Cloud Computing in the 3PL industry
A profound insight into the benefits & challenges of cloud-based services:
A two-fold approach

Master of Science Thesis within
International Logistics & Supply Chain Management

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Lastly, I am more than grateful to my friends who supported me all the way, until the completion of this thesis.

I personally would like to dedicate this thesis to the most important persons of my life, my beloved mother and sister.

Lastly, I would like to dedicate this thesis to the most important persons of my life, my beloved mother and sister.

Παντα στο νου σου να χεις την Ιθακη (...) Η Ιθάκη σε έδωσε τ’ ωραίο ταξείδι. Χωρίς αυτήν δεν θα βγαινες στον δρόμο’ Κ.Π.Καβάφης

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**Title:** Cloud computing in the 3PL industry. A profound insight into the benefits & challenges of cloud-based services: a two-fold approach  
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**Abstract**

**Problem:** Practical industry advancements associated with cloud computing in the context of supply chain rapidly proliferate. However, there is a lack of academic research that investigates the application of this technology from a theoretical standpoint. A significant part of the literature explores the perceived advantages and disadvantages related to the decision-making process of the adoption of the specific technology, rather than the perceived benefits and challenges when the cloud has been already adopted and used. Furthermore, absent from the literature is a thorough understanding of the cloud-based applications in the industry of 3PLs, and the perceived benefits and challenges not only from the user’s side but from the supply side as well. The research is limited referring to critical aspects of cloud computing applied on 3PLs within a theoretical basis. Thus, in this study, the authors aim at filling these gaps by exploring what types of cloud-based services are applied on 3PLs, what are the perceived benefits and challenges from the 3PLs perspective as well as from their cloud providers/IT companies.

**Purpose:** The purpose of this thesis is to investigate what cloud-based services are used in the 3PL industry as well as the challenges and benefits perceived by the cloud providers of 3PL firms and by the 3PL firms that use this technology. In order to gain a thorough understanding of this usage and grasp the full picture within the focal industry, the research is focusing on the perspectives of three cloud providers and three 3PLs that use and/or provide cloud based services.

**Method:** This is a qualitative study. The authors are making use of a case study strategy with six investigated companies. The majority of the data is gathered from semi-structured interviews, while documentary secondary data concerning basic companies’ information, have been collected as well. The analysis of the findings is based on the revision of the set-up a priori codes by the authors. A cross-analysis between 3PLs and cloud providers of those firms is being conducted in order to identify the perceived challenges and benefits of cloud by both, within the 3PL industry.

**Conclusion:** The findings of this thesis demonstrate Software as a Service (SaaS) and more precisely, transportation administration (TA) software, as the most prevailing cloud-based system applied in the 3PL industry nowadays. It has been revealed that 3PLs benefit from cloud technology in terms of cost savings, strategic flexibility, access to leading-edge IT resources and security, whereas the challenges faced are related to performance and strategic aspect. Furthermore, the authors identify and propose the different phases of cloud computing implementation in the 3PL sector. Lastly, a model of perceived challenges and benefits of cloud in 3PLs firms has been compiled and presented.
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DEFINITIONS

**Data center**: a physical facility that houses computer systems and associated components, such as telecommunication network devices and storage systems. The data center typically includes redundant or backup power supplies, redundant data communications connections, environmental controls and security devices.

**Distributed computing**: process of aggregating the power of several computing entities, which are logically distributed and may even be geologically distributed, to collaboratively run a single computational task in a transparent and coherent way, so that they appear as a single, centralized system.

**Grid Computing**: a system that supports the execution of parallel applications containing heterogeneous distributed resources, providing a consistent and inexpensive access to resources, regardless of user location.

**Logistics**: the part of the supply chain process that plans, implements, and controls the efficient, effective flow and storage of goods, services, and related information from point of origin to point of consumption in order to meet customer requirements.

**Module**: a unit of a program that carries out a specific function and may be used alone or combined with other modules of the same program.

**Parallel Computing**: the simultaneous execution of the same task on multiple processors in order to obtain faster results.

**Supply chain management**: the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. It also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third party service providers, and customers.

**Utility Computing**: the rental of computing resources such as hardware, software and network services (bandwidth), in accordance with the needs of customers and almost automatically.

**Virtualization**: a technology which consists of the technique used to hide the physical characteristics of computing resources so that other systems, applications or end users can interact with these features.
ABBREVIATIONS

3PL: Third party Logistics

e.g: exempli gratia (for example)

ERP: Enterprise Resource Planning

LSPs: Logistics Service Providers

NIST: National Institute of Standards and Technology

R&D: Research and Development

RFID: Radio Frequency Identification

SCM: Supply Chain Management

SLM: Service Level Management

TA: Transport Administration

TMS: Transport Management system
I Introduction

This chapter aims in introducing the reader to the topic of cloud computing under a logistics and supply chain management perspective. The general background, the problematization and the purpose are presented in this first section as well as the research questions that this thesis seeks to fulfill. Furthermore, the research limitations and delimitations are stated and last but not least, the structure of the present thesis.

1.1 Background

Cloud computing is a relatively new concept in information technology, as first emerged at the end of 2007 (Li, Wang, & Chen, 2012). It connotes a shift in computing as both hardware and software are virtualized (Schuldt, Hribernik, Gehrke, Thoben, & Herzog, 2010) and constitutes the development of Distributed Computing, Parallel Computing and Grid Computing, based on internet (Jun & Wei, 2011). The data are being stored 'in the cloud', in a remote data center where thousands of computers and servers are connected. Information and user applications are stored on those servers in the web; hence, the transition to a cloud practically makes everything turn into a service (Varbanov, 2011). Cloud computing entails large data centers, which offer economies of scale, cheaper computing power and especially the flexibility to pay only for what you use. A widespread view is that both users and developers are thus able to do more with less: they have access to greater computing power without having to invest large sums in equipment.

Cloud computing may be described as one of the prominent technology trends; several platforms have been emerged and developed based on this technology as the Amazon Elastic compute cloud (EC2), Google App Engine, Microsoft Azure, Sunnetwork.com and GRIDS Lab Aneka (Buyya, Yeo, Venugopal, Broberg, & Brandic, 2009). Five are the essential elements of cloud computing stated in the research of Dillon, Wu and Chang (2010); on-demand self-service, broad network access, resource pooling, rapid elasticity and measured service. On demand supply and billing according to the amount of usage are two of the most distinctive features of cloud computing. A categorization of cloud computing models has come up from Dillion et al. (2010), who divide them into four types; the private, community, public and hybrid cloud, while Ferreira and Moreira (2012) added one category more, the partner cloud.

Cloud is clearly articulated into three types of basic services, each corresponding to specific business needs; IaaS (Infrastructure as a Service), PaaS (Platform as a Service), and SaaS (Software as a Service) (Dillion et al., 2010).

The transition to the cloud has brought the emergence of a new business model with profound impact, gradually adopted by the enterprises, which are trying to determine whether the cloud based functionality is scalable into other business functions beyond the realm of information technology. With the promise of infinite capacity, businesses are taking advantage of the pay-as-you-go model of this technology, its scalability and its flexibility features (Kshetri, 2011). According to a survey of Wu, Cegleski, Hazen, and Hall (2013), the factors that affect a firm’s propensity to adopt cloud technology are business process complexity, entrepreneurial culture and the level to which its information systems incorporate compatibility and application functionality.
Cloud computing has been gaining ground in the supply chain management and logistics field over the last few years. As nowadays very few companies own, operate or control their entire supply chain internally (from end-to-end), an independent platform like the cloud, might represent a facilitator for SLM (Service Level Management). For organizations within a complex supply chain, flexibility is among the greatest advantage of the cloud computing model (Cegielski, Jones-Farmer, Wu, & Hazen, 2012). Therefore, the migration of a supply chain to cloud is a fact that cannot be neglected in the business world as it is steadily increasing. Moreover, financial and operational benefits are stemming from the utilization of cloud-based services in supply chain management, where scalability ensures that the computing services are available to the users at any point anytime (Tiwari & Jain, 2013).

The era of implementation of cloud computing in supply chain management and logistics is divided into three parts by Schramm, Wright, Seng and Jones, cited in Tiwari and Jain (2013); the 2010-2011 part, 2011-2013 and 2013-2015. In this last period, which is the current one, it is stated that the consolidation phase starts and major players are defined, while complex processes will be covered in cloud.

Nevertheless, cloud computing did not come alone in the foreground, yet with its own set of challenges. The loss of control over data, cost, security, the lack of standardization and availability are some risks and challenges that have to be confronted (Varbanov, 2011) as the cloud is vastly gaining ground in the supply chain management. Security thought tends to be the major issue for enterprises and cloud providers (Dillion et al., 2010).

In a setting characterized mainly by fierce competition and complexity, companies are investigating on optimizing both cost and efficiency of each phase of their supply chain such as planning and forecasting, procurement and logistics. Therefore, their perspective is not limited to a single organization but refers to the entire supply chain (Li, Wang & Chen, 2011). IT is widely considered as a critical resource to the successful management of supply chains and has been shown to enhance supply chain performance (Autry et al., 2010; Chen et al., 2007; Frohlich, 2002; Frohlich and Westbrook, 2001; Hall et al., 2012; Hazen and Byrd, 2012; Li and Lin, 2006). Cloud computing, as an emerging IT, can be correlated to the whole supply chain optimization by providing infrastructure, platform and software solutions.
1.2 Problematization

Although practical industry advancements associated with cloud computing in the context of supply chain rapidly proliferate, there is a lack of academic research that investigates the application of this technology from a theoretical standpoint (Wu, Cegielski, Hazen & Hall, 2013). Moreover, previous studies regarding to cloud mainly explore technological issues such as cloud performance or network (Armbrust, Fox, Griffith, Joseph, Katz, Konwinski, Lee, Patterson, Rabkin, Stoica & Zaharia, 2009; Bernstein, Ludvigson, Sankar, Diamond & Morrow, 2009), business issues such as business models, potential risks and opportunities of migration into the cloud as well as privacy and legal aspects (Assuncao, Costanzo & Buyya, 2009; Pearson, 2009), applications on cloud computing platforms (Delic & Riley, 2009), or general issues such as foundational concepts of cloud or its implementation, pros and cons (Aymerich, Fenu & Surcis, 2008).

A significant part of the literature explores the perceived pros and cons related with the decision-making process of the adoption of the specific technology rather than the perceived benefits and challenges when the cloud has been already adopted and used; that is, in its post-implementation phase. Previous studies have focused on the cloud implementation in logistics (Schuldt, Hribernik, Gehrke, Thoben, & Herzog, 2010; Tiwari & Jain, 2013); yet absent from the literature is a thorough understanding of the cloud-based applications in the industry of 3PLs in particular, and the perceived pros and cons not only from the user’s side but from the supply side as well. According to Cui and Hertz (2011), 3PLs are considered as advanced and sophisticated enterprises which focus on the integration of the different components of the supply chain. Thus, the authors, recognizing the importance of this type of firms and their role, pursue a profound understanding of the usage of an advanced IT technology within them. The research is limited referring to critical aspects of cloud computing applied on 3PLs within a theoretical basis. Thus, in this study, the authors aim at filling these gaps by exploring what types of cloud-based services are applied on 3PLs, what are the perceived benefits and challenges from the 3PLs perspective as well as from their cloud providers/IT companies at the post-implementation phase.

1.3 Purpose

The purpose of this thesis is to investigate what cloud-based services are used in the 3PL industry as well as the challenges and benefits perceived by the cloud providers of 3PL firms and by the 3PL firms that use this technology. In order to gain a thorough understanding of this usage and grasp the full picture within the focal industry, the research is focusing on the perspectives of three cloud providers and three 3PLs that use and/or provide cloud-based services.
1.3.1 Research Questions

For the fulfillment of the research purpose, the authors, after considering the background and the problem discussion of this current thesis, concluded in two research questions which will be instrumental for the investigation.

Research Question 1: What are the cloud-based services that are used and/or provided by 3PLs?

Research Question 2: What are the perceived challenges and benefits of the cloud in the post-implementation phase within the 3PL industry?

1.4 Limitations and Delimitations

With respect to the limited time, resources and word limitation of this study, in addition to the wide scope of the topic, certain delimitations have to be drawn. This thesis explores the perceived challenges and benefits when using or providing cloud-based services in the 3PL sector, and is based on semi-structured interviews with companies located in US, Sweden and Denmark. It has to be mentioned that the authors focus on countries with high level of IT maturity. The companies chosen, should also fulfill the industry criteria the authors have set; hence, the number of the companies fulfilling them and further being eager to participate in this study was small. Moreover, due to the limited time given, it was difficult finding firms to take part in this research. Conjointly, this thesis is also limited in terms of the sector in which it focuses.
1.5 Thesis Structure

![Thesis Structure Diagram]

In the introductory part of this thesis, the authors discuss about the background, the problem and the purpose statements. Thence, the reader will be introduced to the field of study.

The second part of the thesis is the literature review, where the authors have explored researches relevant to the topic. Various theories of several authors are presented stemming from the deep exploration into the literature, in order to provide a deeper knowledge about cloud computing in the 3PL industry.

In the third part, the methodology that was used for this thesis is described so that the research questions are answered. The authors chose to conduct a qualitative research with an abductive approach and collection of primary and secondary data. Furthermore, the case companies are presented and the quality criteria of this thesis are being discussed. The next part consists of the empirical data, collected from the interviews with the companies’ representatives.

In the analysis part, the authors try to find linkages between the collected data and the literature due to the abductive approach adopted. Conclusively, a “feedback circle” is created, where the literature and the interview findings are continuously examined in contrast and a final model is developed. Lastly, the conclusions summarizing the answer of the research questions are presented in the sixth part and further discussion is made upon the findings.
2 Literature review

In this chapter the authors present the theoretical framework in which they base this thesis on; related literature, previous research that has been conducted on the area of cloud computing, benefits and challenges are demonstrated as the core in order that the reader understands the main concepts which are used in the upcoming parts of this thesis.

2.1 Cloud Computing

Cloud computing is considered as a new IT implementation with a profound impact on technological change. It is based on the concept that IT information resources can be provided and seen as a service through the Internet (Li et al., 2011). Many attempts to define cloud computing technology have been recorded over time; for instance, Vaquero, Rodero-Merino, Caceres and Linder (2008) combined 22 different definitions in order to provide a unified one. According to National Institute of Standards and Technology cited in Mell and Grance (2011), the most recent and accepted definition for cloud computing is the following that articulates cloud computing as: “a model for enabling ubiquitous, convenient, on demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction” (Mell & Grance, 2011, p.2).

