs on the platform and infrastructure of the cloud and is realized from various collaborations, analytics and marketing SaaS applications. IBM is also offering services to clients that do not use SmartCloud Platform. The IBM SmartCloud Platform is composed only from Hardware, software, services and practices. [27]

Companies are choosing to use cloud so they can supply business with responsive IT services and cloud is also used to innovate the way the employees are working. IBM is offering a various number of cloud services that are helping the customer to use his resources at maximum.

- SaaS business application is provided to those that want to develop their business, regarding the field that they are from: market, sales, it. For this IBM is offering more than 90 applications, but I decided to present only few of them.
    - Silverpop engage is a cloud based marketing automation platform that is providing to the customer email marketing and management solutions. This application is collecting all the information from a specific customer and it is using this information to provide in real time interactions special created for them.
    - Easy file sharing for business- because IBM is using his applications to gather people in such a manner that they will share their information, expertise, ideas; and this users are known as knowledge workers. For this IBM has IBM Navigator on cloud that was developed by industry leaders in Enterprise Content Management (ECM) and is giving interaction authorization between knowledge workers that are creating, managing reusing the data that will lead them to innovation and the outcomes of the business will be positive.
    - IBM Connections is used by companies because they are providing to the companies the tools needed so they can be more agile, collaboration between them and the partners will be at maximum efficiency; employees

will have the possibility to share their knowledge and ideas with others that are not in the same headquarter or company.[14]

- IaaS infrastructure services are offered for those companies that decide that they need choices of open cloud infrastructure for IT operations. Regarding the needs of the business IBM Cloud offered the possibility for companies to have public, private and hybrid clouds.
- PaaS developer platform- IBM is offering applications that are already developed for helping customers to create the applications desired much faster and better. The customers do not need to modify the infrastructure that they already use.[15]

3.4 Summary

In this chapter I am presenting the main cloud providers on the market and the products that they are offering. From the products provided to the customers I selected only the ones that I considered relevant for my project, because each of them have more than 80 products that are available for the customers.

	IaaS	SaaS	PaaS
Google	If a customer is using Google's infrastructure they will have access of billions of search returns in couple of milliseconds.	Google is offering this service through his application Google Docs	Is allowing the customers to store data, analyze data and create website, etc. Google App Engine.
Amazon	Is offering for their customers a large number of services, which are using Amazon infrastructure, that are helping companies to function better.	They are not offering this service	Amazon is giving access to the customers to use platform from them, but they have to pay for the service that they are using.
IBM	Customers that need an open cloud infrastructure. They are offering public, private and hybrid clouds	Customers that have their own business	The infrastructure that the customer is using is not going to change.

Chapter 4 Literature review

This chapter of the thesis is dedicated to literature review for topics specific to my thesis. Here I will present the new papers, which were published, related to my problem definition question and I will present also my opinion regarding this papers. This chapter is important for my thesis because the preliminary search was helping me to bring and improve my research ideas. [M. Saunders, P. Lewis, A. Thornhill, 2009]

4.1 Impact of cloud computing on IT industry and revenue

In the research paper "Impact of cloud computing on IT industry: Review and analysis" from November 2012, the authors are discussing about the three main services that cloud computing can offer (IaaS, SaaS, PaaS) and they are also presenting the interrelationship and inter-dependency on preliminary technology. In this research paper it is also presented a discussion about the changes that cloud computing is bringing and what is the impact that has on IT industry.

Because all data is stored on a server, the security and administration of the data is ensured by the service provider and the users have a better and easier access to the data. I agree with the fact that cloud computing is a good way for company to get a better flow of information between his employees, because if a company decides to use a cloud computing that is offering services like storage, transfer and create of data, they can decide which employee has access to specific part of the data that is stored on the server. Furthermore, company doesn't have to take care of the security of the data that they store in the cloud, because the provider will do this for them. Because there aren't any concrete laws for the security of the cloud, they are still developing them, I this that the cloud is not protecting the customers' privacy very well. For example, Facebook where people are storing pictures and information about themselves; and a lot of users can have access to their information and even use them.

Cloud computing platforms can help companies of all sizes to increase their revenue, by reducing the IT costs, because the investments in the IT hardware and software will decrease.[D. Eisner, June 2014] I consider that cloud computing will have a positive impact on the companies that will decide to adopt this technology, because it can help the company to grow on the market by using the services that they need and the company will have to pay only for those ones. Not like until they start using a cloud, when they will have to develop their own system. This means

that the company was spending much more on the resources used, like: employees, software, hardware that will help them to support the services developed.[M. Rahul, M. J. Haque, M.Muntjir, 2012]

Another research paper that I am going to discuss was conducted by IBM and is concentrating on a specific company, Drivewyze, based in Canada. They are aware of using cloud as a way to drive innovation. Being a young company they are aware of the fact that truck industry is lowering the inefficiency. Because in the U.S. there are many companies in this industry, they are also called as the backbone of the economy. This is why the government needs to provide them good working conditions. But, also the companies have the responsibility to ensure the safety of their employees and also of the people that are driving on the roads. They have to stop regularly at stations special created for them, and this can cause delays in delivering the products. Because there are many trucks that are driving on the U.S. roads and not enough inspectors, Drivewzye believes that the law enforcement need to find other ways for doing this inspections and they should concentrate on the trucks that are not so safe. [IBM and Economist Intelligence Unit]

To avoid the situation described above, Drivewzye created an application called Dricewzye PreClear that are offering the driver a safe and secure way for requesting and receiving the accreditation for permanent and weigh stations and mobile inspections sites. Drivewzye system can check if a truck is close and also if is respecting the requirement that are asked by the law enforcement. They can do this only if they are using a GPS, a cellular and internet network. After it was accepted, Drivewzye have to start the production of the service. The costs applied for developing their own infrastructure where higher than the outcome that was expected. So, the company came to the conclusion that having their own infrastructure and maintaining it will be too expensive and will slow down to process to production; and the company could not afford this costs. Because the competitor already own 60-70% of the market share, Drivewzye needs to speed up the production roadmap to market deployment having low costs.

DRivewzye PreClear application is developed using IBM SmartCloud Enterprise+, which is offering to the customers a fully working infrastructure. The IBM cloud is offering to the

customer a secure environment, they can have access to backup information, recovery and features that are important to offer access to the customer.

Because cloud computing has such a huge impact on the businesses, companies will start to be only online. Companies will start to using services and products provided by cloud providers, IT suppliers and business processes. This is one of the reasons why innovation will represent a competitive way between It and business industries. Customers are asking more then only IT operations from the cloud, they also want to have access to business processes and market innovation.[L. Willcocks, W. Venters, E. A. Whitley, 2011]

From this research paper I have noticed that cloud can be used more than just shaving costs for the company. The companies that are using cloud are no longer lock-in; they do not have the restrictions that they were having couple of years ago. Cloud computing is offering more computer power and the costs and lowering significantly, so the companies are delivering their products much faster. I do agree that if they are developing their own products companies will have more gains then losses, but if they will use the cloud for fulfilling the goals of their companies, they will have more to gain, thanks to the multitude of services that the cloud are offering; but of course there is a negative side because the customers could be lock-in for a specific cloud provider and most of the big companies are trying to avoid this.

In the Ericsson white paper ”The real-time cloud”, they affirm that providers have to come with new ways for delivering their services and products to the customers so that the customers will not be tempted to change providers only because the competitors have better services and products. A solution for this is represented by NFV. Providers have the opportunity to offer service to the customers without having to change the quality of the service. Innovation can happen when is formed a bridge between for the resources that are in the cloud and network domains. All the capabilities presented above will be possible if technologies are going to combine: network-enable cloud (it is helping the virtual infrastructure to be across the usual computing and traditional storage of resources), network functionalities are virtualized (it will be possible to function on various hardware platforms), real time control capabilities of service providers SDN(it is helping the operators to integrate their networks to the real time demands of the new services that are on the market or are going to appear). The consumers and companies will have a greater experience, efficiency; the costs are going to lower.

I consider that is a good think that customers and providers can gain benefits from the fact that they are using and providing cloud services, because customers could use the infrastructure that they already have and the applications will just adapt on it. Regarding the costs that the providers will save represents a positive think, because companies are always looking new ways for saving money inside the company and they can do this only if they are offering only the newest services and also if they are using them also. They could reduce the costs by implementing new programs and so the organization structure of the company will change, because positions that were occupied by employees will be takeover by the clouds.

In the last years companies start searching for technological solutions that will help them to reduce the cost structure and make more profit. One of the solutions that they found was cloud computing. Because cloud computing start to be used more and more on the market, companies start asking themselves how will this technology will affect their revenue. [PWC, 2009][36]

The latest reports that were done, revealed that the giants of the technology industry, IBM and Microsoft, are at risk because they changed their delivery method, from delivered with the help of the Internet from distant data centers to pay-for-use services and not a product. Microsoft's cloud revenue increased in the first half of the year with 163 percent, while IBM's revenue increased with only 86 percenters. The market leader is Amazon which had a cloud revenue of 962$ million, while Microsoft and IBM had each 370$milion and 259$ million. [S. Lohr, 2014]

In conclusion, I consider that adopting a cloud inside the company is a positive think, because they do not have to take care of the maintenance of the system, the infrastructure is provided by the service provider. Cloud computing impact regarding the business has its ups and downs, because it is helping the companies to grow on the market by using services that are already developed for them or which is helping them, but on the other hand when we are talking about security there are some problems, because people are trying to get access to folder that do not belong to them and the service providers need to put extra effort in solving this problem.

4.2 Cloud computing and the flow of information in the organization

Because cloud computing offers pay-as-you-go services with the help of the Internet, flow of information to cloud computing will come with security problems, but will also help the companies to reduce the costs, they will have access to information whenever they will needed from any place. [Rochwerger, 2009]. If inside the company there is positive information sharing this will increase the performances of the supply chain. After cloud computing is adopted in a company, security represents an important issue for information sharing, because for companies is important to have a stabile social capital and also to have a effective and efficient flow of information. [Cai, 2010]

There are companies on the market that are using cloud computing as a way for facilitating information flow between then and customers/ partners, but this way can affect the correctitude of the information that is transmitted, because there are a high number of people that can have access to this information and they cloud modify it. Using cloud computing as a way to improve flow of information can bring some benefits for companies, like: variation of the prices is lowering; the strategies applied for their businesses are more accurate. [Q. Cao, D. G. Schniederjans, J. Triche, M. J. Schniederjans, 2013]

Flow of information can bring positive effects for a business, because is helping the employees to improve their performances, but o the other hand it can have also negative effects because many people will have access to the information and the information could be affected or modify.

4.3 How is cloud computing integrating in the company and what are the challenges of adopting it

An important issue, when cloud computing is adopted, is about synchronizing the existing data with the new system. The cloud computing developers do not always have this issue in mind when they start working to a new system and this is making harder for companies to integrate their information that are on the old system to the new one. When a new system is adopted, we have to be aware if the system able to integrate different programs without any extra efforts. [D. Linthicum, 2099]

Even if there are numerous benefits of adopting cloud computing, there were also identified some challenges regarding the integration, because it can represent a huge barrier for

developing web based applications and SaaS.[Louis Columbus, 2014] This two are raising challenges because the number of SaaS services is increasing and not all of them are having in mind these problems. Because companies are also adopting the other two types of cloud computing, the mobile application market is in constant growth and social media are used in daily basis; means that data and processes are also migrating from the firewalls to the cloud. The challenges that can appear are connected to security, flexibility and scalability, management, open platform. [37]

Cloud integration represents an important issue for companies, because they will have to keep all their old data saved on devices if the synchronization between systems is not possible and that is why I consider that developers should pay more attention to these. Another problem is represented by the challenges regarding the security of the information, challenges that I have presented in the next chapter in more details. In conclusion companies should analyze all the benefits and challenges that each cloud offers and they should chose the one that will help them reach the companies goals.

4.4 Cloud computing is helping the improvement of knowledge and information management

Amazon is one of the companies that are presenting his products as a way for information to be access in real time and this is why the company is the choice for cloud based knowledge management. There are few characteristics for cloud based knowledge management: almost all the information technology has default meanings and it also has benefits like costs that are low, efficiency of the operations is high. The conclusion for this research paper was that information and knowledge management has a great impact inside organizations, because the company will know significant growth. [S. E. Arnold, March 2014]

Because new technologies are coming out every day, companies have to keep the trends inside, and knowledge management represents an important area where companies have to invest when a cloud is adopted. The infrastructure provided by the cloud is a perfect way for companies to gather and distribute knowledge between their employees.[R. Maier, 2007] So, cloud computing has huge capabilities for giving access to knowledge management services that can help the employees. The capabilities are not used for knowledge management in intra and inter companies businesses. Knowledge and knowledge management represent an important

factor for enterprise intelligence, market intelligence, business intelligence, competitive intelligence and strategic intelligence.[S. Khoshnevis, F. Rabeifar, 2012]

Another paper that presents how knowledge helps customers to get great experiences when using a cloud computing service is “Empowered customers and productive agents” from BMC. For customer that decided to use a cloud service the fact that the access to the knowledge is immediately represents a huge point because in this way they could solved their problems faster and without putting any big efforts. This has also advantages for the company because the information and skills are shared faster and easier between employees, the correct information can be given at the proper moment and knowledge can be store, share and control- specific people can have access to specific information at the correct moment. [35]

Knowledge and information management are representing an important issue for companies and the fact that many of them are using cloud computing, is helping the employees and customers to get access to the right information at the right time without having to wait or search for it for a long time. This can help companies to reduce costs and improve the work inside the company. Also, because only few people can get access to sensitive information, the security and privacy are respected and the risks for hacks are low.

In conclusion, literature review represents an important chapter for thesis project because with the help of the latest articles I could review my research questions. With the help of this articles I found that cloud computing is playing an important role inside companies, because by using one or more services offered by the cloud the company could have great benefits like: reducing costs, the knowledge management and information management are also important because it could help the company to grow on the market and many other benefits that were presented above. Through my thesis I will present deeper the benefits of using a cloud service in the company and for this I am using interviews and specific data from the two companies that accepted to participate. I will try to convince readers that cloud computing represents a more cheap and easier solution for them.

Chapter 5 Theoretical framework

In my theoretical framework I will talk about demand and supply theory, theory of innovation and lock-in, pricing strategies, business strategies, organization structure; and knowledge and information management. I decided to present these theories because they are relevant for my problem formulation and I will use them in my analyze for the companies that I interviewed, C&A and Dialogue One.

5.1 Demand and supply theory

Due to the fact that in our days there are many users and providers that are using cloud computing, I have decided to take in account both factors. Pricing is influence by demand and supply factors. The effective price can be affected by these two factors. Competition has a great influence on the demand and supply model, because on the market there will be always more than one provider and the user will always try to find the best offer that is suitable for his company needs. The prices will always get higher and higher for the user when there is no competition on the markets, because the demand of the service will be high and the provider will see a way to increase his revenue; and from the point of view of the provider the prices will have to decrease, because the competition is high and they will have to try and attract more customers by lowering the prices and offering more services at low prices. When the quantity of services is equal with the products requested, on the market will establish equilibrium, because all the orders are delivered and the prices will not increase or decrease because none of the providers or users will accept them anymore.

Even if a company has the most effective methods of production and the knowledge and management of information is used at the highest point it cannot exist on the market if there isn't a sufficient demand for his products and services, which will help to cover all the production and selling costs for a relative long period of time.