![Figure 2.1 Essential Characteristics, Service Models and Deployment Models of Cloud (adopted by NIST).](image-url)
2.1.1 Main Characteristics

Five essential characteristics of cloud computing are articulated and presented. The first refers to its on-demand self-service nature, as the consumer can avail new or increasing computing capabilities such as emails or applications automatically without the need to resort to human interactions with the cloud providers (Ferreira & Moreira, 2012; Singh, 2012; Dillion et al., 2010). The second feature includes the broad network access, which means that the computing resources are delivered over the network (e.g. Internet) and are accessible by various clients with different types of platforms such as mobile phones or personal computers (Ferreira & Moreira, 2012; Singh, 2012; Dillion et al., 2010). The next key characteristic of cloud computing involves the resource pooling, since the computing resources such as storage, processing, memory, network bandwidth or virtual machines are pooled together geographically in order to serve multiple consumers and subsequently achieve economies of scale and specialization. It has to be mentioned that the customer does not have any control or knowledge over the location, formation and originality of these resources (Dillion et al., 2010).

The rapid elasticity constitutes the forth important feature of cloud computing, which is defined as the ability to allocate more or less resources when they are needed in a fast and agile manner. From the consumer standpoint, the capabilities available appear to be immediate and unlimited, and can be purchased in any quantity at any time (Dillion et al., 2010). The measured service is the last cloud computing key characteristic, as the utilized service can be measured, controlled and reported automatically in the cloud, leading to transparency for the provider and the consumer. IT services such as data center hosting are paid per use and their consumption can be optimized by the client (Ferreira & Moreira, 2012; Singh, 2012; Dillion et al., 2010).

2.1.2 Types of services

Every company has to select a cloud service and a deployment model depending on their specific business, operational and technical needs.

Four different types of services are introduced in the following. Cloud Software as a Service (SaaS) encompasses the online delivery of software functionality. The software is not installed in the customer’s personal device, but it is in the cloud and can be accessed through the Internet. Enterprise level SaaS providers deliver a broad spectrum of advanced applications such as supply chain management and product lifecycle management (Ferreira & Moreira, 2012). When using Cloud Platform as a Service (PaaS), the clients move to the cloud applications, which are designed and developed by them, using programming language and tools provided by the cloud supplier. Therefore, it is a cloud-based application development environment - not tied directly to hardware resources - that enables companies to produce new applications in a quick and flexible manner (Singh, 2012).

Cloud Infrastructure as a Service (IaaS) entails the rental of virtual machines for running applications, hosting data, or housing a company’s entire computing environment. Thus, from a company perspective, the costs of maintaining or upgrading the used hardware are prevented. Moreover, huge initial investments in computing hardware such as networking devices, servers and processing units, can be significantly decreased. Amazon EC2 is an example of IaaS (Ferreira & Moreira, 2012; Singh, 2012). Last but not least, Process as a Service is a layer unique to logistics clouds, which provides both software and platform ena-
bling the integration of logistics service providers. Hence, in this case, the cloud provider could become a fourth-party logistics provider (Schuldt et al., 2010).

2.1.3 Deployment Models

Four cloud computing deployment models have been identified by several authors such as Ferreira and Moreira (2012), Singh (2012) and Dillion et. al. (2010). The private cloud involves infrastructure solely used by one organization. It can be managed by the organization or a third party and can be on or off. The public cloud is accessible to the general public or a large number of organizations. It is managed by the cloud provider. The hybrid cloud includes a combination of both public and private clouds, as an organization manages some resources in-house and has others provided externally. Finally, the Community Cloud model entails the cloud infrastructure shared by various organizations forming a community with common interests and concerns. It can be managed by the organizations or a third party and can be on or off premise.

2.1.4 Cloud Stakeholders

The cloud could be provided, used or both. The terms of cloud provider and cloud user are explained below based on Hamdaqa’s (2012) definitions.

Cloud provider: an individual or an organization that makes one or more cloud services available to consumers based on a Service Level Agreement (SLA). In several scenarios, a cloud provider can also be a consumer of services provided by another provider or creator of their own services (Hamdaqa, 2012).

Cloud user: an individual or organization that acquires, uses and manages a cloud service that is provided by a cloud service provider directly or through a broker. A cloud user can be a system administrator, a developer or an end-user depending on the service level. Some cloud users are providers (Hamdaqa, 2012).

2.2 Third-party logistics providers

As the authors of this thesis aim at investigating the concept of cloud computing in the context of 3PLs, their description is necessitated. It has to be mentioned that there is a certain level of confusion about the different categories of logistics firms in research (Fabbe-Costes, Jahre & Roussat, 2009). Logistics service providers (LSPs) are often perceived as third-party logistics companies (3PLs), while in other studies they are regarded as logistics firms in general (Cui & Hertz, 2011). Persson and Virum (2001) categorize LSPs according to their strategic position, depending on the complexity and on the asset specificity. Furthermore, Hertz and Alfredsson (2003) differentiate 3PLs on the basis of two dimensions: problem-solving ability and customer adaptation.

However, in this thesis, LSPs are apprehended as all types of logistics firms and are categorized into carriers, logistics intermediaries and 3PL firms. Therefore, the model of Cui and Hertz (2011) for the categorization of LSPs is used and evaluated as more appropriate for the purpose of this research, because it describes the characteristics of the different logistics firms based on the concept that the LSP is the focal firm and that there is a logistics service supply chain in addition to the industrial one.

According to Cui and Hertz (2011) carriers’ core competence relies on moving products from point A to point B in the most efficient way. They invest heavily in means of
transport, transport equipment and related infrastructures. Logistics intermediaries’ core business includes consolidating products and connecting carriers and clients. They focus on their horizontal network of actors by building geographical representations in different locations. In this study, the 3PL providers are examined pertaining to the usage of cloud-based solutions; therefore, they are presented in more detail by the authors:

**Third-party logistics providers**

A common definition of a 3PL provider is lacking. Hertz and Alfredsson (2003, p.140) suggest a 3PL provider as ‘an external provider who manages, controls, and delivers logistics activities on behalf of a shipper’. Moreover, it can be defined as ‘an external supplier that performs all or part of the company’s logistics functions’ (Langley, Coyle, Gibson, Novack & Bardi, 2008, p.119). 3PL firms could also be divided into transportation-based, warehouse/distribution-based, forward-based, financial-based, and information-based (Langley et al., 2008). According to Bolumole (2001), 3PL companies can offer functional logistics services or value-added and virtual logistics in an integrated way. The 3PL-client relationship is usually long-term and characterized by a strategic nature. Hertz and Alfredsson (2003), support that there is a need for strategic alliance between the 3PL providers and the clients which can lead to quality performance, economies of scale and efficiency. Stefansson (2006) mentions that they offer transportation, warehousing services, consolidation and deconsolidation, picking and packing, forwarding services, cross-docking, track and trace information, custom clearance, insurance services, tendering and contracting carriers, and payment services.

Last but not least, according to Cui and Hertz (2011), 3PL’s core capability involves the coordination of clients, logistics intermediaries and carriers on multiple levels so that they offer an integrated logistics service in a customized way. In other words, they are managing the vertical network of actors and the physical flows along a specific supply chain. Their main concern is effectiveness and their investments are mainly warehouses and advanced IT systems.

### 2.3 Cloud computing in the supply chain management

According to Tiwari and Jain (2013), the implementation process of Supply Chain Management on cloud platforms starts in 2010 and its first phase includes support and administrative processes, such as training delivery or simple analytics, which can easily be abstracted and do not require complicated integration. The era of 2011 – 2013 is regarded as mature with higher focus on core and complex processes, such as pricing optimization, transportation load building, replenishment planning and order processing. Thereafter, in 2013, the consolidation phase starts, when well established models for usage and payment of cloud services are accepted within the supply chain management. Complex processes, which require a high level of inter-organizational collaboration and integration, are covered on the cloud; collaborative engineering, reverse logistics, fleet management, warehousing and distribution encompass some examples of this era.

Concerning the usage of cloud in the field of logistics, Arnold, Oberländer and Schwarzbach, (2012) identify four different types. The first category contains the outsourcing of IT resources and related services such as software applications (e.g. TMS, tracking and tracing software, Supply Chain Management software) from local IT systems into a cloud. The second type refers to the usage of cloud computing by the logistics firms for the integration and sharing of data. Typical intra-organizational uses of cloud are the linkages of subsidiaries or branch offices with the headquarter. Inter-organizational uses consist of file-
exchanges among partners. The third category entails the usage of internet as a channel of e-business, while the last one is related to a Management Platform, which represents advanced cloud uses aiming at efficiency improvements and value creation by additional cloud services (e.g. optimization of transports).

Furthermore, Schuldt et al., (2010) state that cloud computing has various applications in logistics. An example in this field includes the internet-based system for rail freight matching supply and demand developed in the joint R & D – project CODE 24 of the Rotterdam – Genoa corridor. Another example is the project CloudLogistic of Aachen University and industry partners which entails a cloud platform in order to match supply and demand of loads of trucks depending on the geographical coordinates. LOGICAL also constitutes a project in the Central Europe in order to integrate IT outsourcing, business process outsourcing, virtual marketplace related to logistics services, data, collaboration space and a platform (Arnold, Oberländer, & Schwarzbach, 2012).

2.4 Challenges of cloud computing

2.4.1 Data Security

Security is referring to the action of protecting the data in order not to be prone to corruption (Chandran & Angepat, 2010). Among the top concerns for organisations on the cloud is security according to a research conducted by Aleem and Sprott (2013). Regarding to the data, as it is stored outside the enterprise boundary, the cloud provider must ensure security and prevent breaches derived from security vulnerabilities or through malicious employees (Zissis & Lekkas, 2012). Thus, the use of strong encryption techniques is necessitated (Subashini & Kavitha, 2011). Furthermore, Ogigau-Neamtiu (2012) explains that data security lifecycle includes the creation, the storage, the use, the sharing, the archiving and the destruction of the data. He highlights that, in a cloud environment, these stages are more complex and subsequently higher security risks are posed. It has been supported that the security issues play the most important role in hindering cloud computing usage (Dillon et al., 2010). From an engineering viewpoint, the centralization of data and the universal architecture that characterize cloud technology can facilitate overcoming the security challenges (Zissis & Lekkas, 2012).

2.4.2 Confidentiality and privacy

Confidentiality refers to the ability to access protected data upon authorization (Zissis & Lekkas, 2012). Cloud computing is based on a business model where resources are shared. Therefore, the augmented number of parties, devices, applications involved, which leads to an increased number of points of access, raise the threat of data compromised in the cloud (Subashini & Kavitha, 2011). Furthermore Chandran & Angepat (2010) and Santos, Gummed and Rodrigues (2009) highlight in their work the challenge of confidentiality in a cloud environment.

Privacy contains the desire of a person to control the disclosure of personal information. As the data is stored in multiple locations in the cloud, the risk of confidentiality and privacy breaches is increased. The fact that the data storage is not on the company’s servers but on the service provider’s servers, which could be in Europe, Asia or anywhere else, conflicts with various legal requirements. For instance, the European laws require that an or-
ganization is always aware of where its data is. What is more, in many European and South American countries, certain types of sensitive information cannot leave the country (Subashini & Kavitha, 2011).

2.4.3 Availability

Availability refers to the possession of a system accessible and usable upon demand by an authorized entity (Zissis & Lekkas, 2012). The dynamicity of cloud computing requires high degree of availability, in order to ensure the smooth functioning of the business operations. Organizations worry about whether cloud-based services will have adequate availability, whereas existing SaaS products have set a high standard in this regard (Armbrust et al., 2009). The major risks refer to the service provider’s resources (servers, internal networks and storage media), connection to the Internet as well as the consumer’s connection to it. It has to be stressed that the dependency of cloud computing on network connectivity determines the level of its reliability; a key concern in cloud technology which has constantly questioned its performance (Chandran & Angepat, 2010). Aleem & Sprott (2013) identify the control over service availability as a major challenge.

2.4.4 Cost

This category of challenges contains the possibility that the actual costs are higher than expected. In addition, the originally calculated cost savings may be lower because of the emergence of unanticipated costs and thereby the expected cost reduction cannot be achieved (Barthelemy, 2001; Dillion et al., 2010). Moreover, it is suggested that the geodiverse data centers which host the developed cloud models can raise the cost of the providing services (Greenberg, Hamilton, Maltz & Patel, 2009).

2.4.5 Loss of control over data

A significant parameter, which businesses have to take into careful consideration, is that the upload of data on the cloud corresponds to the loss of control over them. That is why, the hosting of software or business processes make companies more vulnerable and dependent on the cloud vendor. Especially in case that the provider of cloud-based services faces technical or financial problems, the access to clients’ data is hindered (Varbanov, 2011). The legal implications of data and applications being held by a third party are complex and there is no structured comprehension of them. There is also a potential lack of control and transparency when a third party holds the data (Chow, Golle, Jakobsson, Shi, Molina, Mashuoka & Staddon, 2009).
2.4.6 Lack of standardization

Hamdaqa (2012) suggest that there should be created standardization bodies; organizations and industry consortiums that set the cloud standards. However, Ogigau-Neamtiu (2012) argues that the immaturity of this technology makes it difficult to build a comprehensive and commonly accepted set of standards. The excitement around cloud has created a flurry of standards and open source activity leading to market confusion. That is why, working groups such as Cloud Standards Coordination act in order to improve collaboration, coordination of information and resource sharing between the organizations being in this research field. Varbanov (2011) states as well the issues of the lack of standardization of cloud technology. Lastly, it is suggested by Emison (2013) that cloud platforms hinder the standardization.

2.5 Benefits of cloud computing

2.5.1 Benefits of cloud in the supply chain

Compatibility & Information Collaboration

In a setting with high degree of elongation and complexity of supply chains, difficulties related to the compatibility and functioning variety prevail (Kasperek, 2013; Love, 2004). The cloud-based systems are characterized by simplification and provide easy accessibility to services. They facilitate connection of every component of the supply chain by more easily integrating with different systems. Therefore, elimination of the compatibility problem can be achieved and information collaboration can be considerably enhanced between the different partners such as suppliers, retailers and distributors (Tiwari & Jain, 2013). What is more, previous studies distinguish cloud computing from other information technologies in terms of its flexibility with processing data on various platforms (Marston, Bandyopadhyay, Zhang & Ghalsasi, 2011). On the contrary, the web-based EDI, for instance, often requires common platforms (Monczka, Handfield, Giunipero & Patterson, 2011). Past research also suggests that various benefits of cloud computing may positively influence information sharing (Sahin & Robinson, 2002; Rochwerger, Breitgand, Levy, Galis, Nagin, Llorente, Montero, Wolfsthal, Elmoth, Caceres, Ben-Yehuda, Emmerich & Galan, 2010; Vouk, 2008; Rosenthal, Mork, Li, Stanford, Koester & Reynolds, 2010). Sharing of data is critical to maintaining and fostering the relations among supply chain members, and can create superior performance as allows the different partners to operate as an entity (Li et al., 2005).

As the supply chain entails a dynamic organization system and information service object is always changing, Jun and Wei (2011) point out that only the internet is simple, convenient and low cost satisfying supply chain information collaboration. They also support that if the supply chain is regarded as an enterprise, then the cloud platform is equivalent to ERP system, where each functional department could be considered as an enterprise. The cloud-based supply chain database allocates information resources leading to the reduction of the information distortion as well as the acceleration of the information transmission speed and accuracy. Moreover, visibility could be achieved, which subsequently assists in the coordination of the operations and the management of various customers. Visibility also offers a transparent view of the whole system to the customers (Tiwari & Jain, 2013).
2.5.2 Benefits of cloud in the organization

Scalability – Flexibility

According to Venters and Whitley (2012), scalability describes the ability to quickly add or remove resources to allow the better matching of resources to workload. Most authors agree that scalability is central to cloud computing (Vaquero et al., 2008; Armbrust et al., 2009). Moreover, the advent of this technology increases flexibility, since it enables companies to adjust their capacity automatically according to their needs and demands fluctuations. Users can be fastly offered computing resources without human interaction. Capabilities are elastically provisioned, in some cases automatically, to quickly scale out or up (Zissis & Lekkas, 2012; Marston et al., 2011; Iyer & Henderson, 2010).

In addition, according to Ferreira and Moreira (2012), the increased computing power that cloud computing can provide substantiates an important reason of implementing it. The available capabilities appear to be immediate and unlimited (Cao, Schniederjans, Triche & Schniederjans, 2013). Lastly, Wang and Laszewski (2008), also support that scalability and flexibility mainly drive the emergence of cloud technology, as cloud-based services and computing platforms can be scaled across multiple geographical locations, hardware performance or software configurations. The platforms have to be flexible so that they can adapt to multiple requirements of a potentially large number of users.

Cost

The main goal of cloud computing is the provision of lower cost capabilities in comparison with those maintained and serviced in-house (Varbanov, 2011). According to Ferreira and Moreira (2012), the first reason of migrating from a traditional IT architecture to cloud computing is related to economics, including spending on hardware, software and IT employees. The company is given the opportunity to switch capital expenditure into operational (Accenture, 2014). More precisely, such purchases lead to a large financial outflow in a relatively short period of time, which means that the appropriate financial resources must be previously accumulated. What is more, such an obligation may negatively affect the financial liquidity of the organization. The cloud computing model assists in avoiding these problems. Since its major idea lies on the pay-as-you-go model, it leads to complete disappearance of high initial financial outflow. As a consequence, absence of up-front capital expanse allows capital to be redirected to core business investment (Pazowski & Pastuszak, 2013; Marston et al., 2011). At the same time, cloud technology allows organizations to pay for use of computing resources on a short-term basis as needed depending on demand and thereby avoiding excessive cost (Accenture, 2014).

The depreciation costs of hardware and software as well as the cost of systems maintenance and upgrading are no longer taken into consideration, since they are performed by the cloud provider. Therefore, from a financial viewpoint, upgrading and maintenance cost savings can be achieved (Cao et al., 2013; Marston et al., 2011; Alford & Morton, 2009; Whitten et al., 2010; Demirkan, 2010; Benlian & Hess, 2011).
Core Competence & Specialized Services

By using cloud technology, on the one side, small and medium sized enterprises could take advantage of the high quality processes and services with a minimal investment, since cloud providers have a deep domain expertise in the service-base applications they develop and provide. On the other side, large firms are driven to a sharper focus on running their core processes more efficiently (Li et al., 2011; Accenture, 2014; Benlian & Hess, 2011; Marston et al., 2011).

Ease Of Use & Accessibility

Cloud structure is characterized by a high degree of adaptiveness and is shared by various end users with different mediums (Cao et al., 2013; Marston et al., 2011; Iyer & Henderson, 2010). Capabilities are available over the network and accessed through standard mechanisms that promote use by heterogeneous platforms (e.g., mobile phones and laptops). Access from any location is enabled. For example, corporate data and documents can be available at any time and from any point, as long as there is internet connection (Varbanov, 2011).

Competitive Advantage & Value Creation

The notion of value creation which refers to the fact that processes and people add value at each step of a product lifecycle so that every step is optimized, is introduced by Porter, cited in Meisner’s article (2008). Cloud technology can facilitate the creation of value-added services and more particularly, according to Meisner (2008), SaaS-based applications allow organizations to stay ahead of the competition successfully in today's globalized setting. She also claims that competitive advantage can be achieved by companies which focus their resources on core competencies and create products with strong differentiation.

Moreover, Tiwari & Jain (2013) support that the flexibility achieved due to the cloud, leads to safer and more effective environment for information sharing which can be a resource for superior competitive advantage. Lastly, according to the findings of the research made by Venters and Whitley (2012), the conventional way of offering fundamental organizational IT services is more time-consuming than the cloud-based. Thus, in this rapid paced economy, time reduction can be translated into a business opportunity and a competitive advantage.

Upgrades

According to Varvanov (2011), the IT personnel’s work is disengaged by software upgrades and issues associated with computer equipment. Furthermore, the centralized control over versioning and the simplified maintenance are considered as advantage of cloud computing by Armbust et al. (2009).
Responsiveness

According to Foster, Zhao, Raicu and Lu (2008), cloud technology could lead to improved responsiveness due to the adoption of virtualization. It is also supported that real-time responsiveness is the key benefit of cloud computing (Benlian & Hess, 2011; Defense Science Board, 2013). Finally, Etro (2009) explains that the cloud generates new potential of product creation especially related to the rapid adoption of changes. For instance, it is considered that common applications in the cloud are altered on a daily basis in order to accommodate new requirements, which is impossible with on-premise solutions.

2.6 An opportunity – risk framework

This thesis focuses on the perceptions of benefits and challenges at the post-implementation stage of cloud-based services in 3PLs. The opportunity – risk framework of Software as a Service (SaaS) adoption was developed by Benlian and Hess (2011), and demonstrates the opportunities and risks of this technology adoption as perceived by IT executives at adopter and non-adopter firms.

More precisely, this framework is based on the concept that IT executives assess specific risks and opportunities, and combine them into overall perceived ones. The result is an overall attitudinal appraisal which subsequently influences their intentions to increase the level of adoption. The authors use only the classification of the risks and opportunities in order to answer the research questions as they do not investigate neither their relation to the overall perception of them nor the intention to adopt.

Five opportunities are identified by Benlian and Hess (2011): cost savings, strategic flexibility, a focus on core competences, access to leading-edge IT resources and quality improvements.

- **Cost savings** indicate that the vendor provides IT functions at lower cost - due to its specialization and the realization of scale and scope economies - than the firm could achieve.
- **Strategic Flexibility** suggests that the adopters are more flexible in regard with switching IT providers than local installations because of the on-demand application delivery. In addition, capital and operational investments are shifted from the customer to the vendor. A high degree of flexibility is generated, as easily scalable IT resources are utilized, and consequently business-level volatility is more easily managed.
- **Access to leading-edge IT resources** encompass the specialized capabilities that the cloud provider renders and cannot be developed internally.
- **Focusing on core competences** constitutes the forth opportunity. As the outsourced software application and its underlying infrastructure are developed, tested and maintained by the vendor, the company’s IT staff can be used more productively in areas that create value to the business.
Quality improvements can be achieved due to the efficiency and effectiveness of the processes that the application service supports. For instance, cloud providers are expected to incorporate industry best practices and meet customer needs.

Moreover, five different risks are articulated by Benlian and Hess (2011): performance, economic, strategic, security and managerial/psychosocial.

- **Security risks** arise since the vendor is given the direct control of the company’s data. This category of risks refers to the data protection especially due to the Internet-based nature of this technology and the environmental uncertainties.
- **Strategic risks** assume that the organization looses critical resources and capabilities when using software-as-a-service (SaaS). For instance, external sourcing of essential resources can lead to a high degree of customer’s dependence on the provider which can subsequently reduce the firm’s ability to react promptly to new internal and external forces (e.g. by aligning a new strategy or seizing a new market opportunity).
- **Managerial or psychosocial risks** entail the possibility that the personal reputation and career of the manager responsible for the adoption are harmed due to its failure.
- **Financial risks** include higher than expected costs.
- **Performance risks** involve the possibility that the specific technology will not deliver the expected level of service; (e.g. the expected application availability and/or the expected network bandwidth may not be provided; system outages and/or connectivity problems might occur).

This aforementioned model of Benlian and Hess (2011) is theoretically grounded on the Theory of Reasoned Action (Ajzen & Fishbein, 1980) and has been evaluated as highly appropriate by the authors since it concentrates on perceptions, analyzes both opportunities and risks, and refers to the pre-adoptions and post-adoptions phases, as there are differences in the behavioral and normative beliefs between potential adopters and users of IT (Karahanna, Straub & Chervany, 1999). It is highlighted that Benlian and Hess (2011), developed a total model with perceptions of adopters and non-adopters, which encompasses an adopter sub-model as well as a non-adopter sub-model.

As the authors aim at investigating perceptions of benefits and challenges at the post-implementation phase of cloud, they are based on the sub-model of the adopters. According to its findings, the opportunities significantly and positively related to the overall perceived opportunities are **cost savings, strategic flexibility and access to leading-edge IT resources**, whereas the risks significantly and positively associated with the overall perceived risk of adoption are **security, strategic and performance risks**. Thus, the above classification is used by the authors as a basis of their abductive research approach. The adopters sub-model’s classification is used in the analysis part for the research purpose fulfillment and answer of the research questions. The authors classify the aforementioned benefits and challenges - that are presented in the existing literature and described in chapters 2.4 and 2.5 of this thesis - based on the categories that the sub-model of adopters suggests. More precisely, they develop a proposed framework in which they use the perceived risks and opportunities of the sub-model compiled by Benlian and Hess (2011), as categories for their perceived challenges and benefits respectively.
The framework of perceived challenges and benefits of cloud computing technology proposed by the authors, is hereby presented.

The perceived challenges are segregated into four categories: financial, strategic, performance and security. The financial challenges consist of the cost, while the strategic ones of the loss of the control over data. The challenges pertinent to performance are the availability of the cloud-based solutions and the lack of standardization. Lastly, security challenges lie upon data security, confidentiality and privacy.

Conjointly, the perceived benefits are segregated into three main categories: cost savings, strategic flexibility and lastly, access to leading-edge IT resources. Cost savings consist of the initial capital investment, the IT staff, and the maintenance and upgrading costs. Scalability and flexibility, compatibility and interorganizational collaboration as well as responsiveness belong to the category of strategic flexibility. The perceived benefits related to the access to leading-edge IT resources are: upgrades, competitive advantage and value creation, core competence and specialized services, and last but not least the ease of use and accessibility.

*Figure 2.2 Proposed Framework of perceived challenges and benefits of cloud-based services (compiled by the authors)*
3 Methodology

The research design is outlined in this chapter. The reader is provided with information about the research approach and the methodological choice of the authors. The companies are introduced in this section as well as the data collection and data analysis. Lastly, the quality criteria are presented and the transferability, dependability and confirmability of this thesis are discussed.

In order that the reader comprehends the methodological choice of the authors, the research questions that the authors seek to fulfil, are presented again in the beginning of this chapter. In that way, the authors demonstrate the questions and the method for their answer. The research questions composed by the authors are the following:

1) What are the cloud-based services that are used and/or provided by 3PLs?

2) What are the perceived challenges and benefits of the cloud in the post-implementation phase within the 3PL industry?

3.1 Research approach

According to Saunders, Lewis and Tornhill (2012), there are two approaches to conduct a study; the deductive and the inductive approach. The inductive approach suggests that firstly comes the collection of the data and then, the completion of the analysis and the author or authors build a theory upon the results emerging from the research. On the other hand, the deductive approach suggests that the research design is based on a frame of references and it tests propositions stemming from those theories. Bryman and Bell (2007) state, that the inductive approach is related to the generation of theory, whereas the deductive approach is used for testing existing theories. Nevertheless, the differences between the two approaches shall not been clearly designated, because a study may have features of both approaches combined in a research (Bryman & Bell, 2007). The above mentioned logic imprints to the method that Alvesson and Sköldberg (2009) describe as the abductive approach, which was firstly introduced and named by Pierce (1955). In this approach, the analysis of the empirical facts is combined with - or preceded by - studies of previous literature (Alvesson & Sköldberg, 2009). Hence, ‘the research process alternates between theory and empirical facts whereby both are successively reinterpreted in the light of each other’ (Alvesson & Sköldberg, 2009, p.4), and ‘the particular facts are not merely brought together, but there is a new element added to the combination by the very act of thought by which they are combined’ (Aristotle, Posterior Analytic, vol. II, p. 19, cited in Givón 1989, p.286). For the purposes of this thesis the authors have concluded in the abductive research approach in order to transact the research needed.

The present thesis is dealing with companies which are using or providing cloud computing services. This study is making use of a revised, by the authors, framework of perceived challenges and benefits, in terms of designing and analyzing this research. The authors aim at exploring the views of 3PL firms and cloud providers, whose client list includes 3PLs, pertaining to the perceived challenges and benefits of cloud computing as well as investigating in which way cloud computing is being used currently in this type of companies and if possible, to provide theory. Moreover, the authors of this thesis intend to see how the responses taken will be related with the existing literature.
In addition to the aforementioned approach a research may have a descriptive, explanatory or exploratory purpose, fact which influences the type of the study as well. The objective of explanatory studies is to explain the causal relationship between variables (Kumar, 2011), which can be accomplished either by using quantitative data analyzed through statistical correlation tests, or by the use of qualitative data in order to explain the reasons behind the relationship (Saunders et al., 2012). A descriptive study concerns structured and well-understood problems in accordance with Ghauri & Grønhaug (2005) and aims in achieving an accurate picture of situations, individuals, and events (Robson, 2002). Last but not least, a study might be of exploratory nature, which means that it enables the researcher to gain insights regarding an unclear problem. As stated by Bajpai (2011), the techniques used in exploratory studies are commonly expert interviews, in-depth interviews, literature review or focus groups.

The authors find it suitable to conduct their study within the frame of exploratory research, as the purpose of this thesis is to investigate the use of the cloud by both the 3PL firms and the cloud providers and furthermore to scrutinize the benefits and challenges emerging in the post-implementation phase of the cloud in the 3PL industry. Moreover, both of the research questions begin with “what”; type of questions treated in exploratory studies.

Even though there is a large amount of research regarding the cloud computing technology in general, the perspective of the real-life challenges and benefits of the cloud within the 3PLs and their cloud providers is not explored yet and only assumptions can be made from previous findings. Hence, an exploratory study is pertinent as it provides the opportunity to fulfill this gap by getting thorough insights about the phenomenon of concern. By exploring the use of cloud computing within 3PL industry and stressing its perceived challenges and benefits by both: the 3PL firms and the cloud providers, this research can provide an understanding of the reality, whereas it does not aim in describing or explaining the problem in full detail.