The total size of the market or industry affects the demands for commodity, which represents the total sum of the demand for commodity of the consumer in the market. This is depends of the consumer, of how much he wants certain products or service. The demand theory of consumer states that the quantity needed of a commodity depends on the product price, the income that the consumer has, what are the prices for complementary products. The demand of

commodity regarding the companies is influenced by the market size, the number of competition companies that exist on the market and how the industry is set up.

Inside of a company it can be observed that the sales are decreasing when the prices for commodity is increasing. Every manager is aware of the fact that when the prices are increasing the products sales are decreasing and the other way around, when the prices are lowered the sales of the products are high.

Market demand refers to the demand that exists on the market for a service or product. Market demand is used to determine the level of production that needs to be established for the market and it is also useful for companies to determine the optimal price for a product or service, so that they could increase their revenue. [31] In 2012 80% of the applications that were on the market were part of a cloud and until 2020 the ICT industry will represent the most profitable industry in the world. From the research that was conducted by IDG Enterprise Cloud Computing study I could observe that the demand for cloud on the market is getting higher and higher every year, because the companies that are already using the cloud infrastructure are in a continued growth, but the interesting part that makes cloud computing to have such a huge success is represented by the technology that is underneath this adoption. From the same research we can observe that over a third from the companies that are using cloud computing are satisfied by the services that the cloud is offering and there are still companies that are didn't decided if they should move to the cloud or not.

Because the interesting for the cloud computing is getting higher and higher by each year, in 2013 only 61% from the companies that participated in the research were using cloud services, in 2012 there were 57%. From this we can observe that the demand for cloud services is going up from one year to another. By using cloud services companies can increase IT agility, IT innovation and the collaboration between employees. The most companies affirmed that they would like to invest in software defined network (SDN) and network functions virtualization (NFV), so that they can have the biggest agility from the cloud investments.[J. Bourne, November 2014]

Market supply represents the sum of every single supply curve for a distinct market where the market is considered to have a perfect competition. [32] An important tools used to

analyze the market is represented by the supply. This means that an organization can deliver on the market a specific number of products and services at a specific price and in a specific period of time. When the prices are getting lower and lower, only the companies that are on the market for a long period of time and they already have a good reputation, they are the only ones that can produce services and products. On the other side, when the prices are high everyone can sell their products and so everyone can produce services and products. [O. Hedegaard , M. Hedegaard, 2008]

5.2 Pricing strategies

Pricing strategy is about the ability to pay, what are the market conditions, what are the competitors doing, how much are the companies adding to the initial cost of the product or service.

- *Premium pricing* means that the highest price is used for determine criteria. This type of strategy it brings benefits on markets where the competitive advantages are for the company;
- *Penetration pricing* means that the price is low, so the company can earn the market fast and easy. This strategy is used when there are promotions for a new product, but after the promotion expires the price of the product will increase;
- *Economy pricing* means that the cost attributed for advertising and marketing are low;
- *Skimming strategy* means that a high price is asked for a product until the competitors will bring the same product on the market and after the price will start to decrease.[28]
- *Optional product pricing* means that companies will try to increase the amount that the customer will pay for a service, by adding different services besides the service that the customer really wants.
- *Product bundle pricing* is applied when sellers are combining different products in a package.
- *Promotional pricing* is when sellers are making promotion so that they can sell their products. An example can be when there is an offer of paying for a product and the second one is free or at half price.

- *Geographical pricing* is when the same product has different prices because it is in different part of the world.
- *Value pricing* is applied when there is a high competition on the market and companies are offering more products in the same package, so that they will retain sales.[16]

Pricing represents the income that a provider will receive from a user that is using the provider services or products. There needs to be developed accurate pricing techniques, if we desire for cloud computing to have a success on the IT market. Pricing process can be described as:

- *Fixed prices* where the customer has to pay the same amount every time for the service or product;
- *Dynamic prices* where the customers are charged differently;
- *Market-dependent price* where the customer is charged in real time depending on the market conditions.[M.Al-Roomi, S. Al-Ebrahim, S. Buqrais, I. Ahmad, 2013]

Pricing in cloud computing can be affected by the following factors:

- Initial costs represents the amount of money spend by the provider on resources;
- Lease period represents the period of time in which the customer will lease resources from the provider;
- QoS represents the technologies and techniques provided by service provider to the customer, so he can have a great user experience in the cloud. They can provide security, privacy to the customer. The prices will increase if the QoS is going to be at the customers' expectations.
- Age of resources represents the age of the resources that the provider is offering. If the resource is old, then the prices are low;
- Cost of maintenance represents the annually amount paid by the provider for maintaining and making the cloud more secure.[M.Al-Roomi, S. Al-Ebrahim, S. Buqrais, I. Ahmad, 2013]

Optimal price means that "a typically profit-maximizing price where marginal revenue is equal to marginal price".[3] One strategy that can be applied to determine the optimal price would be to put a price that is smaller than the market price for a product. After a period of time the price increases and the customers' reactions are registered. After that the company is analyzing the profit that was made after the increasing of the price and if the high price was well received by the customers, the profit increased, than the company continues to increase the price regularly. But is the profit didn't increase and they made low profit, the company will lower the price again. When the company observed that the products that they sell weren't affected by the increasing of the price, then they could increase the price. [30]

Price discrimination means that providers are asking different prices for the same service or product.[29] Pricing discrimination refers to the fact that a company is applying different prices to their customers, because they are living in different parts of the country, for example, and this is called geographical price discrimination. International price discrimination is when companies are charging more/less for the same products or services for customers that are outside the country borders. Price discrimination can be: first degree when the customers are charged at the maximum price that they are willing to pay; second degree is when the customers is charged depending on the quantity that he is consuming; third degree represents the difference prices that are applied for different categories of people.

For a company to apply price discrimination has to fulfill some conditions: the competition between the companies has to be imperfect; the company has to have control over the market so that they can prevent resale of the goods; there should be groups of customers that will have an elastic demand.[25]

5.2.1 Price elasticity

Price elasticity of demand represents the relationship that exists between price and quantity demanded and also gives an exact calculation of the effects that take place is there are any changes in the price regarding a quantity demanded. If a small change occurs regarding the price and a high one in the quantity demanded, then we can say that the demand for a good is elastic. If the quantity demanded will be less than the price, then the elasticity will be less than 1.

[3] http://www.businessdictionary.com/definition/optimal-price.html#ixzz3LhxHhbB2

And the demand will be inelastic. If the quantity demanded is higher than the price, then the elasticity will be higher than 1. And so the demand will be elastic.

When the quantity demanded is the same all the time and the price has no influence, then there is a perfectly inelastic demand. The demand of commodity is not changing even if the prices are increasing or decreasing. A perfectly elastic demand is when any changes that take place in the price are affecting the demand. The revenue will be equal to zero regardless the small increase of the price.[17]

5.2.2 Costs

Variable cost and fixed cost are forming the cost structure. Variable costs are those costs that are dependent of the production, when there is no production the costs are equal with zero and they increase when production increases. Fixed costs are those costs that are the same every month. They take place regardless if the company has any profit or not.

Costs are helping the managers of the companies to take the decisions, and the information that they have should be up to date, because they can influence the costs and the business strategies of the company.

5.2.2.1 Cost reduction

Cost reduction is the strategies applied by companies to reduce their expenses and for them to increase profit without affecting the quality of the products or services. Often the companies' managers will apply the cost reduction strategy so they can increase the efficiency of the company and for increasing the profit. For these the managers have to identify from where they are losing money and after that they can apply the reduction. After the problem is detected they have to come with strategies that will help them to increase efficiency and reduce the costs. [18]

5.3 Theory of innovation

Innovation is the process of creating new products or organizational improvements for an industry. Innovation is helping to reduce the costs in a company and it also helps to expand the demands of the market. [Jon Sundbo]

The trilogy of innovation is mention by Schumpeter, trilogy that includes invention, innovation and diffusion. Schumpeter gives different definitions for innovation:[Jon Sundbo]

- New products are presented on the market, to the products is attributed a new quality and it is used a new method for production;
- A new market appears;
- Companies decide to use new materials even if these materials were already used by other companies.

By using the innovation process inside the company it can help to develop new knowledge for them, it also helps the company to have a significant growth on the market and if the company decides not to change their usual production and delivering activities they can be takeover by other companies that have market power. [Jon Sundbo]

Innovation as technology is significant because of his efficient effect. Innovation efficiency takes place when advantages regarding competition are putted together with the help of new knowledge. In our days the economy has changes because new technologies appeared, new software is created and in telecommunication new social networks are making their place in the market. The new innovation that appears on the market are characterized by the fact that they have a positive effect on the market and they also have big effects via knowledge diffusion and transmission.[Jati Sengupt, 2014]

5.4 Theory of lock-in

Theory of lock-in concerns a case where an agent decision regarding the adaption of a standard which is affecting the social welfare of the business. Cloud computing can be considered as a multiple equilibria, because it has strong network externalities. Multiple equilibria are a market where a multitude of network effects exists. For example, if a cloud computing provider is coming with a new product and no consumer tried it before, then the customers will be reluctant about the product. But when a customer is adopting the new service or product then it created equilibrium. There can be established an equilibrium also when more customers are adopting the service or product. When there is no adoption of the service or product, then the market can become locked-in, because there is a service that has a better Quality of Service. Also, if the customers will behave in the same way, they can influence the standard that is chosen and locked-in will take place only if there is a coordination failure.[V. Stango, 2004]

Vendor lock-in is seen as an impediment for cloud computing to evolve. Until now every technology that had appeared has been locked-in, even if there were attempts like Open System and Java. Another definition of vendor lock-in is that a customer depends on the products and services that a vendor is offering, and if the customer wants to change the vendor they will have to pay for switching the vendors. [G. Petri, 2014]

Below I will present four types of lock-in, so I can explain how cloud computing is affecting lock-in.

- *Horizontal lock-in*: the switch from a product to a another one that is from the competitors is restricted;
- Vertical lock-in: the customer is obliged to use a specific database, operating system, who is selling the hardware and the partners that are for implementation. A way of escape of being locked-in; the hardware, open system, operating system can be elected independently;
- *Diagonal lock-in*: vendors are buying applications from a provider, even if he is not offering the best services in the area;
- *Generational lock-in*: this type represents the baddest type of locked-in. The first types of locked-in are acceptable is the right platform is chosen and also the right solution that the vendor is offering. Even the leaders of the market cannot survive, if they would not offer the possibility to the customers to have access to new technologies.[G. Petri, 2014]

5.4.1 The impact of cloud computing on lock-in

Customers are using many cloud services, which are offered by different vendors, for their needs; without having any lock-in. This cloud services can also offer the possibility for the customer to synchronize their account, from different clouds, between them. Further in this subchapter of the thesis I will present how cloud services are affecting the lock-in.

- *Horizontal:*
    - For a company that is using a SaaS solution and wants to transfer to another one is not affecting the transfer of data, because the company doesn't have to have two infrastructures.

    - For PaaS is a little different, because if the programing language that is used belongs to the PaaS platform the lock-in is going to take place , because the infrastructure is also going to be locked-in.
    - The IaaS is not actually affected "by lock-in in the traditional hardware vendors as virtualization"[4]. Customers are not usually locking-in themselves for a specific vendor; they will have to be capable to move their work from an IaaS provider to another one.
- *Vertical:*
    - For both PaaS and Saas the lock-in takes place in the package from which the infrastructure is.the underlying layers from the services are not the customers' concern and he cannot access them. If the customer doesn't agree with the products and services that the provider chose to use, then the customer has the possibility not to choose the specific provider.
    - For IaaS there isn't so much vertical lock-in, because the customers are already using a low level, and the chose for the IaaS server provider it shouldn't create a boundary for the IaaS network and IaaS storage provider.
- *Diagonal:* when using a cloud the customer is usually buy more products from the cloud provider. Customers usually are sing cloud services from the same provider, because it is much easier than to have hundreds of SaaS vendors. Because of the same reasons, customers are forcing the vendors to offer services for SaaS, PaaS, IaaS; even if the services that they are offering are not the best.
- *Generational:* all the time new technologies are going to appear and customers want to have access to them. A customer can be lock-in to a vendor, when this vendor lose his market domination, because the customer has sign a contract and it Is difficult to get out without having to pay some extra costs.[G. Petri, 2014]

5.5 Business strategies vs Business model

Business strategies represent an important aspect in the well-functioning of the company and it is a step closer for the company to achieve his goals. Depending on the business strategies that are adopted the companies could have some benefits as: saving money, increasing sales and

[4] Gregor Petri "Vendor lock-in and cloud computing", 2014

for making better the business model of the company, that are very important because the usage of them can parry business failure and drive it to success for a long time. By using a business model we can see what the relationship between customer needs is and what the company is offering, between value and price, between revenue and costs and between effectiveness and efficiency.

The four elements of business model are:

- Service design- what services the company offers to specific customers;
- Organization design- the role that each player has in the network and describes the network that is providing the services and products to the users;
- Technology design-for the service to reach an end, technology design contains the description for the technical system and architecture that is required;
- Finance design- revenue is wished to be achieved through the services and costs.[20]

Business strategy represents the methods through which companies are putting the foundation for their mission, goals, are creating projects and plans, after that they will invest time and money to make these plans come true. The company' strategy when adopting business strategies is to touch long time objectives, by combining activities from different departments.

When using business strategies, companies can meet resource issues like: the finance allocated for a factory will increase. Before companies will start sing strategies they will have to decide which products will receive the majority of resources. Business activities are the ones that influence the strategies adopted.

There are two main categories of business strategies:

- Generic strategies
- Competitive strategies

Organizations can fallow one of the main types of generic strategies:

- Growth is when the companies will afford to buy new businesses, develop new products;

- Internationalization/globalization takes place when companies are extending and they are opening headquarters in more and more countries;
- Companies should focus on what they know to do best.

Competitive strategies means that companies should try to dominate the market by offering products and services that are better than the competitors' products and services. For this the company shouldn't steal the ideas of the competitors, they should come with their own ideas that are better. We can identify two ways of competitively:

- If a company is the market leader, they can afford to offer products and services at lower prices;
- The company can ask for a higher price than his rivals, if the products and services that are offering are better and different from the ones offered by competitors.[19]

5.5.1 Business capabilities

Business capabilities are the elements that are helping the company to find how they can exercise in their benefit the differences that exist in the business, so that they are sure that the main attention is given to the areas that are the most important for the company.

Business capabilities utility is to configure best the services and products offered by the company. They are driven by a team or person from the company and completed by a business process. The user and company have the power to take actions when they want to change something.[S. Ilie, N. Nedelcu, 2013]

5.6 Organization structure

Organization structure represents the hierarchy that exists within the organization. Having an organization structure is useful, because it is much easier to recognize the responsibilities for each job and where they fit better in the organization. Organization structure it is also helping the company to reach the goals.

Each type of organization structure was developed with the scope to help the organization to reach his goals. The organization structure types are:

- *Divisional structure* can be seen in companies that are concentrated on business;

- *Geographical structure* means that the company can have headquarters in more than one locations;
- *Functional structure* it is in function of the responsibilities of each job;
- *Matrix structure* it is mandatory for the companies that have a geographical structure.