Consequently, as exploratory data analysis performs the function of a model builder for confirmatory data analysis, abduction plays the role of explorer of viable paths to further inquiry. Hence, the logic of abduction fits well into exploratory data analysis, as the goal is to explore the data and find out a plausible pattern according to Yu (1994). Abduction is thus inferring a case from a rule and a result (Svennevig, 2001) which imprints to what Pierce (1955) described as abduction; a process of gaining new knowledge. Hence, as it can be inferred, the abductive approach is the most suitable solution ad hoc, complementing the exploratory research study, that the authors of this thesis conduct.

### 3.1.1 Time Horizon

The time horizon is cross-sectional in this thesis which means that its focal point lies upon a specific phenomenon in a single moment in time, in lieu of the development over time, as a longitudinal study implies (Ruane, 2005). This thesis does not aim in getting a rich understanding of the use of cloud computing in 3PL companies and their providers of cloud over time; rather aims in capturing the status-quo.
3.2 Research method - case study

It is considered as a matter of high importance the choice of the right method in order to ensure that the data is sufficient and contextual, so as to address the question and therefore support the required analysis (Richards, 2005). In this thesis, the authors use the qualitative research method in the process of gathering information pertinent to the topic. According to Saunders et al. (2012), a research method refers to the procedures and techniques that contribute in the collection and the analysis of data.

A case study method is applicable when it gives a description of social phenomenon (Yin, 2009). There are three possibilities in this case; history, case study and experiment. According to the authors, the case study method is the most appropriate because it adds relevant sources of evidence as Yin (2009) indicates. The source of evidence in this research is the semi-structured interviews and as a result, the case study method will give the authors more data in order to explore the field of study in depth. Hence, it is impossible to make generalizations from a single case study; therefore, better results derive from a multi-case study research method (Yin, 2009). The authors chose to write within the context of a case study method and conduct semi-structured interviews due to the fact that, cloud computing within 3PL companies, is not yet well explored.

The perspectives of each 3PL company and each cloud provider of 3PL companies will be presented, in order to reach the goal of this master thesis. After the collection of the data from the interviews conducted, the authors integrated the existing literature and their proposed framework with the interviews, so as to investigate how reality corresponds with the literature in order to be driven to the development of their model.

3.3 Method of data collection

The authors based the major part of their research upon primary data, however they make use of documentary secondary data as well, in order to fulfill their thesis. In this way the reader is led to a better understanding of the research topic.

3.3.1 Primary data

Data may be congregated through three different kinds of interviews; unstructured, semi-structured, and structured ones (Tenenbaum & Driscoll, 2005). Semi structured interviews is the best approach to collect qualitative data according to Williamson (2002), therefore, semi-structured interviews have been conducted by the authors in order to explore the companies’ perceptions on the challenges and benefits generated from the cloud usage. In the concept of a semi-structured interview, the interviewer follows the template of the interview, yet leaving space for further questions, if generated, to the correspondent. The authors have come up with a standard list of questions; yet this method selected, allows the interviewer to follow up on answers provided by a participant and in this particular way, gain more relevant information.

Semi-structured interviews are suitable for the purpose of this thesis based on the desire to get a profound insight of the challenges and benefits generated by the use of cloud computing in the 3PL industry and the feasibility to gain real-life business insights by the case companies. Conjointly, a semi structured interview enables the respondents to express their thoughts and experiences without the restriction of preset answers. Hence, the impossibil-
ity to predict responses is a matter of great importance within this research, as it allows for new discoveries; fact extremely crucial due to the gap in literature.

The authors conducted six interviews in order to gain that data with 3PL companies and cloud providers, settled in countries where cloud computing technology is widely used among 3PL firms. Three 3PLs - two in Sweden, one in Denmark - and three Cloud providers of 3PLs - two in Sweden, one in USA - have been investigated, fact that eliminates in a great extent the effect of potential cultural differences making an impact on the results. In other words, if this research would only include companies of one country, the results might be influenced by the local culture, and hence not be respectively relevant for the 3PL companies and cloud providers in other countries.

3.3.2 Documentary secondary data

Documentary secondary data is separated in text materials such as correspondence, transcripts of interviews, magazine articles, web site texts or newspapers (Saunders et al., 2012) and in non-text materials such as films, videos and drawings (Robson, 2011). The authors make use of documentary secondary data for this thesis which is the text of the companies’ websites. The websites have been used in order to gain relevant information for the companies and their cloud-based solutions, which they use or provide. The aforementioned secondary data has been critically evaluated by the authors and has been used in order to avoid biased statements.

3.3.3 Case criteria selection

The criteria that were fulfilled when choosing the case companies, were the use of cloud along with the 3PLs orientation for the cloud providers and the cloud use or supply for the 3PL companies. The authors of this thesis searched for companies that use or provide cloud-based services and were willing to share their experience on cloud computing. The information when selecting the companies was the one available on the Internet. The authors have analyzed the companies, their use or supply of cloud along with the relation to the third party logistics sector and their web-pages. Therefore, the authors recognized a number of companies from different areas of the world that were proper and willing for further investigation. Four companies located in Sweden, one in USA and one in Denmark were selected.
Table 3.1 Interview Details

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3.4 Data Analysis

Regarding the data analysis, the authors of this thesis have conducted semi-constructed interviews with the companies. The companies have been distinguished into two categories: the cloud providers of 3PLs and the 3PL firms. After the interviews have been transcribed, the authors sent the semi-structured interviews to the representatives of each company in order to be aware of the content that the authors would use. In the beginning of every interview, the authors were informing the correspondents that the interview would be recorded and were asking for their consent. Furthermore, the authors were asking if the companies wanted to keep their anonymity. One of the correspondents wanted to keep his anonymity; hence, the name of the company is not being revealed in the empirical and analysis chapters of this thesis. Lastly, all of the participants agreed on having the interviews recorded.

When the procedure of the interviews started, the authors were introducing themselves explaining again the purpose of the interview and their research. After the interview has been conducted, the authors wrote down transcripts in painstaking attention to detail for the trustworthiness of this thesis. As next step, the authors contacted the interviewed company and sent the transcripts via email in order to be approved by the correspondent. As long as the correspondent agreed on the content of the interview, the authors were qualified to use the data for their analysis. This procedure has been exactly the same for each one of the companies that participated in the interviews at the phase of the empirical data gathering.
For the purposes of the creation of the empirical findings section, each author assessed individually each transcript and color coded the data based on apriori codes. After the individual assessment, the authors met with each other and discussed their evaluations, the new codes generated from the data and the potential reclassification at a lower level of the data that have proven to be of a minor importance. The predefined codes were amended as the data were collected, due to the fact that the process of analyzing the interview transcripts leads to the aposteriori revision of some of the codes set apriori by the authors. The final codes used by the authors reflect the cloud-based services concept within the 3PL sector, the perceived challenges and benefits of the cloud and the current state of affairs in the 3PL industry. By following this procedure, the authors essentially concluded with a list of codes that represented the themes revealed from the data that has been collected. The empirical part started to be formulated after the completion of the evaluations on each interview and the revision of the codes generated, by both authors.

In this thesis, the authors have embraced this kind of analysis due to their belief that the analysis of the data would be more objective, if based on different perspectives. Last but not least, a cross-analysis between 3PLs and cloud providers of those firms is being conducted, in order to identify the perceived challenges and benefits of cloud by both, within 3PL industry.

3.5 Quality Criteria

This thesis has been constructed based on a qualitative study. The data presented derives through semi-structured interviews and literature, in order to fulfill the purpose of this research by answering the research questions. However, there are some limitations in the above mentioned methods and the alternative ways to augment the trustworthiness of this study.

In a scientific research, a matter of great importance is the research process and its findings to stand up the scrutiny. Saunders et al. (2012) point out that the major goal of the researchers shall be to diminish the probability of error and therefore the error per se. The reliability of a study might be negatively affected by certain threats; participant error, participant bias, researcher error, and researcher bias (Saunders et al., 2012). Participant error means that external factors affect subsequently the respondent’s answers, whereas participant bias concerns the interviewees’ unwillingness to share information or give a complete answer to the questions (Robson, 2002). Albeit many critics are reluctant to accept the trustworthiness of qualitative research, frameworks ensuring rigor of this method have been in existence for many years (Shenton, 2004). In order to surpass the aforementioned limitations, the authors apply transferability (in preference to external validity/generizability), dependability (in preference to reliability) and confirmability (in preference to objectivity) (Shenton, 2004).
3.5.1 Transferability

To allow transferability, the researchers must provide sufficient detail of the context of the fieldwork, in a way that the reader is able to determine whether the prevailing environment is similar to another situation with which is familiar and whether the findings can justifiably be applied to the other setting (Merriam, 2002). In this thesis, the authors conducted semi-structured interviews with the 3PLs and cloud providing companies. The template of the semi-structured interviews is provided in the appendices part in order to allow possible future researchers to use it as guidance. Moreover, since this thesis focuses on the challenges and benefits generated by the cloud computing within the 3PL field, the authors have specified that their focus is on 3PLs that are cloud-users/providers and cloud-providers with this type of logistics companies as clients. In this way, the authors do not make generalizations and leave the space to future researchers to concentrate on cloud users and/or providers of different sectors. Last but not least, since this thesis is conducted with an abductive approach, the findings demonstrated in the analysis section might also be used for further investigation and research.

3.5.2 Dependability

According to Shenton (2004), the dependability criterion is arduous in a qualitative work, albeit researchers ought to strive to enable a future investigator to repeat their study. Hence, the processes conducted within the study ought to be reported painstakingly in order to enable a future researcher repeating the work, if not necessarily to gain the same results (Shenton, 2004). Such an in-depth coverage allows the reader to assess whether proper research practices have been followed. As Lincoln and Guba articulate (cited in Shenton, 2004, p.71), ‘this may be achieved through the use of “overlapping methods”, such as the focus group and individual interview’. Within this thesis, the authors will be able to provide the interview transcripts to the future researchers. This shall happen in order to assure the dependability of this study.

3.5.3 Confirmability

In order that confirmability is achieved within the thesis, researchers shall demonstrate that findings emerge from the data and not their own predispositions (Shenton, 2004). Hence, the researcher should be described with impartiality. Designated steps ought to be taken, in order to ensure that the research’s findings are not stemming from the preferences of the researcher, yet derive from the experiences and ideas of the informants (Shenton, 2004). After the collection of the primary data - interviews conducted with the case companies -, the authors transcribed the whole interviews and sent them back to the companies’ representatives. As a result, the representatives examined the whole interview again, evaluated their answers and gave the permission to the authors to use the interviews as empirical findings for the analysis purpose.
4 Empirical Study

In this chapter the empirical data collected by semi-structured interviews from six case companies are presented. Three cloud providers with 3PL firms as customers and three 3PL firms have been investigated. The authors focus on the logistics activities based on the cloud, the perceived challenges, the positive aspects of cloud as well as the perceptions about the future of cloud computing in the logistics industry.

4.1 Findings of Memnon Networks AB

Memnon Networks AB is a large company located in Stockholm, specialized in the area of Transport Administration (TA). It was founded in 1997 and provides e-solutions for Transport Administration (TA) and Transport Management (TM) for over 200,000 users (Memnon, 2014).

Cloud based services

According to the interviewee, the company provides cloud-based TA and TM software associated with the physical movement of goods before, during and after transportation such as: ‘printing documents, making the booking, getting the status, tracking and a number of other related services (...) so that we can have an integration with IT systems’. This system links the LSPs with their customers and is provided under either Memnon’s brand name or the LSP’s one (CEO, telephone communication, 2014-04-09).

Furthermore, he distinguishes three different areas of demanded functionalities: the inbound transport, price information and invoice follow up as well as modules which integrate the TA system with the customers’ systems (e.g. ERP, Warehouse Management System and Order Management System). He also explains that there are basic functions such as booking and documentation and additional ones. Lastly, he recognizes a difference in terms of providing the same cloud-based service to a 3PL firm and to a logistics department of a company; ‘of course Unilever has some slight different needs than DHL and we use slightly different set of modules.’ (CEO, telephone communication, 2014-04-09).

Challenges of the Cloud

In regards to the usage of cloud, the interviewee cannot pinpoint any significant challenges or problems. However, he emphasizes that a 3PL is not able to control and tailor the changes of the cloud-based software: ‘you cannot control 100% of all developments (...) you are subjected to automatic upgrades’. According to him, a firm rarely prefers the previous version of the system. Furthermore, he points out that the standardization of the cloud-based processes does not leave a great space for customized solutions: ‘you need to treat your IT system a slightly different way, you cannot tailor everything to the smallest event, but you really need to think a little bit about the processes. (...) An old solution which is tailored built with 2,000 different adaptations would be difficult to fit into box’ (CEO, telephone communication, 2014-04-09).

Benefits of the Cloud

The CEO of the Swedish IT company admits that ‘I very seldom have to argue about the software as a service solution’ (telephone communication, 2014-04-09). He strongly supports that the central advantage of the cloud is related to the opportunity for collaboration among the different organizations. This technology significantly facilitates linking different compo-
ponents of the supply chain and the integration of different softwares becomes easier due to the usage of cloud. He also emphasizes that all the supply chain members are on the same platform and follow the same upgrades in real time. In addition, ‘You have a higher reliability, 99.99% up time and the low install software that can actually have that because you don’t have the infrastructure to do the surveillance. We have a much higher security, we have a much higher operation stability because we invest much more in it. (...) The build cost is much lower, the time to market is faster’ suggests the interviewee (CEO, telephone communication, 2014-04-09).

It is further explained by the CEO (telephone communication, 2014-04-09) of the specific IT company that creation of value can be achieved when new modules are easily added to the cloud-based platform generating new features, new services and new concepts; ‘when it’s cloud based and web based you can easily just add modules. If it is installed or of old technology you can’t do that. You need to go out install it and then rebuild it. (...) we can basically add it to all our 30,000 customers if they would like to have it. And that is the big difference from a supplier/provider perspective, that you have much greater opportunities to create value’. Additionally, from a financial viewpoint, he states that ‘If you take one example of ERP system five or ten years ago all the ERP systems had their own TA modules. (...) The problem is that the cost of maintaining those is just increasing and it’s quite expensive and if you want to be innovative and leading in that section it takes quite a lot of it. We are forty five people only working with the integration and maintaining the functionalities’ (CEO, telephone communication, 2014-04-09).

Lastly, the interviewee illustrates his point by explaining that today 3PLs ‘say: we cannot have forty five people working on a TA module because a. it takes focus of our core business and b. it’s just expensive. And c. we will not have a state-of-the-art function’. Thus, the firms stop building modules internally and start collaborating with IT companies ‘and that of course is only possible if you are cloud based because otherwise the collaboration would become difficult’ (CEO, telephone communication, 2014-04-09).