Even with all the types that exist for organization structure, which are helping the organization to reach her goals, all of them are reporting to the headquarter to which it belongs. If the organization decides to create other headquarters in other locations, then the organization structure will make this happen by providing space for this.[21]

Below I will present the six models of organization structure:

- *Line structure* represents the relevancy that is between the team members and manager;
- *Cross-functional* and self-managed team presents people from different areas of work that have common goals;
- *Network structure* means that a network structure is used by a company to deliver tasks for a providers that is not part of the same company, by keeping a relationship between them;
- *Line and staff structure* represents a multitude of layers for management;
- *Cluster structure* means that the company has a high number or divisions and subdivisions;
- *Matrix structure* means that efficiency is at high capacity when employees of the company are structured by their credentials. [22]

The organization structure helps us to realize how the flow of information takes place in the company, because the information can delay the decision taken if it is modify or someone from outside the company gains access. This is called pyramid of hierarchical structure. Hierarchical communication presents how the information is shared and stored in the company; and how it is affecting the members of the company. Manager of the company has to give feedback about his employee's performance; he also has to deliver to the employees the details about the companies' goals and details about the job for each employee. In turn, employees also have to give information about themselves to the manager.[S. Adubato, 2005]

5.6.1 Roles of organization structure

Departments inside a company are structured with the help of organization structure. According to the business size, there can be many levels of management and many employees.

Organization structure has the fallowing roles:

- *Efficiency* means that companies should exploit their resources at maximum and they shouldn't waist any of them.
- *Harnessing experience* the departments inside the company are structure depending of their functions.
- *Decision making* means that companies are structure their organization so they can choose the best way to solve problems or to find solutions.
- *Communication* is very important in a company and for big organization is effective when the information comes from the higher level and it is going to the other levels in the organizations structure.[23]

5.7 Knowledge and information management

Knowledge represents the skills and information that we have from our studies and experiences. Information represents specific data that is arranged in a specific way for fulfilling a specific goal; and it is submitted in a context that can help the reader to understand better the requirements of a task. Information has to be precise, because it can lead to a behavior change, outcome or decision. [24]

Knowledge management is used in different types of organizations. Organizations are curios how companies are handling the knowledge between their employees. Because computers are doing the people jobs, more and more often, knowledge became an interesting subject. Because companies' goals cannot be reached only through traditional ways, they need to gather all the knowledge that the employees have in a single place, so everyone can use them when needed. Knowledge management it is a tool through which the company can see the opportunities that were achieved with the help of knowledge. Knowledge management it is about sharing, creating and identifying knowledge. [University of North Carolina at Chapel Hill]

Knowledge management it is considered to be a solution for keeping the organization to go forward, because IT sector was affected in the last years by having holes in the way the

information and knowledge were directed. Knowledge management is a tool that helps the organization to capture, structure, value and share his intellectual properties.

There are two types of knowledge:

- *Tacit knowledge* the business is growing and the employees are using the information that they know.
- *Explicit knowledge* the business is growing when employees are using information that is on paper. [J. Damsgaard, 2001]

Within an organization there are several processes that occur: creation, dissemination, upgrade and application at the organization survival. The company wants to increase his value on the market by identifying, applying and integrating knowledge in different ways. The company can be affected in a positive way, when employees are exchanging knowledge between them by using technologies.

There are four organizational processes for knowledge management:

- Knowledge creation it happens when new knowledge is created by the companies employees;
- Knowledge storing/ retrieval is about the way in which a relevant knowledge is identified and access;
- Knowledge transfer is about the way in which the knowledge is shared in the company;
- The last organizational process is referring to how the knowledge is transformed in an action. [J. Damsgaard, 2001]

5.8 Summary

In this chapter I am presenting the main theories that I am going to use in my analyze that I had with the two companies mention before.

Theory of demand and supply is important for my project, because with the help of these factors the prices are established on the market. The demand and supply theory is important for my thesis, because the cloud computing market represent a competitive market where there are many providers and customers, whom are attempting to buy or sell products that are similar.

Pricing strategies are referring to the strategies that are applied by the providers to increase or decrease the prices of a service or product.

Theory of innovation represents an important factor for the company if they want to grow on the market innovation can be a first step that is applied for a business to have success and for a fast growth.

Theory of lock-in is important for my project, because many customers are locked-in for one provider because of the contract that is signed, or the customer can be locked-in on the products that the provider is offering. In the subchapter of lock-in I presented the types of lock-in and why it is good to avoid them while there is still a chance.

Business strategies, organization structure and knowledge and information management are important in the project because companies have to take in mind the strategies that they will apply when a cloud computing is adopted and how is this going to affect the structure of the company. With the adoption of a cloud computing the flow of information is changed in the company and employees are getting access to information that weren't available before or they would have to go through some steps to gain access to the information.

Chapter 6 Description of the interviewed companies

The purpose of this chapter is to get familiar with the companies that I am going to analyze later in the project. Here I will talk about the activities of each company, their products, and the field that they operate; and also I will provide some information about their partners.

6.1 C&A

It is a fashion company that first started in Germany in 1841 and since then they became an international company, having headquarters all over the world. The fundamental characteristics are based on the traditional values. Their business strategies and management structure is based on the principle of sustainability, because they are dealing everyday with people from all over the world and they have to adapt to different cultures and fashion trends. Their business relationship is based on a Conduit code that specifies clear ethical, social and ecological standards. Since 2006 they have started to present collections that are totally ecological for the environment, having contracts with the small companies that are producing the material and in this way they are helping the small businesses to grow. [6]

6.2 Dialogue One

Dialogue One A/S is a Danish marketing consulting company with more than 10 years of experience in the industry. At the moment, the company is operating primarily in Germany, Sweden, Norway, the Netherlands, Finland and Denmark. Therefore, there are native speakers for each operational market, in order to ensure quality and efficiency of the services.

As a fact Dialogue One has 25 employees and the company's business comprises different marketing concepts, services and channels, but originally Dialogue One was founded as a strategic telemarketing company back in 2002, having only 2 employees at that point.

The company growth resulted in growing ambitions as well. The company started a transition from strategic telemarketing into marketing consulting, focusing on new service areas and solutions. This led to new collaborations with international clients and well-known brands, more employees and a multinational team, new headquarters and various new projects.

As recently Dialogue One has begun the transition from telemarketing to market consulting in order to provide full customer care services, the company is currently looking into software development project proposals to boost customer experience. On one hand Dialogue

One has a stable and steady utilization of traditional static file management and meetings' planning between company and clients, on the other hand this approach challenges the company's capabilities to respond and adapt to changes. They also might miss opportunities to early adopt the newest technology.

Nowadays time saving is an important issue for everyone, especially for those that can find themselves with an overbooked schedule. Therefore smartphones and tablets can be an efficient way to improve the communication, both for business to business and business to customer.

As improving the communication with its customers is mandatory, a mobile application, that can be a time saver for the clients and moreover it could facilitate the communication between Dialogue One and its clients, could be the right solution.[7]

Chapter 7 Analysis

This chapter of the thesis is dedicated to analyze the data that I have gain through the interviews and how this data is going to help me to answer my research questions. For this I am going to use both qualitative and quantitative methods. In my analysis chapter I will use the interviews conducted with the two companies, I will also use specific data received from the interviewed companies and that I found on the web and I will give my opinion regarding the research questions that I will try to analyze. For this I will combine the theory presented in the chapters before and I will argue the different points of view, from interviews and literature review. One of the companies is providing the cloud for the customers and the other one is a customer that is paying subscription to the providers.

7.1 How is cloud computing influencing the flow of information in the company and how is cloud computing integrating

Flow of information represents an important issue in a company, because as I presented in the literature review chapter this can help the company to save money and will give access to the employees to information and knowledge where ever they are, and they could access from any device.

From the interview conducted with Dialogue One I found that they are offering to their clients a software as a service (SaaS) , which improves the communication between the company and clients. The software is "a mobile application that is connected to a server and retrieves the necessary data"[5], which permits to the company to connect with clients for creating meetings, facilitate the communication and the information is delivered automatically to the clients. When I asked why the company decided to use this specific type of cloud the contact person said that time represents an issue for everyone in this days and tablets and smartphones are representing a sure way for them to improve the communication both for business to business and business to customer. Because Dialogue one is not using the system that they developed and it is only for the customers, could represent a negative part, because the system could offer to the company a better access to information. The fact that the clients are the ones using the system provided by

[5] Dialogue One interview

Dialogue One, can affect the information, because many people can modify it having access. Dialogue one should think on start using their application, because it could bring benefits like: lowering the costs for transmitting the information, the information is more precise and the performances of the employees will increase. From theory I found that because many people can have access to information, this can affect the security. Dialogue One can improve this by giving access to specific parts only to some employees, and they should have a unique password for login. This principle can be applied for customers also.

On the other hand C&A are using cloud offered by Google and Dropbox , because at that moment this two companies offered the services that integrated best in the company and were satisfying the business demands. The company decided to move to the cloud, because in the last years the start to expand a lot in many countries and this force them to modify their organization structure so that the company could increase the performance. By using this two cloud providers the flow of information improved inside the company, because employees are storing the information and knowledge in the cloud and in this way they are helping their colleagues to save time when they are searching for data; so they don't have to send e-mails or call for finding some information, they are accessing the folder where is stored. The information is stored in the cloud depending on the projects where they were used. To gain access to specific information the employees have to log-in using account details that were provided for them.

Regarding the theory and literature review, I can affirm that C&A is protecting the information stored in the cloud, because each employee has unique password to login. By transferring all the information in the cloud they facilitate the flow of information in the company and in this way they succeed to reach a purpose that they mention in the interview, to improve the performances of the company and they also saved money. Regarding the theory of lock-in C&A has sign contracts with Dropbox and they are locked-in for a period of 12 months in the beginning and after that they selected the possibility to pay the subscription every month. And if their privacy is violated they will have the possibility to terminate the contract earlier, if not the company will have to pay a fee. With Google the company is not paying a subscription, because they decide that the services offered for free on the web are enough. Dropbox is the cloud used to store all the data and this is the reason for paying subscription.

7.2 How cloud computing will improve the revenue of the company

Revenue represents the most important aspect in the company. All the decisions that are made are well related with the increase of the revenue. When a company decides to make changes inside, the first think that they look at is how is going to affect the budget. From the literature review we can notice that cloud computing is a new strategy adopted by companies to increase their revenue, because the costs in IT are reduced and the investments in IT systems will not be so high; because they are paying only for the services that they are using. From the data presented in literature review chapter we can notice that the market leaders on providing the cloud have significant increase in revenue.

Regarding the Dialogue One, that is a cloud provider, I have found that the revenue of the company has increase, because by using the application provided by them the time spend has decrease significantly, but on the other hand they had to pay a person that will do the maintenance for the application. Being a new product the company had to spend money in the beginning for moving the current database management system to the cloud database and this took four months; time in which the company lost money. Because there weren't any changes in the organizational structure of the company they are trying to teach all the employees how to work with the application. From data received from the company, I found that they have until now 75000 users and their number is increasing from one month to another. Being a new cloud provider on the market they are applying a penetration pricing strategy, by offering the product at low price, so that they can grow on the market fast and easy. In the interview the contact person also mention that before they start developing the product they made marketing research and they found that the is a real demand for products of this kind and also, using this market research the company established this starting price for the product.

In C&A's case, being a cloud customer, it took time for all the employees to get used with the new system. It took one year for the company to finish the implementation of the system. In the beginning they analyzed the market, to find the best cloud providers that will help them to reach the business goals. They analyzed the advantages and disadvantages for each provider and after that they start implementing the cloud in the company. After the system start to be used by all the employees, the advantages could be seen:" there are a lot of services we

benefit from at a low cost, comparing to the costs of each service if there were outsourced separately: a big amount of space for data storage, back-up and recovery services, etc. But the most important fact is the easy access to the information: especially for the retail activity of our company, it was a huge improvement to create the context where the IT department employees, and not only, can have access to the information needed, in real time, regardless their location or the devices used."[6] This offered the employees the possibility to have access to information whenever they need it, for example when a new store is open almost all the employees are helping and in some cases they need to use data that they used before. Because the IT department suffered some modifications and some tasks were taking from them, the number of the employees had to be lowered, and so the company saved money from this point.

From the interviews and theoretical framework, we can notice that revenue plays an important role in the companies, because all the strategies and systems that are adopted are well researched and picked in such a manner that will increase the revenue of the company. In C&A's case they made market research for almost a year before decide to implement cloud computing. Dialogue One decided to use cloud as a way to enable innovation in the company and they are trying to attract customers by offering low prices.

7.3 Challenges using cloud computing

Like any other new system that is presented, the use of cloud computing in companies presents some challenges in terms of employees' perception of the system. Regarding the theory that was presented in the theoretical framework about challenges that can appear when a cloud is adopted, both companies had difficulties with the employees/customers to adapt to the new system and that is why they had training periods, so the employees/customers could learn how to use the system in a proper way, so that it could increase the efficiency and performances of the company. An important challenge is represented by the security and privacy of information. As I mention before in this chapter both companies are taking this matter serious, because they are always working to ways of improving the system and from what they know there weren't any information leaks.

[6] C&A interview

7.4 The use of cloud computing is influencing the business strategies?

Before a new product is chose for being used in a company or being developed, the companies will have to do a market research for finding out if there is sufficient demand on the market for the product that they will want to develop or in case when a company will implement a new system, they will have to analyze all the competitors that exist on the market and chose the best product that will help them to fulfil their business demands. If the correct product it is selected the company will achieve some benefits that will help them grow on the market.

In Dialogue One case, the development of the new application helps them make some changes inside the company. They start a transition from strategic telemarketing to marketing consulting; and they soon start having new service areas and solutions. This strategy that they adopted, helped the company to gain more customers, they entered the international market and also having signed contract with well-known companies. With the help of the new approach that they adopted Dialogue One grow on the market. The use of cloud computing made from Dialogue One a market leader in Denmark and on the international market the company is in continues growth.

From the interview with C&A I noticed that the business strategies of the companies didn't changed after the adoption of the cloud. But the cloud helped the employees to perform their duties much faster having access to information that until then were difficult to access. There is also information that is not available to all the employees, as I mention before they need special approvals to gain access to them.

Standards represent an important issue for companies that are operating online, in Dialogue One's case, because the company has to take in mind all the aspects of a website (multi-language website, availability for people with disabilities, visible in search-engine), facilitating the user experience. Because Dialogue One has a website and the application developed by them is for smartphones and tablets, they will have to follow some standards. Therefore, Dialogue One's website does not apply them, as it is only in English and people that are not familiarly with this language cannot use it; and the information available on the website is superficial. They should write more information about their services and in the same time spend some time in improving their website.

7.5 Cloud computing is improving the knowledge and information management

Information and knowledge management represents an important business strategy for both Dialogue One and C&A. Both companies need to have in mind the following aspects when new systems are adopted: advantages that the company will have using/providing the cloud, innovation, they will also have to be aware that the technologies are evolving every day, they will have to adopt the best strategies that will help them penetrate the market. All this improvements can be succeeded with the help of innovation. In Dialogue One case, they will have to come with new functions for the application that they developed so the company could progress or even develop new applications. The fact that the company changed the working fields, from strategic telemarketing to marketing consulting, represents an important step in the growing of the company. For C&A Company, the situation is different, because they are the ones that are using the cloud. As I affirmed before the innovation that the company is using is different, because the information and knowledge can be found in the cloud and are available for new changes. The changes are made when the information and knowledge that are stored in the cloud are not accurate anymore and the employees are the ones that are modifying them. After the company decided to implement the cloud, as I mention, all employees benefited of a training period that help them to get used with the new system and also the process of sharing information was improved, because all the work that is done for a project, for example, is saved in the cloud and all the employees can have access to those information and knowledge. There are some special cases, where only few employees can gain access to important information, due to the fact that those information are related to private data about customers.