The status quo and the future of Cloud in 3PLs

The cloud technology is still a growing field and changes are yet to come for the logistics industry according to the CEO (telephone communication, 2014-04-09) of the company based in the capital of Sweden. As he states, ‘I still see growth. Do I think that our market share and market segments will increase? Yes. Are there still installed and pc based installations that will gradually disappear? Yes. Is the big growth behind us in terms of, you know, the transaction in our area? Yes, it’s behind us’. He further concludes by emphasizing that: ‘I cannot see any rational reasons, why in any dimension an installed system would be better than a cloud based. I can only see arguments for the opposite’(CEO, telephone communication, 2014-04-09).
4.2 Findings of Solvoyo

Solvoyo is a cloud provider located in USA. The company was founded in 2005 and incorporated in Massachusetts (Solvoyo, 2014)

Cloud based services

The company provides a planning optimization cloud-based software which optimizes the fulfillment of the everyday orders. Solvoyo is focused on providing supply chain solutions in a cloud based platform for its clients; the Solvoyo Elevation Platform (Solvoyo, 2014). ‘One of our specialized solutions is for the transportation phase’ points out the interviewee. He also mentions: ‘Our software is hosted on the Amazon cloud and we have servers open in the US, Asia, Australia and Europe (…) we own the model and we run it and provide the solution of using our software (…) we just have a monthly fee’. As the company focuses on providing optimal planning solutions, they have developed the cloud-based order management system which leads to ‘the optimal allocation of orders with a specific application that we have’ (VP Customer Solutions, telephone communication, 2014-03-25).

Moreover, the interviewee states that the software provided is the same but the objective differs depending on the industry that the customer belongs to. For instance, the retailers focus on the profit of their products, whereas the 3PLs concentrate on making profit of the warehouse itself. There is a combination of different factors such as profit, revenue and cost, yet ‘from the logistics provider perspective the cost is the most important piece of the equation’(VP Customer Solutions, telephone communication, 2014-03-25).

Challenges of the Cloud

The VP Customer Solutions of Solvoyo (telephone communication, 2014-03-25) mentions the dependency on customer’s internet connection which sometimes can be an issue: ‘when we get a customer location we do use a hotspot not a wifi. But we also have a partner who uses only wifi; so, it just depends’. Regarding to the aspect of security, the interviewee is stating that ‘we actually do work with banks in Europe (just to demonstrate the level of security that we have) and our implementation on them is more secure than the core of the banking system’. Furthermore, he emphasizes on the fact that there are descriptions of their security system in the contract and prior discussions with the customer on this topic. For instance, the usage of 64bit encrypted technology is being disclosed to the customer and the interviewee further claims: ‘You know what you get. So, of course that’s part of the engagement (...), they have to be confident that it is secure (...) security has not been an issue and in our case it has not been a deal breaker or a reason why someone would not do business with us’ (VP Customer Solutions, telephone communication, 2014-03-25).

Benefits of the Cloud

The VP Customer Solutions (telephone communication, 2014-03-25) explains that ‘the biggest target for us is the scale and the availability and if you try to solve some of the models that we solve mathematically on other computer, you couldn’t afford. That’s why the company is using the cloud, because we try to go out and buy servers with, you know, a hundred GB of RAM’. Nowadays a solution based on cloud ‘is more capable, more scalable but it doesn’t really cost you more than your currently manual process’ (VP Customer Solutions, telephone communication, 2014-03-25). Moreover, he suggests that a typical advantage of cloud is that ‘from the perspective of access, everyone who has an operating budget can participate’. Taking it further, not only a firm can gain access to this
high powered technology but also ‘it’s very affordable (...) so, it’s an advantage for us to sell this thing’ (VP Customer Solutions, telephone communication, 2014-03-25).

In addition, the interviewee points out that ‘this advanced capability used to be available only through major licensing fees (...) in the past you had to send up to 500,000 USDs to get started (...) and you had to buy your own servers’. Emphasis is given upon the fact that big global logistics firms ‘can bring large implementations, because they already own the hardware, they can invest in hardware, and they can invest in very expensive alternatives for the customers’ (VP Customer Solutions, telephone communication, 2014-03-25). However, he supports that ‘this solution is just as relevant to them as it is to a smaller firm (...) and also your service is certainly more advanced (...) I don’t think that others are more advantaged than medium sized companies because now you compete on even ground’.

A cloud-based planning solution differentiates a 3PL from its competitors when providing not only a large number of trucks or warehouses but also ‘an integrated TMS, the best planning solution available in the market, all scalable on the cloud’ as the VP Customer Solutions (telephone communication, 2014-03-25) argues. He also considers that the 3PLs are given the opportunity to ‘now bring on more customers and more effectively integrate them on software that’s available on the cloud’. Last but not least, he reveals that: ‘it’s a fully redundant system and I think the reliability and the uptime is in the 99.99 something %’ and concludes that ‘there is easier implementation and non jeopardy of the solution because it is always improving. You don’t buy the software and then have to buy it again; there are so many improvements or changes’ (VP Customer Solutions, telephone communication, 2014-03-25).

**The status quo and the future of Cloud in 3PLs**

The VP Customer Solutions (telephone communication, 2014-03-25) affirms that nowadays in the business world the access of hardware via internet and the true adoption of cloud technology in logistics is not fully understandable and embraced. As he states ‘the cloud computing and the effective use of the cloud is very young globally. (...) but those who have been focused on it, embrace it as a business model, I think they differentiate in the stage’.


4.3 Findings of LogTrade BarLink AB

LogTrade BarLink AB was founded in 1992 and its head office is located in Malmö of Sweden. The company has more than 6,000 customers in the Nordic region. LogTrade has been operational as a cloud service since 2008, when also LogTrade 2.0, a web based service for TMS, was launched (Logtrade BarLink, 2013).

Cloud based services

The company mainly provides a cloud-based TA software which has been running from 2008 and includes ‘electronic booking, shipping instructions, transport follow ups, electronic finance handling between the carriers and their customers’(CEO, telephone communication, 2014-04-03). Thus, the company’s main business refers to building functionalities that connect the 3PLs with the users and, more precisely, the 3PLs with companies using Microsoft Dynamics. Furthermore, the interviewee states that ‘today we actually use the cloud service as a transactional server more automatically and we connect different systems. The main difference between the market in the end of 90s and the market today is that certain years of development have moved the transactional phase from manually users to an automatic transaction system’ (CEO, telephone communication, 2014-04-03).

In the beginning, a DOS based system was developed which was then turned into a Windows based one. Moreover, he adds that ‘the trickiest part was when we had to move our customers away from a locally based windows environment to a cloud based’ (CEO, telephone communication, 2014-04-03). However, he supports that the migration into cloud technology was successful and none of their clients is interested in a local installation today. He furthermore states that ‘we have the exactly same software for our 2,500 customers’ and he emphasizes on the fact that ‘the most demanded service is the functionalities that connect the users with the firms’ (CEO, telephone communication, 2014-04-03).

Challenges of the Cloud

Due to the standardized nature of the cloud system, it cannot offer special solutions for special customers, whereas in a local Windows environment for example, specific parameters can be created in the installation. The CEO (telephone communication, 2014-04-03) states that ‘some customers want to get data in their own way’. Furthermore, the Swedish company’s CEO (telephone communication, 2014-04-03) witnesses the loss of control up to a certain degree when using the cloud, mentioning ‘the loss of how to deal with sales, how to give the right price to the customer and so on’. The interviewee strongly supports that ‘you should use this to automate the transaction flows to the logistics providers. It shouldn’t be any people involvement in that’ (CEO, telephone communication, 2014-04-03).

Benefits of the Cloud

The CEO (telephone communication, 2014-04-03) highlights that ‘the biggest advantage now when we are all on the cloud, it’s actually that everybody is on the same version (...) everybody is running the same system all the time in real time’. What is more, he suggests that cloud technology makes the connection of different organizations and their systems. More precisely, cloud-based
systems link ERP with Microsoft Dynamics. The standardized data structure on the cloud makes their movement easier (CEO, telephone communication, 2014-04-03). The CEO also explains that “if we had software installed in Windows environment like we had before, we would have 5,000 different installations” (telephone communication, 2014-04-03). For instance, if a 3PL firm has to upgrade an existing service or release a new one in the market, it needs to communicate with these 5,000 different customers in order to give the appropriate instructions. On the contrary, when migrating from a local installation into cloud, only one real time change is necessitated in the system. Furthermore, he argues that ‘companies will stop installing locally their software because it’s too expensive to maintain and support’ (CEO, telephone communication, 2014-04-03).

The interviewee mentions the ease of use, the simplicity and automation that cloud technology offers. He supports that its usage is necessitated in order to meet customers’ needs, since they are becoming more demanding and technologically mature. He also mentions that there is a 3PL where ‘approximately 1,000 people are working on sales and administration in the sales, I think they can take away the 99% of these people if they are using the cloud right. That’s quite a huge change’ (CEO, telephone communication, 2014-04-03). The CEO (telephone communication, 2014-04-03) adds that ‘if you look to the companies with the highest profit (…) all of these companies have made very simple products, they have a very standardized way of how they are handling the communication with the customer and they are all using the cloud to 100% (…) They are working like McDonald’s in the logistics industry’. He concludes that 3PL firms with many employees ought to fully take advantage of the cloud technology; otherwise those firms will have too expensive overhead costs for sales and administration and they will not survive’ (CEO, telephone communication, 2014-04-03).

The status quo and the future of Cloud in 3PLs

‘I think this is the future’ states the interviewee (telephone communication, 2014-04-03). He also adds that setting up certain rules -regarding to a booking, a transport instruction etc.-entails a key element in order to move data between different organizations. Thus, emphasis is given on the standardization of the processes and the structure of the data transferred when implementing cloud solutions; as the CEO (telephone communication, 2014-04-03) describes: 'I think that the logistics services in the Nordic region, they are pioneers in the world market who are setting up these rules'. He further explains that ‘If I have a person or a company comes to me and say we can’t have standardized products being used by a large amount of customers, if we need to have special solutions for every customer, special set up with every installation and everything, I say to them you are not ready for the cloud. And I think you are thinking with the wrong way’ (CEO, telephone communication, 2014-04-03).

Moreover, regarding the implementation of Cloud in the realm of future logistics, the interviewee considers that ‘in the Nordic region everybody is ready for the cloud. They have seen that this model is right here now and everybody is moving there (...) my recommendation to my customers and my partners is that you can’t stop this; this is happening (...) You are in a country now that has invented Spotify and other things. We are very used to these types of systems’ (CEO, telephone communication, 2014-04-03). He concludes that the usage of cloud-based systems in the logistics industry and their demand are highly dependent on the age of the users; ‘The development among the users is what is driving this market’ as the CEO (telephone communication, 2014-04-03) of the Swedish company states, signifying that the current generation has advanced computing skills in comparison with previous ones.
4.4 Findings of 3PL_1

The Danish 3PL_1 is a warehousing-based firm, operating mainly in Denmark and the Scandinavian region. The firm is specialized in customer solutions such as storage, pallet and packages distribution and cross-docking (website, 2013). As the Logistics Manager (telephone communication, 2014-05-01) of the company affirms: ‘we are neither a large company, nor a very small one though. But we think that we can compete the large multinationals up to a degree and therefore survive into the business world’. The 3PL_1 located in the capital of Denmark, Copenhagen, is using cloud-based solutions for the Transport Administration which are provided by a Swedish cloud provider the last five years.

Cloud based services

The Logistics Manager (telephone communication, 2014-05-01) suggests that the cloud based services the company uses have ‘changed the way that the company works; this is undoubtable. We are capable now to see the data real-time and we have all the information in a single platform’. Moreover, the Logistics Manager of the 3PL_1 (telephone communication, 2014-05-01) states that ‘I imagine that the cloud based functionalities used by a firm like ours are not different from the ones provided to other industries, but I think that a 3PL needs certain adaptations, I mean it needs specific modules. I guess those are the ones requested mostly by that type of companies’.

Lastly, the use of the cloud is highlighted as really important in a company which serves the logistics sector as he supports that ‘cloud based modules and services are the trend I think. Large 3PL companies have already this technology since 2005 or 2006, we started to use it on late 2008 because we cannot ..should not stay behind’ (Logistics Manager, telephone communication, 2014-05-01).

Challenges of the Cloud

For the Logistics Manager of 3PL_1 the disadvantages are ostensibly concealed for now. As he supports : ‘cloud technology is really new. (…) We think we know how to deal with it, but I believe that there will be some disadvantages maybe in the future, when a new technology will come up to show us that cloud has some drawbacks’ (Logistics Manager, telephone communication, 2014-05-01). However, he imprints that : ‘Now, I don’t see any disadvantage or challenge, not even little. Maybe there are, but until now in the field none of them has come up. (…) I guess that everyone needs connection, access to the internet, so if someone does not have it , he cannot have the cloud also, can he?’ (Logistics Manager, telephone communication, 2014-05-01).

Regarding the issue of security of the cloud and the challenges that have been arisen in the 3PL firms, the interviewee is revealing: ‘Well, we have a public cloud. In the beginning of the 2000 when those technologies started to develop I think that everyone had doubts about the security, but now there is no doubt about it. (…) Someone could say : the data are not safe since you have a public cloud. I think those are the people who have absolutely no idea about the technology nowadays and the business world’ (Logistics Manager, telephone communication, 2014-05-01). He further states that ‘I don’t believe that security should be counted as a drawback, (…) now in 2014, it should be a plus of this technology’ (Logistics Manager, telephone communication, 2014-05-01).

Moreover, he emphasizes on the fact that the cloud is built upon a standardized structure of the data and identifies that this might make some businesses hesitant in its adoption or incapable of using it in a proper way and take its full advantage. In accordance with his
words: ‘this technology though, is very structured. I mean, the cloud is structured, standardized in a way. You can add or remove things, modules, functionalities you can adopt it to your company but I know it takes too long to fully adapt to everything and tailor everything’ (Logistics Manager, telephone communication, 2014-05-01). The interviewee exemplifies that they do not have control over the changes that are made by the automatic upgrading; however, their company has never faced any issue. Lastly, he pinpoints that the differences of standards across the industries and countries should be gradually decreased.

Benefits of the Cloud

The advantages of the cloud are visible in the everyday working life as the Logistics Manager (telephone communication, 2014-05-01) supports. Cloud has made the collaboration between the partners easier and more trustfull as all the data are accessible by the customers. The company is focusing on fostering good and stable relations with its customers and the cloud serves this objective (Logistics Manager, telephone communication, 2014-05-01).

‘Cloud based modules and functionalities that link us to our customers and help us to collaborate with many partners and handle those partnerships effectively and be responsive’. (Logistics Manager, telephone communication 2014-05-01).

The Logistics Manager (telephone communication, 2014-05-01) suggests that ‘cloud technology gives us opportunities. That is the biggest advantage. (...) With a basic locally installed system it was not the same. Now the system is scalable to the highest degree and available anywhere anytime for everyone’. He continues by explaining that ‘real-time updates makes the collaboration faster and we are sure that our data are 100% up-to-date, so do our customers. They know that if something happens they will see it immediately in the system and we will do the actions needed. But with the cloud, we have never faced any problem, as I told you already. Everything is being under control and we know it could not be better than that for us, taking into consideration the budget that we have(…), the money invested in those systems by other companies’ (Logistics Manager, telephone communication, 2014-05-01).