7.6 Cloud infrastructure

A cloud infrastructure represents the hardware and software components required so that the storage of data can take place. When Dialogue One contact person was asked about the infrastructure of their application, they answered that they cannot help me with this information, because it is a private on, but they mention in the beginning of the interview that they are offering a SaaS infrastructure of the cloud. In C&A's case they are using the infrastructures offered by Google and Dropbox, so they didn't had any knowledge about how they are functioning.

7.7 SWOT analysis

Thanks to the research conducted on the market, from the interviews and other sources, I have determined that it will be helpful to highlight the main positive aspects, to present the weaknesses, to find out the new opportunities and handle and remove the threats in my case studies.

Strengths	**Weaknesses**
- The transition from strategic telemarketing to marketing consulting represents new service areas to focus on; - Dialogue One is the only company that is offering this kind of application, so they have the opportunity to change the prices; - The fact that C&A depends on the infrastructure provided by the cloud providers, gives to the IT department the opportunity to focus on the other services like: POS maintenance, software maintenance, petty cash maintenance; - Security offered by cloud providers is high; - Operational costs are low; -Flexible customization; - Services are available at any time and from any device; -Highly qualified staff.	- Because the application developed by Dialogue One is not used inside the company, creates a weakness point, because it could help improving the flow of information; - Improvements that can be done to their website; - Due to the fact that the information is managed by more people it can be modified until reaches the client; - Dialogue One had to hire a person that will do the maintenance of the system; - C&A employees have access to mainly all the information that exist on the cloud and anyone can modify/ delete something; - Customers are lock-in for one year with the cloud provider.
Opportunities	**Threats**
- Extending on new international market - They could develop new technologies for their customers	-New competitors in the marketing consulting; - New competitors in the design marketing; -Changes in environment (e.g. law and regulation).

Chapter 8 Conclusion

My thesis reflects on the adoption of cloud computing in companies and what are the implications. I have looked in the impact that cloud computing has on the business and how the service providers are competing between them on this market, so that they could become market leaders with the help of the services and products offered by them.

First step was to make some research regarding how cloud computing works. This research was made with the help of literature and web search. This research has brought me deep knowledge in the cloud computing architecture and how it is working, what are the security and privacy issues and solutions. When I company decides to move to a cloud they will have advantages and disadvantages, challenges that will bring revenue losses to the company, for example the company will have to pay fees if he will like to terminate a contract with a cloud provider. I also conducted a research about the main cloud competitors that exist on the market and for the services that they are using. From this research I could have an inside look at the products that they are offering and why they are the market leaders for this technology. Second step of the thesis is represented by the theories and literature review that helped me to answer my research questions. This step represents an important part for my project because of the knowledge that I gain through them, knowledge that helped me to conduct proper interviews and analysis.

After I had assumed these issues, I had to prove the knowledge that I have gain through my literature and web research; I had to conduct two interviews with a marketing consulting company, Dialogue One, and a design company, C&A. Both companies offered me an insight look of the IT department, why they decided to provide/adopt a cloud. What are the benefits of using such of technology and what was the impact that this technology had on the business.

From all the researched that I have done for writing this thesis I can affirm that cloud computing represents a proper way for companies to increase their revenue and employees performances, by choosing the proper cloud service that is suitable for their goals. By using a cloud technology companies can enable innovation and so new knowledge can be created. A bad aspect of using cloud is represented by the cloud providers, because they can force the customer to be locked-in with them for a period of time. The research questions that I formulated in the

beginning of the thesis were answered with the help of the interviews and literature research that I have discussed earlier in the thesis.

Cloud computing is the new technology that companies decided to adopt for helping them to grow on the market. Cloud computing offers the possibility to have their own infrastructure or to use the one offered by a third part. Cloud offers to the customer four types of cloud: hybrid, public, private and community which are helping the customers to have information about the services. One of the most important issues regarding cloud computing is represented by the security of the cloud, because companies are storing important data and they wish to have them well protected. But the cloud security system is effective, because the information that is send to the user is encrypted and verified before the decryption.

When a cloud is used the client has the benefit that he can access the information stored in the cloud from any device, at any time and from any place; but if the internet connection is not working properly the data stored in the cloud cannot be access and there are also some security issues because there aren't any strict regulation for this. Standards are playing an important role in the development of the cloud, because if the standards imposed by the relevant organizations are not respected, then innovation cannot take place. And also by using virtualization in the cloud, resources are going to be used in the proper way and in the same time there are going to be used only the necessary resources.

From the literature review chapter I could observe that cloud computing is used by companies as a way to increase their revenue, but also as a way to enable innovation in the company. There are continue researches that made for improving the knowledge and information management with the help of cloud computing because by using this technology the information and knowledge is shared faster between employees.

In conclusion, cloud computing represents a positive impact for the businesses, because it will help the companies to grow on the market without having to invest in a new infrastructure and the systems offered optimized so that the programs own by the companies will integrate with no problems in the new infrastructure. In the future there could be done more researches regarding the regulation and laws that cloud computing have to obey on; and also on how the cloud is affecting the organization structure of the company.

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Appendix

1 Interviews

1.1 Dialogue One

1. Why did the company decided to use cloud computing and which one they are using?

For the past many years, companies have confronted an issue - adapting and responding to the rapid development of opportunities that new IT technology can offer. The IT technology development in recent years shows a new trend, which is emphasizing on communication and data availability. This trend allows companies to develop smart and cloud solutions helping the employees solving daily tasks at any location by implementing new technical tools.

SaaS – Dialogue One provides to client companies a software as a service, which facilitates the communication between Dialogue One and its clients. The actual software is a mobile application that is connected to a cloud server and retrieves the necessary data.

2. . Why the company decided to use this specific one?

Nowadays time saving is an important issue for everyone, especially for those that can find themselves with an overbooked schedule. Therefore smartphones and tablets can be an efficient way to improve the communication, both for business to business and business to customer.

The steady utilization of traditional static file management and meetings planning between company and clients - along with the negative image association - have been an increasing problem for marketing companies in the recent years. Customer reactions are not always friendly, as bad experiences with different companies and time-consuming routine file administration contribute to the negative stereotype.

The application connects Dialogue One with clients to create sales meetings, facilitate communication and automate information delivery to clients. It should provide the necessary tools for thorough meeting planning, time management and information flow.

3. How long it took to move from the system used by the company to cloud computing?

The necessary time to make the transition was four months, because the company had to move current Database management system to the cloud database.

4. What was the process time from preparation to implementation?

Dialogue One was using only Microsoft Access databases, a separate database for each project and client. The direct consequence was the arise of data duplicates.

The new cloud based data management system is creating a joint Data Warehouse, comprising all smaller databases that are currently in use, preventing data filtering, statistics and trend operations across clients. Afterwards, a mobile phone application was developed, which is connected to the cloud database.

5. What are the most important challenges that appeared when the service started to be used?

The users of the system had to adapt to the new one and therefore there were offered training and coaching sessions to the project leaders and persons in change.

6. +7. What are the benefits, regarding the costs for the company? How the company benefits from the cloud computing?

Action	Type	Description
Maintenance	Cost	Software needs maintenance; therefore Dialogue One will have to hire a Software Engineer to maintain the system
Reduce employees working time	Savings	An efficient application with use of meeting planning and statistics and reporting overview, can save the time used by employees to communicate with the clients.
Time saver	Customer Satisfaction	This application is having an integrated way of showing the shortest route to the location of the meeting; therefore the clients will be very grateful for the saved time.
Unique	Stronger	As there is no other company similar to

	brand / New clients	Dialogue One which provides this kind of mobile application; Dialogue One could has the chance to become a well-established market leader and further continue its growth on the market.

8. +9. *How the business strategies of the company changed after the cloud was adopted? The* fact that the company is using a cloud, the knowledge sharing inside the company is improved? And in which way?

The company started a transition from strategic telemarketing into marketing consulting, focusing on new service areas and solutions. This led to new collaborations with international clients and well-known brands, more employees and a multinational team, new headquarters and various new projects.

10. How is the cloud influencing the flow of the information?

The system is used by the clients and not by the Dialogue One.

11. How are the employees receiving and responding to this service?

It provides a better way of transmitting information, in terms of time consumption. Furthermore, it provides statistical data for the clients.

12. What is the role of it department in the company?

The IT Department is maintaining the current system and tries to find new ways of improving the system.

13. What impact the cloud has on it organization structure?

There was no change

14. How the infrastructure of the cloud looks like?

Confidential

15 What are the implications (legal, political, business.....) for the company if they are losing control over some aspects of the service?

The system is very secure and therefore the probability of data leakage is very low. The company is working constantly on improving the security of the application.

16 Dialogue One considers that the cloud chose to be used, is offering the security and privacy needed for their information? Where there any attempts of hacking?

Yes, the security and privacy are at very high level.

No, that we are aware of.

17. If the company decides to change the provider of the cloud what are the implications? regarding the contract

The minimum period of a contract is 12 months, but the customers bring evidence that contract agreement were not respected, the contract can be terminated.

18. What can be improved and why?

The software developers are working continuously on improving the system. The main areas of improvement are: security, usability and performance.

19. How the cloud helped the company to grow on the market and what was the impact had on it?

The company became a well-established market leader in Denmark and further continues its growth on the international markets.

20. What are the advantages of how the company perceived the cloud, what are the recommendations offered and where there any problems?

The clients were satisfied with the services offered. We advise any company, which would like to promote and build a strong brand and ensure long term strategic development, to focus on new technologies such as cloud computing.

3.1 C&A

1. Why did the company decided to use cloud computing and which one is used?

The company's expansion from the last few years brought on the need to develop the entire organization but also its departments, in order to increase the performance of the activity and of

the employees and, furthermore, the need to adapt to modern technologies and environments. In this context, regarding the IT department, the company decided to embrace the advantages of using a cloud computing and to implement the cloud which best fits the needs and the activity of our organization.

2. Why the company decided to use this specific one?

The company decided to use the cloud offered by Google and Dropbox, because at that moment was the one that was most suitable for the company's needs and of course it was also about the costs for the subscriptions that had a huge influence.

3. How long it took to move from the system used by the company to cloud computing?

When the decision was made, the company scheduled a proper period of time for the preparation and implementation of the process, because the entire transition implied some significant steps which had to be done one by one, in an effective way, in order to ensure the success of the implementation: research of the circumstances, background, advantages versus costs, arrangements, testing and finally the factual implementation. All these phases came to a total period of a year.

4. What was the process time from preparation to implementation?

Well, as I was explaining before, it has been almost an year from the preparation to the implementation; of course that the actual preparation was preceded by a period of planning and administrative organization during the decision making process, but also by a period of research regarding the benefits, costs, legal requirements and so on.

5. What are the most important challenges that appeared when the service started to be used?

I consider that one of the most challenging steps when the service started to be used was the training of the employees, both in the headquarter but also in stores, summing up approximately 200 people. The training process implied not only learning how to use the cloud computing in an effective manner, but also explaining the need of using the system, its benefits and moreover, trying to encourage and develop the usage of the system into a dependence for the employees, in order to generalize the process in the whole country.

6. +7. What are the benefits, regarding the costs for the company? How the company benefits from the cloud computing?

Once the system was implemented and became used by all employees, of course that the advantages were noticeable. First of all, there are a lot of services we benefit from at a low cost, comparing to the costs of each service if there were outsourced separately: a big amount of space for data storage, back-up and recovery services, etc. But the most important fact is the easy access to the information: especially for the retail activity of our company, it was a huge improvement to create the context where the IT department employees, and not only, can have access to the information needed, in real time, regardless their location or the devices used. This has a real importance especially on those periods when the company opens new stores and most of the employees from the head quarter are engaged in different preopening activities at the location of the new stores, but they still need to support the others stores in different matters and issues which can occur. Furthermore, using a cloud computing on a regular basis helps employees to save time because they save data and files in only one same location, where anyone from the company can access it, instead of spending time for saving information on external hard disks, sending e-mails, etc.

8. +9. How the business strategies of the company changed after the cloud was adopted? The fact that the company is using a cloud, the knowledge sharing inside the company is improved? And in which way?

The entire process of sharing information was improved along with the implementation of the cloud computing, because all employees have access to the information they need in order to perform their daily duties, but, on the other side, there is also confidential data which is available only for those employees who are allowed and need to access that specific information; in this way, we consider that the whole process of sharing information was optimized depending on the employees duties and needs..

10. How is the cloud influencing the flow of the information?

The flow of the information has significantly improved because employees save real time by storing data in the cloud and in this way the other colleagues from other stores or from head quarter can easily find the information they need instead of asking for different files via e-mail, phone.

11. How are the employees receiving and responding to this service?

The employees have really adapted themselves to this new service probably due to the fact that training was really solid and not short, because we wanted to ensure that all employees know how to use the system, on the one hand, and that all of them understand and realize the importance and the benefits of using the system, on the other hand; after the training period they have really embraced the usage of the system and the feedback we received from them was a positive one.

12. What is the role of it department in the company?

The IT department has a fundamental role in the company, especially because it ensures the proper working of the sales activity, it maintains the functioning of the petty cash machines and fiscal printers, which are requisites in the stores. That's why we consider that at C&A, and especially in the entire retail activity businesses, the it departments have a more extended role, beside the traditional services they provide, because they also have the responsibility to ensure the petty cash maintenance, POS maintenance, software maintenance, etc.

13. What impact the cloud has on it organization structure?

There weren't any changes in the organization structure of the company.

14. How the infrastructure of the cloud looks like?

The company doesn't have her own infrastructure; it is using the one provided by Google and Dropbox.

15. What are the implications (legal, political, business.....) for the company if they are losing control over some aspects of the service?

Before starting preparing the implementation of the system, some research studies were made, and one of them also referred to the security of the information. These studies did not release some major risks regarding privacy, but of course that the company also implemented some additional protection measures, in order to double the level of the security. There have been no attempts of hacking by now.

16. C&A considers that the cloud chose to be used, is offering the security and privacy needed for their information? Where there any attempts of hacking?

These two big companies were chosen to be used after long researches and we have decided that our data is well protected. Since we start using them we didn't had any data disclosure.

17. If the company decides to change the provider of the cloud what are the implications? regarding the contract

The company has a contract signed for 1 year with both companies and if we decide to terminate it we will have to pay a fee. But we are allowed to terminate the contract if our privacy is violated.

18. What can be improved and why?

Until now C&A is satisfied of the services offered by Google and Dropbox.

19. How the cloud helped the company to grow on the market and what was the impact had on it?

Because all the information are stored in a single place and they are classified according to their importance and subject it is much easier and faster to finish a project. The usage of cloud computing is helping us carry out our tasks faster; and so the new products reach the store quickly.

20. What are the advantages of how the company perceived the cloud, what are the recommendations offered and where there any problems?

The clients are satisfied that our products reach the stores in a short period between collections, the new locations are opening, our employees are satisfied because they have access faster to the information that were already used and they can see the new projects that are ongoing.