Moreover he adds that ‘I can say that cloud technology in general facilitates you to cut the cost in a company like this. You don’t need neither the same amount of people anymore for the administrative work nor the same amount of money for the upgrading and maintenance costs but you have to implement it in the right way to say that you can save money at the end of the day’ (Logistics Manager, telephone communication, 2014-05-01). He also states that the firm’s focus on its core business is of major importance. According to the interviewee, ‘there is neither time nor money for us to build such an advanced TA software like this which ultimately is what differentiates from the others’. He highlights the need of working in a standardized way in order to survive and be profitable. As the interviewee is a strong supporter of their cloud-based system, the high degree of its security is mentioned. Lastly, he states: ‘I believe that cloud in 2014 has made the firms more competitive and adds to them value. But we have not realized yet its full potential I think’ (Logistics Manager, 2014-05-01).

The status quo and the future of Cloud in 3PLs

‘Cloud systems and this technology is already here in the Nordics (...) but as far as I am concerned it is not widely used in the 3PLs or logistics providers of other countries around the world. If we speak about Scandinavia, I think we are pioneers in technology’ explains the Logistics Manager (telephone communication, 2014-05-01) of the Danish company in Copenhagen. He strongly supports that companies like 3PLs follow the technological trends as they provide a solution for
their work: ‘Technology is our weapon. Of course first of all we pay attention to our services and to our customer relations, but without the technology we would not stand here now and we would not compete with the big logistics firms (...) the cloud makes it possible for us to provide services that add value for the customer and keep up with our competitors’ (Logistics Manager, telephone communication, 2014-05-01).

The Logistics Manager (telephone communication, 2014-05-01) of the Danish firm concludes that the cloud computing in the 3PLs is going to be widely used by the laggards of this technology as: ‘It is definitely the newest technological trend and is going to be implemented globally I think, because its advantages are a positive addition for a firm. (...) In some time if they actually won’t do so, they will disappear. They cannot do anything different but to follow the cloud’.
4.5 Findings of DHL Freight

DHL Freight has 1,300 service points all over Sweden, with international terminals in Sundsvall, Stockholm, Jönköping, Malmö, Helsingborg and Göteborg (DHL Freight Sverige, 2014). The DHL Freight, located in the Swedish town of Jönköping, is a 3PL which uses and provides cloud-based solutions related to three different stages: before, during and after transportation.

Cloud-based services

In regards to customer’s needs, the cloud-based services that the company uses includes the price calculation of the freight, the pickup order, the label or document printing, the timetable, the pallet account and the customs clearance in the pre-transportation phase. The part during transportation involves tracking and tracing, the status information and the deviation report. Lastly, the stage after transportation entails the delivery information, the charging, the invoicing and the statistics. The IS Integrator of DHL Freight in Jönköping mentions that the company’s data center is situated in Prague (personal communication, 2014-03-31). He also highlights that ‘If you have a cloud, (...) you have a lot of different needs from the logistics world; a lot of different uses between two companies; within the company as well’.

Moreover the interviewee suggests that customers’ expectations and demands are higher in Nordic region due to their higher degree of IT maturity in comparison with other European countries. This concept explains the absence of a common European cloud-based system. The interviewee further pinpoints that the organization offers all its cloud-based logistics services in four different ways; the first one refers to a simple webpage where customer can order transportation and the second one to a more advanced extranet. Both of them are free of charge, whereas there are also cloud-based systems - offered by certified suppliers such as Centiro, Memnon, Logtrade – for which the client has to pay. He emphasizes that these IT companies have 97.7% of DHL Freight's shipments counted electronically (IS Integrator, personal communication, 2014-03-31). Last but not least, according to the IS Integrator (personal communication, 2014-03-31), the company develops cloud solutions in which the customer can also build small functions such as price or pickup requesting.

Challenges of the Cloud

The 3PL representative strongly supports the usage of cloud services: ‘I only see advantages’ (IS Integrator, personal communication, 2014-03-31). Nevertheless, he admits that ‘Somehow different industries have different standards. This could be in some cases tricky’ and he exemplifies that the e-freight project, which is sponsored by the European Union, is difficult to work due to the high degree of standardization and adaptation that each industry needs. Moreover, the development of logistics cloud-based services and their level of standardization are highly dependent on the IT maturity and openness of each country. For instance, Swedish people highly rely on these types of technology: ‘Even kids have credit cards in Sweden (...) I would say culture is a big challenge’ (IS Integrator, personal communication, 2014-03-31).

Additionally, the interviewee conceded that some customers do not fully rely on it, mentioning that ‘they want to build this by themselves. Every time you build something for a customer costs money’. Thus, if a customer chooses to develop a cloud-based software in cooperation with
DHL Freight, it is more costly. ‘I would say we launched internet usage on 1996-1997 and today customers were afraid but today I would say the question never comes up’ affirms the IS Integrator (personal communication, 2014-03-31) regarding to the security of the cloud-based system. He states that their contracts included a privacy statement in the initial phase of EDI, but that has not been used for the past ten years as ‘It is more about the process. It is not too confidential’ (IS Integrator, personal communication, 2014-03-31).

Benefits of the Cloud

The interviewee explains that ‘One of the biggest advantages is that we need to update only in one place. If you have a lot of local installations, you need to update everywhere. It’s only one place to update and all the customers have the same information at the same time’. Regarding to the locally installed HR system, he admits that it used to be very complex and a lot of upgrades were necessitated. Moreover, he states that cloud technology is used in order to generate industry standards: ‘We agreed on standards that these companies use; for example, on the label of the barcode (...) because the customer uses the same label for us as for Schenker or the Swedish Post’. Thus, collaboration with other logistics firms is facilitated (IS Integrator, personal communication, 2014-03-31).

What is more, referring to the company’s different cloud-based systems: ‘the more advanced it becomes, the more secure it is’ (IS Integrator, personal communication, 2014-03-31). The interviewee also suggests that ‘the Business to Consumer (B2C) market has changed very fast the last years because suddenly people started buying automatically instead of going to the store. So we needed to build up our service packet. The B2C market made us to take some fast decisions (...) the cloud makes it possible with the business – consumer shopping’. The usage of cloud technology is necessitated so that their Swedish customers are provided information electronically in an easy, automated and simplified manner.

Furthermore, the interviewee claims that the cloud providers as IT companies are highly specialized in the field of cloud technology: ‘this cloud computing is their core business; so, it is hard for us, as a transportation company, to compete with’. He also perceives the fast implementation of new services as a critical advantage of cloud providers. Lastly, the automation that cloud computing provides leads to a significant reduction of data entry personnel: ‘in the beginning of 80s, I had 35 women making data entry in the office and we realized that this kind of automation could help us (...) Today we have 10 people in India’ (IS Integrator, personal communication, 2014-03-31).

The status quo and the future of Cloud in 3PLs

As the IS Integrator (personal communication, 2014-03-31) supports, the cloud ‘is the future. The other countries have to understand the possibilities’. He further explains: ‘I think we need to be faster, we need to adopt these new changes, because everything is changing faster because of the cloud. So, we need to be faster in our movement, defining new ideas and follow the customer, because they drive our development’. Lastly, he states that ‘Standardization is very important to succeed here (...) if it’s an application or a cloud service, it’s very important that it has a standard’. 
### 4.6 Findings of DACHSER

DACHSER is a private-owned company with 25,000 employees and 340 offices worldwide. Its main business refers to air, sea and road transportation as well as food logistics focusing mainly on pallets’ distribution. What differentiates the company from its competitors is the fact that every customer corresponds to a specific contact person. The Branch Manager (personal communication, 2014-04-10) of DACHSER in Jönköping gives emphasis on this strategy mentioning that ‘if the client calls to our branch, they have a certain name and a certain person to speak to’. He also states that the company invests heavily on IT, as more than 380 IT specialists are working at its head office.

#### Cloud based services

According to the Branch Manager (personal communication, 2014-04-10), their cloud-based platform encompasses the communication panel with the customers and links the Internet with the physical movement of goods. It is used for the online control of the different processes and all of the company’s clients are connected to it. He continues by explaining how they have real-time sharing of information all over the world about the pallets they distribute: ‘They scan it when they unload it and they scan it when they load it again on a departure trailer for delivery to the client. And when they come to the client, they scan again and in the scanner there is a square where they can sign and in 3 seconds or now it may be in 3 milliseconds, you have it in the system’.

#### Challenges of the Cloud

The interviewee is a strong supporter of the cloud-based e-Logistics database and he emphasizes on the fact that in the company, he has not experienced anything that could count as a drawback for the use of cloud. He explains that ‘if we have a problem with electricity all over, then it’s a problem but then it’s a problem for everything’ (Branch Manager, personal communication, 2014-04-10). Moreover, regarding to the security of their system, the Branch Manager mentions: “we don’t have to speak about security (…) I think this is only transportation”. He furthermore suggests that he does not perceive any challenges concerning the security of the system as he states that ‘the hackers cannot come in and they try every day as far as we know’.

#### Benefits of the Cloud

According to the interviewee, the main benefit of the cloud-based platform is that “we can follow everything on the system (…) it’s real time all over the world” (Branch Manager, personal communication, 2014-04-10). The customers can be provided with all the information needed: ‘they have 99% in there’. Moreover, it has to be stressed that only one worldwide cloud-based system is used, which means that every shipment does not correspond to different numbers in different countries, as the interviewee illustrates the process of tracking and tracing through the cloud-based system of the company: ‘If you go with another 3PL, when you go for the bridge departure from Denmark, the shipment is somewhere in the system; when you go to a new country, it doesn’t disappear but it’s very difficult to find it; and, as a client, you can’t find it, you have to call somebody’ (Branch Manager, personal communication, 2014-04-10). Thus, he stresses that their advanced and globalized cloud-based system provides automation and ease of use, and prevents from people involvement.

The 3PL representative also underlines that this specific database entails a major competitive advantage; ‘we are moving a lot further than the other ones. We are not 2 steps ahead; many steps
ahead’ (Branch Manager, personal communication, 2014-04-10). However, being close to the customers and communicating with them remains a key aspect for the company: ‘We are not cutting down the employees because we have a good system’ (Branch Manager, personal communication, 2014-04-10). Last but not least, the 3PL representative (personal communication, 2014-04-10) suggests that cloud technology gives the opportunity to connect a customer with another logistics service provider: “If there is a client who has paid X amount of money to go into the cloud and use it for working with another 3PL, we can connect that to our E-Logistics (...) so they can book through”. In this case, DACHSER provides to its customers only the booking function of its cloud-based system.

The status quo and the future of Cloud in 3PLs

‘I am more than happy about the system and I’d like to say that I don’t want to change anything because they have thought about this for a long period and they have done it for many years (20 – 25 years)’ states the Branch Manager (personal communication, 2014-04-10) of DACHSER in Jönköping. He reveals that the company has invested a large amount of money and human capital on the specific cloud-based platform. Lastly, referring to the company’s competitors, he mentions that they ‘are far way back. It’s a lot of money and they won’t invest it; they will always be behind us. They would like to have it. And some of them have it in a small way’.
### 4.7 Summary of Empirical Findings

*Table 4.1 Summary of Empirical Findings.*

<table>
<thead>
<tr>
<th>Cloud-based Services</th>
<th>3PL Providers</th>
<th>Cloud Providers - IT companies</th>
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<tbody>
<tr>
<td></td>
<td>Software as a Service (SaaS):</td>
<td>Software as a Service (SaaS):</td>
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<td></td>
<td>✓ Transport Administration (TA) Software</td>
<td>✓ Transport Administration (TA) Software</td>
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<td></td>
<td>✓ Transportation Management System (TMS)</td>
<td>✓ Planning Optimization Software</td>
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<td></td>
<td>✓ Planning Optimization Software</td>
<td>✓ Order Management Software</td>
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<td></td>
<td>✓ Order Management Software</td>
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<tr>
<td>Challenges</td>
<td>✓ High level of standardization</td>
<td>✓ High level of standardization</td>
</tr>
<tr>
<td></td>
<td>✓ Lack of common standards across industries &amp; countries</td>
<td>✓ Loss of control over processes</td>
</tr>
<tr>
<td></td>
<td>✓ Dependency on the Internet</td>
<td>✓ Dependency on the Internet</td>
</tr>
<tr>
<td>Benefits</td>
<td>✓ Compatibility &amp; Inter-organizational Collaboration</td>
<td>✓ Compatibility &amp; Inter-organizational Collaboration</td>
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<tr>
<td></td>
<td>✓ Standardization</td>
<td>✓ Standardization</td>
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<tr>
<td></td>
<td>✓ Scalability &amp; Flexibility</td>
<td>✓ Scalability &amp; Flexibility</td>
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<td></td>
<td>✓ Responsiveness</td>
<td>✓ Responsiveness</td>
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<td></td>
<td>✓ Cost</td>
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<td>✓ Security</td>
<td>✓ Security</td>
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<td></td>
<td>✓ Upgrades</td>
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<tr>
<td></td>
<td>✓ Core Competence &amp; Specialized Services</td>
<td>✓ Core Competence &amp; Specialized Services</td>
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<tr>
<td></td>
<td>✓ Competitive Advantage &amp; Value Creation</td>
<td>✓ Competitive Advantage &amp; Value Creation</td>
</tr>
<tr>
<td></td>
<td>✓ Ease Of Use &amp; Accessibility</td>
<td>✓ Ease Of Use &amp; Accessibility</td>
</tr>
<tr>
<td>Status Quo &amp; Future Of Cloud In 3PL Sector</td>
<td>✓ It is the future. Growth &amp; Spread globally – especially in Nordic region (level of IT maturity &amp; culture – important role)</td>
<td>✓ Gradual disappearance of local installations</td>
</tr>
<tr>
<td></td>
<td>✓ Competitive Advantage - Differentiation</td>
<td>✓ It is the future. Global Growth &amp; Spread has been forecasted – especially in Nordic region.</td>
</tr>
<tr>
<td></td>
<td>✓ Faster Changes within the 3PL industry</td>
<td>✓ Standardization</td>
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<tr>
<td></td>
<td>✓ Standardization &amp; Automation of the cloud (critical to survival and success)</td>
<td>✓ Young technology</td>
</tr>
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<td></td>
<td>✓ No entry barriers for 3PLs in regards to IT – changes in the business setting</td>
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5 Analysis

In this chapter the authors integrate the empirical findings with the previous researches of the theoretical part. The perceived benefits and challenges of cloud technology in the 3PLs are investigated from the scope of the cloud providers of 3PLs and the 3PL firms. A cross-analysis is being conducted by the authors in order to fulfill the purpose and answer the research questions of this thesis.

The analysis section correlates the thorough literature review with the empirical data that were collected and selectively presented by the authors. The analysis part is composed by reviewing what was stressed in the frame of references section, and what was revealed from the interviews. Hence, the authors facilitate the reader to comprehend the present state of affairs in cloud technology within 3PLs. For that reason the authors have developed a model where the challenges and benefits of cloud in the 3PLs are clearly demonstrated.

5.1 The current state of cloud-based services in 3PLs

Articulated in theory by Arnold et al. (2013), cloud computing in logistics supports mainly the co-modal transport management in a resource efficient way. The cloud is indeed used in transport administration as it stems from the empirical findings of this thesis. TA modules are extensively used on the cloud (Logistics Manager, telephone communication, 2014-05-01) and in particular in the form of track and trace modules (Branch Manager, personal communication, 2014-04-10) or inbound transport control and collaboration linkages based on EDI (CEO, telephone communication, 2014-04-09). According to the VP Customer Solutions of the American company Solvoyo (telephone communication, 2014-03-25), their company provides optimal planning solutions via a cloud based order management system with is in accordance with the Arnold et al. (2013) research which supports that cloud computing in logistics substantiates collaborative and smart supply chain management.

All empirical findings deriving from the interviews, concur to the identically of the cloud-based software among the industries in terms of computing architecture and characteristics. However, interviewees agree on the slight differentiation of adjusted modules in the logistics industry (Logistics Manager, telephone communication, 2014-05-01; VP Customer Solutions, telephone communication, 2014-03-25). This differentiation also originates from the expectations of customers (IS Integrator, personal communication, 2014-03-31), which happen to be higher in countries with current IT maturity (CEO, telephone communication, 2014-04-03; Brand Manager, personal communication, 2014-04-10).
5.2 Challenges of the cloud in 3PLs

5.2.1 Data Security

Data security is presented as an issue of major importance by Aleem & Sprott (2013), Dillion et al. (2010) and Chandran & Angepat (2010), whereas for the cloud providers of the 3PL firms this issue does not arise any more, as the continuous advancements of the model has ensured its security to the level that the question never comes up (VP Customer Solutions, telephone communication, 2014-03-25). As for the CEO of Memnon Networks (telephone communication, 2014-04-09) and the CEO of LogTrade (telephone communication, 2014-04-03), security did not appear as a challenge of cloud computing.

Regarding to the 3PLs, security is not mentioned as a challenge as well; for the interviewees of the three firms, security was not graded as an issue or a challenge that their firm should face. The Logistics Manager (telephone communication, 2014-05-01) of 3PL_1 along with the IS Integrator of DHL Freight (personal communication, 2014-03-31) and the Branch Manager of DACHSER (personal communication, 2014-04-10) argue that security is not a disadvantage of this technology; rather the opposite. Therefore, these perceptions come in contradiction with the previous researches (Chandran & Angepat, 2010; Subashini & Kavitha, 2011; Ogigau-Neamtiu, 2012; Aleem & Sprott, 2013).

SYNTHESIS

Researches conclude that data security is a challenge of major importance concerning the cloud computing technology. According to the findings, neither the 3PLs are wary about the security nor their cloud providers. Thus, in the 3PL industry the issue of cloud security of the data is not perceived as a challenge.

5.2.2 Confidentiality and privacy

Chandran and Angepat (2010) have addressed the issue of data confidentiality as hazardous security issue stemming from the cloud architecture. Furthermore Subashini & Kavitha (2011) as well as Santos et al. (2009) have also identified the data confidentiality as a challenge, whereas the investigated cloud providers do not perceive this as an issue that should be counted in the drawbacks of cloud. In particular, the VP Customer Solutions of Solvoyo (telephone communication, 2014-03-25) claimed that ‘security has not been an issue and in our case it has not been a deal breaker or a reason why someone would not do business with us’. It has also been clearly stated by the other two cloud providers data confidentiality is not a challenge for them, as the encrypted technology provides a safe umbrella under which they operate. Thus, the literature does not correspond to the empirical data collected by the authors.

The interviewees of the 3PL firms have demonstrated that data confidentiality is not perceived as a challenge (Logistics Manager, telephone communication, 2014-05-01; Branch Manager, personal communication, 2014-04-10), yet as an advantage of the relatively new technology of cloud (IS Integrator, personal communication, 2014-03-31). However, the researches reveal that it is a challenge that makes companies wary (Subashini & Kavitha, 2011; Chandran & Angepat, 2010; Santos et al. 2009). Therefore, there is a difference between the theoretical part and the empirical findings of this thesis.
SYNTHESIS

The cloud providers and the 3PL companies have revealed that confidentiality on cloud-based services is not perceived as a challenge nowadays. However, the studies suggest that this aspect is of highlighted importance. Therefore, the authors recognize a difference between the literature and the empirical findings.

5.2.3 Availability

Armburst et al. (2009) and Aleem & Sprott (2013) has addressed the problem of availability in terms of access. Cloud providers do not consider it as an obstacle. More precisely, the VP Customer Solutions (telephone communication, 2014-03-25) of the American company of Solvoyo counts data availability on the advantages’ side of cloud technology. The other two cloud providers, Memnon Networks AB (CEO, telephone communication, 2014-04-09) and LogTrade BarLink AB (CEO, telephone communication, 2014-04-03) do not perceive, as well, the availability of the data on cloud as a challenge.

Studies have shed light upon the issue of dependency of the cloud technology on the web. Due to this dependency, Chandran and Angepat (2010) suggest that problems may arise or further issues may occur during the supply chain migration to the cloud. The VP Customer Relations (telephone communication, 2014-03-25) highlights that fact, addressing the lack of internet connection as a potential challenge.

The research of Chandran and Angepat (2010) is in line with the perceptions of the 3PLs’ representatives, as two of the firms identify this potential challenge. Logistics Manager of 3PL_1 (telephone communication, 2014-05-01) states that the access to the internet might be a potential temporary problem, whereas Branch Manager of DACHSER in Jönköping (personal communication, 2014-04-10) suggests that ‘if we have a problem with electricity all over, then it's a problem but then it's a problem for everything’. Hence, the challenge of dependency is conceivable by the interviewees and not availability in general; however, its implications are considered as a scenario of low probability.

SYNTHESIS

The availability, which encompasses the concept of dependency on the internet, is highlighted as a perceived challenge by the literature. Half of the interviewees recognize that availability is not a challenge, whereas dependency may result in instability in terms of connectivity to the cloud. Therefore, the findings are being segregated in the area of availability, as the suggestion that availability is not a challenge, does not comply with the literature, whereas the dependency on the internet connection is supported by the theoretical part.
5.2.4 Cost

The high unpredicted costs of the cloud usage have been highlighted by the studies of Barthelemy (2001), Dillion et al. (2010) and Greenberg et al. (2009). Nevertheless, the cloud providers support that the cost should count as an advantage of the cloud-based services owing to the reduction of maintenance cost (CEO, telephone communication, 2014-04-09; CEO, telephone communication, 2014-04-03) and the affordability of the model (VP Customer Solutions, 2014-03-25).

Additionally, the interviewees of the 3PLs affirm that the cloud-based services lead to cost cutting (Logistics Manager, telephone communication, 2014-05-01). They claim that the implementation of cloud computing in their company led to a reduction of administrative employees (Logistics Manager, telephone communication, 2014-05-01; Branch Manager, personal communication, 2014-04-10). However, it has been stated that a large investment is necessitated when building internally an advanced cloud-based system (Branch Manager, personal communication, 2014-04-10). Albeit Barthelemy (2001), Dillion et al. (2010) and Greenberg et al. (2009) support that the companies should be wary with the cost of the cloud-based services, albeit empirical findings reveal the opposite as 3PLs perceive the cost as an advantage.

SYNTHESIS

Cost of the cloud is perceived as an advantage rather than a challenge by all of the interviewees. However, theory suggests that the firms are vigilant about the cost that may occur when using the cloud technology. Upon the aforementioned, a conclusion can be drawn based on the empirical study, which does not support the researches. Thence, the cost is not perceived as a challenge in the 3PLs that are acquainted with the cloud technology.

5.2.5 Loss of control over data

The dynamic improvements, that is upgrades of cloud-based software, happening automatically may not appeal to the customers and a significant loss of control over developments may occur (CEO, telephone communication, 2014-04-09). Furthermore, the loss of control ‘of how to deal with sales, (...) how to give the right price to the customer’ (CEO, telephone communication, 2014-04-03) has been affirmed by the cloud providers. Based on the empirical findings, the authors suggest that the loss of control is pertinent to processes rather than data as Varbanov (2011) and Chow et al. (2009) support.

The 3PL firms do not introduce the loss of control over developments or data as a challenge in this technological phase of cloud computing in the logistics industry, albeit Varbanov (2011) and Chow et al. (2009) identify this issue in their researches.

SYNTHESIS

In previous studies, the loss of control over data, due to the cession of the IT system's handling, has been presented as an issue. It has been revealed from the findings that the loss of control over processes is perceived as a challenge by the cloud providers, yet the 3PL companies do not express any resentment.
5.2.6 Lack of standardization

Studies suggest that cloud is characterized by lack of standardization (Varbanov, 2011; Ogigau-Neamtiu, 2012; Emison, 2013). However, the empirical findings presented, reveal that the high structural form of the data is a challenge (CEO, telephone communication, 2014-04-09; CEO, telephone communication, 2014-04-03). Moreover, as the CEO of LogTrade states ‘some customers want to get data in their own way’ (telephone communication, 2014-04-03) and the standardization of the cloud does not facilitate tailoring everything in painstaking detail. Hence, the perceptions of cloud providers are not aligned to the past researches.

Similarly, the issue of standardization of the cloud-based systems is perceived as a challenge by the 3PL firms. It is stated that the high degree of standardization and the lack of common standards among the different industries is a challenge faced nowadays (IS Integrator, personal communication, 2014-03-31). Furthermore, the Logistics Manager of 3PL_1 (telephone communication, 2014-05-01) opines that the highly standardized structure of the data on the cloud hinders 3PL firms tailoring everything to the smallest event. Consequently, the perceptions of the 3PLs are in contradiction with the researches pertinent to the lack of standardization (Emison, 2013; Ogigau-Neamtiu, 2012; Varbanov, 2011) as well.

SYNTHESIS

Even though past studies support that the cloud technology is characterized by lack of standardization, the perceptions of the interviewees essentially differ. In fact, the representatives of the case companies emphasize on the different standards among the industries operating on cloud. The development of common standards is perceived as fundamental in order that effective collaboration can be reached.

5.3 Benefits of the Cloud in 3PLs

5.3.1 Benefits of cloud-based services in the supply chain

Compatibility & Inter-organizational Collaboration

Existing literature highlights that one of the most prevailing advantage of cloud-based systems refers to their simplification. The fact that they can be connected to multiple components of the supply chain constitutes a valuable solution to the compatibility problem and significantly enhances information collaboration between different organizations (Tiwari & Jain, 2013). In previous researches, various positive features of cloud computing are also considered as facilitators of information sharing (Sahin & Robinson, 2002; Rochwerger et al., 2009; Vouk, 2008; Rosenthal et al., 2010). This is in line with all the cloud providers’ perceptions, as the CEO of LogTrade Barlink AB (telephone communication, 2014-04-03) claims that their main business refers to the connection of different companies’ systems in order to collaborate electronically. He exemplifies mentioning the connection of the ERP systems to Microsoft Dynamics. What is more, the CEO of Memnon Networks AB (telephone communication, 2014-04-09) emphasizes that linking different parts and members of the value chain and integrating them creates a valuable opportunity for collaboration. Lastly, the VP Customer Solutions of Solvoyo (telephone communication, 2014-03-25) also considers that the cloud-based systems can more effectively integrate with various softwares.
Similarly, all of the 3PL case companies perceive that cloud technology yields high degrees of benefits in terms of collaboration with their partners and sharing of information. More precisely, the Logistics Manager of 3PL_1 (telephone communication, 2014-05-01) stresses the creation of more effective partnerships, while the Branch Manager of DACHSER (personal communication, 2014-04-10) gives emphasis on the real-time nature of the shared information in a global level. Moreover, the IS Integrator of DHL Freight (personal communication, 2014-03-31) underlines the significant role that a European cloud-based platform such as e-freight can play in the collaboration with other firms of logistics industry. Lastly, he highlights that the standardized nature of cloud facilitates their collaboration with their customers and other 3PLs.

SYNTHESIS

According to previous studies as well as to the totality of the interviewees, cloud technology can significantly assist in overcoming the obstacles related to incompatibility by connecting different parts and their systems of the value chain and thereby facilitating information sharing and collaboration.

5.3.2 Benefits of cloud-based services in the organization

Scalability – Flexibility

Previous studies emphasize on the scalable and high powered nature of cloud computing (Zissis & Lekkas, 2012; Marston et al., 2011; Iyer & Henderson, 2010; Vaquero et al., 2008; Ferreira & Moreira, 2012; Venters & Whitley, 2012). Cao et al. (2013) elucidate that its capabilities are unlimited, while Zissis and Lekkas (2012) stress that firms are enabled to adjust their capacity analogously to demand fluctuations. Referring to cloud providers, the VP Customer Solutions of Solvoyo (telephone communication, 2014-03-25) gives emphasis on the importance of cloud technology in terms of the high level of computing power and considers capacity, scalability and agility as its main strengths.

Referring to 3PLs, the Logistics Manager of 3PL_1 (telephone communication, 2014-05-01) claims that the high degree of scalability which characterizes cloud-based systems significantly distinguish them from the locally installed ones. However, these aspects of cloud did not arise throughout the interviews of the other logistics firms.

SYNTHESIS

All in all, the high capacity and scalability are mentioned as important advantages of cloud computing by previous researchers and few interviewees as well.

Cost

Previous researches demonstrate the opportunity, that cloud-based services offer to the organizations, related to the reduction of capital investment. It has been demonstrated that companies are enabled to prevent from investing in IT infrastructure, software and IT staff. Funds can be used for operational rather computational purposes (Ferreira & Moreira, 2012; Accenture, 2014; Pazowski & Pastuszak, 2013; Marston et al., 2011). This is in line with the perceptions of two cloud providers. Firstly, the VP Customer Solutions of Solvoyo (telephone communication, 2014-03-25) denotes that the entry barriers especially for smaller sized firms are significantly reduced. Since the infrastructure is owned by the
cloud providers, purchasing it, is not necessitated. On the contrary, nowadays their customers only have to pay a monthly fee.

Secondly, the CEO of LogTrade Barlink AB (telephone investment, 2014-04-03) gives emphasis on the decreased investment in personnel and strongly supports that there are cases of Swedish 3PLs that can reduce almost the entire staff related to sales and sales administration, due to the effective and efficient use of cloud computing. He further reveals that it is the only way for those firms to survive. Last but not least, he adds that there is an increasing number of organizations which do not have their own local IT environment. Hence, it has to be pinpointed that, in comparison with the existing literature, pertaining only to IT staff, the interviewee refers to administrative personnel as well.

What is more, previous researches have shown that considerable upgrading and maintenance cost savings can be accomplished (Cao et al., 2013; Marston et al., 2011; Alford & Morton, 2009; Whitten et al., 2010; Demirkan, 2010; Benlian et al., 2011). The findings of previous studies regarding only to maintenance cost savings are in accordance to the perceptions of all the cloud providers. More specifically, the CEO of Memnon Networks AB (telephone communication, 2014-04-09) points out the aforementioned costs are greatly increasing. That is why, ERP systems with incorporated Transportation Administration (TA) modules are loosing ground. Furthermore, the CEO of LogTrade BarLink AB (telephone communication, 2014-04-03) predicts that 3PLs will stop installing their software locally due to the high maintenance costs, while the VP Customer Solutions of Solvoyo (telephone communication, 2014-03-25) also considers that, in contrast with the past, expenditure on maintenance is not necessitated in the cloud environment.

From the 3PLs’ perspective, it is clearly affirmed that the significantly lower level of capital investments is a major parameter of cloud technology. The Logistics Manager of 3PL_1 (telephone communication, 2014-05-01) suggests that capital investment on IT systems can be prevented; a critical opportunity for 3PLs with limited budget. Furthermore, the IS Integrator of DHL Freight (personal communication, 2014-03-31) declares that cloud solution is far less costly, since the administrative staff is considerably reduced due to the emergence of cloud-based, automated processes. Existing literature refers only to the reduction of the IT staff, while the interviewees take into consideration the reduction of the administrative staff as well.

Moreover, the empirical findings of this study are in line with those of previous studies only regarding to maintenance costs, since the Logistics Manager of 3PL_1 (telephone communication, 2014-05-01) underlines the importance of not having the above expenditure owing to the cloud computing model.

SYNTHESIS

In total, the majority of the interviewees perceive that cloud technology can lead to cost savings since it leads to IT and administrative staff reduction or even to its elimination. What is more, two interviewees highlight the important role that cloud could play regarding to the initial capital investment on IT systems; especially in smaller sized companies. Because of fund deficiency, it would not be possible to implement those advanced IT systems without the low cost concept of cloud technology. The above mentioned perceptions are in accordance with the existing literature. The important finding throughout the interviews of this , in comparison with previous, is that cloud computing leads not only to IT staff reduction but to administrative as well.
Lastly, to a large extent, the elimination of maintaining costs are conceived as a major benefit of cloud by the existing literature as well as by all the cloud providers and only one 3PL representative. The upgrading costs are not mentioned by any interviewee, even though previous studies refer to them.

Core competences & Specialized Services

Existing literature contains the notion that access to advanced and high quality services is affordable owing to the usage of cloud technology. Thus, nowadays organizations can take advantage of leading practices in contrast with the past (Li, Wang, & Chen, 2011; Accenture, 2014). This concept is suggested by two cloud providers. More precisely, the VP Customer Solutions of Solvoyo (telephone communication, 2014-03-25) strongly supports that the cloud gives the unique opportunity to firms to be provisioned with an innovative solution such as a sophisticated mathematical technique for planning optimization only by paying a monthly fee. In case of a locally installed solution, it could not have been affordable. In addition, the CEO of Memnon Networks AB (telephone communication, 2014-04-09) argues that 3PL firms do not internally develop TA softwares and modules because it is costly and prevents them from concentrating on their core competence. Additionally, the 3PLs cannot reach the high level of specialization that the cloud providers possess in this area.

From the 3PLs’ viewpoint, the focus on core competence and the access to innovative solutions are perceived as benefits. This is in line with the previous studies presented in chapter 2. More specifically, the Logistics Manager of 3PL_1 (telephone communication, 2014-05-01) illustrates that ‘there is neither time nor money for us to build such an advanced TA software like this’. Furthermore, the IS Integrator of DHL Freight (personal communication, 2014-03-31) discloses that cloud providers as IT companies are highly specialized since this technology constitutes their core business and focus.

SYNTHESIS

On the whole, the majority of the interviewees agree with the findings of previous researches, which refer to the opportunity that cloud computing offers to the 3PLs by giving them access to highly specialized services. Due to the cloud technology concept, neither time nor funds are invested in building innovative IT solutions.

Ease Of Use & Accessibility

Previous studies have demonstrated that cloud technology is mainly characterized by adaptiveness which facilitates its sharing with different mediums and at various locations (Cao et al., 2013; Marston et al., 2011; Iyer & Henderson, 2010; Varbanov, 2011). Regarding to cloud providers, this simplicity, automation and ease of use via the internet, without any people involvement, is an aspect mentioned by the CEO of LogTrade BarLink AB (telephone communication, 2014-04-03). He also reveals that cloud technology leads to meeting customers’ needs, since they are constantly getting more demanding and more technologically mature.

Similarly, regarding to 3PLs, the findings of previous researches are in accordance with the empirical findings of this thesis. The Branch Manager of DACHSER (personal communication, 2014-04-10) stresses that their advanced global cloud-based system provides customers with automation and ease of use; additionally, people involvement is prevented. The Logistics Manager of 3PL_1 (telephone communication, 2014-05-01) indicates the
multi-level accessibility by pinpointing that their cloud-based services are accessible anywhere, anytime and for everyone. Last but not least, the Branch Manager of DHL Freight (personal communication, 2014-03-31) emphasizes on the fact that their customers are highly reliant on automatic and electronic way of buying services; easier and less complex solutions are of high priority.

SYNTHESIS

In most of the case companies as well as previous studies’ findings, the ease of use and multi-way accessibility which characterize cloud-based systems substantiate a significant advantage. The interviewees highlight that providing their customers with web-based solutions - instead of locally installed IT resources – is an one-way path that should be followed.

Competitive Advantage & Value Creation

The important aspect of competitiveness is positively and in various ways related with cloud-based systems in the existing literature (Tiwari & Jain, 2013; Meisner, 2008; Venters and Whitley (2012)). In regards to cloud providers, it is also highlighted by the VP Customer Solutions of Solvoyo (telephone communication, 2014-03-25). He considers that a high quality and scalable cloud-based planning software constitutes a critical competitive advantage which differentiates the firm in the stage; especially when it comes to medium sized companies, which can compete on even ground with the large-sized ones. Furthermore, the CEO of Memnon Networks AB (telephone communication, 2014-04-09) suggests that value can be created by adding new functionalities, features, concepts and services on the existing platform; the cloud providers’ expertise and the simplified usage of cloud technology play important role in this value creation.

In regards to 3PLs, two of the interviewees emphasize on the aspect of the competitive advantage. More precisely, it is strongly supported by the Branch Manager of DACHSER (personal communication, 2014-04-10) that their advanced cloud-based platform significantly increases their competitiveness mainly by providing their customers with real time information. Furthermore, the Logistics Manager of 3PL_1 (telephone communication, 2014-05-01) also exemplifies that using trucks, ships, warehouses and various types of good quality equipment is perfectly complemented with an advanced cloud-based software which significantly differentiates them from competitors. He also denotes that the provision of value-added services is a substantial strategic component. Finally, he adds that making processes in a standardized, simple and automated manner is considered to create value to their customers.

SYNTHESIS

All perceptions considered, it can be cited that the majority of the case companies are in line with the existing literature by giving emphasis on the value creation and differentiation achieved owing to the usage of cloud technology.

Upgrades

On the one side, all of the cloud providers support the findings of previous studies by perceiving the aspect of upgrading as an advantages of cloud computing (Varvanov, 2011; Arbrust et al., 2009). They support the importance of not upgrading each client’s software separately. This is a critical advantage especially in cases of 3PLs with thousands of customers. Due to the centralized nature of cloud computing, the platform is upgraded only
once and in real time for every customer simultaneously. Therefore, the process of upgrading, which becomes extremely fast and convenient, accelerates both bringing new cloud-based services on the market and improvements of the existing ones.

On the other side, the majority of 3PLs consider the advantage of upgrading only once as substantial; a perception which is line with the past research. They emphasize on the fact that all of their customers use the same version at the same time, because the software modifications are undertaken simultaneously to all of them.

SYNTHESIS

In all respects, the interviewees conceive the less complex and less time-consuming upgrading advantage as one of the most important; a notion which is in accordance with past researches.

Responsiveness

From the cloud providers’ standpoint, only the CEO of Memnon Networks AB (telephone communication, 2014-04-09) mentions the benefit of responsiveness which is cited in the existing literature (Foster et al., 2008; Benlian & Hess, 2011; Defense Science Board, 2013; Etro, 2009). He claims that time-to-market (TTM) for a new 3PL's cloud-based service is lower, since the cloud provider is always implementing in a faster pace.

From the 3PLs’ standpoint, the perceptions of both the Logistics Manager of 3PL_1 (telephone communication, 2014-05-01) and the IS Integrator of DHL Freight (personal communication, 2014-03-31) are in accordance with the existing literature, as they underline the importance of the cloud provider being responsive by building new modules, new functionalities and new concepts and thereby implementing new services promptly.

SYNTHESIS

On a whole, half of the interviewees support the findings of past research which are associated to the responsiveness; an aspect of major importance since the globalized economy is characterized by fierce competition and considerably fast paced movement.

5.4 The status quo and the future of cloud in 3PLs

In accordance with the findings presented on the empirical part of this thesis, the current state of the cloud technology within the 3PLs have been identified. TA software operating on cloud have facilitated their way of working nowadays. It is clearly declared that the cloud is dominant technology for the firms operating within the logistics industry in countries where the IT maturity is above the average. Growth and spread of its usage is being forecasted (CEO, telephone communication, 2014-04-09; IS Integrator, personal communication, 2014-03-31), while the faster change that cloud brought is visible in the operations (IS Integrator, personal communication, 2014-03-31). Furthermore, it has been revealed from the interviews that cloud usage is adding to 3PLs a competitive advantage (Logistics Manager, telephone communication, 2014-01-05) in order to compete with other firms on even ground (IS Integrator, personal communication, 2014-03-31). The cloud can provide a differentiation for the firms as well (CEO, telephone communication, 2014-03-25) if they embrace it as a business model. Last but not least, it has been stated that effort and investments are needed for the cloud advantageous use (Branch Manager, personal communication, 2014-04-10), so as a certain level of standardization and global structure rules estab-
lishment (CEO, telephone communication, 2014-04-03; IS Integrator, personal communication, 2014-03-31).

After evaluating the empirical findings, the authors accept and recognize the three phases which Schramm et al., cited in the article of Tiwari and Jain (2013), identified regarding to the implementation process of SCM on cloud platforms. Thereafter, they propose a fourth phase (2015-2017) related to the cloud technology post implementation in 3PLs. The following table is adopted by Tiwari and Jain (2013) and is presented revised for the 3PL firms in particular, by the authors of this thesis.

Table 5.1. Implementation process of SCM on cloud. Revised by the authors of this thesis

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Early pilots. Using cloud needs innovation and continuous improvement. Testing attitude. Support and administrative processes, easily abstracted and isolated; do not require complex integration.</td>
<td>Maturing phase. First providers disappear from the market and other invest to grow and improve service offering. Higher focus in core and rather complex processes.</td>
<td>Consolidation phase starts. Major players defined. SCM accept well established models for usage and payment of cloud based services. Complex processes covered in cloud requiring collaboration between many entities and higher integration with other processes. Perhaps involving physical capacity constraints.</td>
<td>Diffusion phase. Cloud enables faster changes in 3PLs. It provides differentiation and competitive advantage, greater responsiveness to B2C market needs. High standardization will bring a unified structural model and rules establishment for every one operating on cloud. Rules will be set by the pioneers of cloud technology in 3PLs (eg. Nordics, countries with IT maturity)</td>
<td></td>
</tr>
<tr>
<td>USER GROUP INTERESTS</td>
<td>Companies with higher pressure for operational excellence and though competition.</td>
<td>Broader industry scope, companies with higher integration needs will start using cloud based services in part of their operating model</td>
<td>All industries applied cloud based processes.</td>
<td>All industries. Laggards in the 3PL industry will adopt the cloud.</td>
</tr>
</tbody>
</table>
5.5 Proposed model

Based on the analysis, the authors of this thesis propose the following model, Figure 5.1. This model is built on the Framework of perceived challenges and benefits, described in section 2.6 (see Figure 2.2), but owing to the context of the 3PLs, it is significantly revised and embodies the findings of the analysis. The proposed model is outlined below.

Challenges

Even though all of the interviewees are strong supporters of cloud-based services in the 3PL sector, two categories of challenges have been disclosed: the strategic and the performance related. The first one includes the loss of control over processes and the second one contains the lack of common standards across the industries and the countries, the standardized nature of cloud as well as the dependency on internet respectively.

First and foremost, the majority of the case companies highlights the loss of control over processes, which has two dimensions. The first one refers to the system’s modifications and developments realized by the cloud provider. As the 3PLs are subjected to automatic upgrades, they have neither the opportunity to fully tailor every aspect of the system nor the opportunity to make multiple adaptations and adjustments. The second dimension includes the fact that the cloud-based system leads to high degrees of automation and subsequently to low people involvement. Certain processes such as customer communication with salespersons are surpassed and undertaken by the system. Therefore, the firm is driven to loss of control of these specific processes. That is why, in the final proposed model the challenge which concerns the loss of control over data supported by the existing literature is converted into the loss of control over processes.

The second challenge, which all the 3PL firms stress, is associated with the lack of common standards and consists of two different aspects. Firstly, due to the absence of common standards across the different industries, the implementation of the same cloud-based platform among the different customers of the 3PLs, becomes difficult. Thus, the firm has to customize it, depending on the sector that its customers belong to. Secondly, all of the 3PLs underline the significance of using a globalized cloud-based platform. Except from DACHSER that is the only company among the interviewed ones that has internally built and use such a platform, the realization of this desire is hindered by the absence of common standards across the different countries. That is induced by the cultural differences in terms of the IT matureness and openness.

The third challenge, which the majority of the cloud providers and 3PLs suggest, is related to the standardized nature of the cloud which decreases customization. More precisely, there are 3PLs that disapprove of the predefined and standardized structure of data on the cloud and demand special solutions in order to differentiate themselves from the competitors.

The last challenge, which has been revealed in this research, is associated with the dependency of cloud-based systems on the customers’ internet connection. This can be an issue when their internet connection quality is not adequate.

In comparison with the initial framework of perceived challenges and benefits, described in section 2.6 (see Figure 2.2), the following differences have been identified. Firstly, none of the interviewees consider the security or the confidentiality and privacy of data as a disadvantage, even though they are widely cited in previous studies. Moreover, the loss of control over data has been converted into the loss of control over processes, whereas the avail-
ability of cloud technology has been more precisely defined as dependency on the internet connection. Finally, the lack of standardization has been belied by the empirical findings of this research. Thus, the high standardized nature of cloud as well as the lack of common standards across the different industries and countries have been introduced by the authors as perceived challenges in the final proposed model.

Benefits

Four different categories of benefits have been disclosed: cost savings, strategic flexibility, access to leading-edge IT resources and security. The first one consists of the initial capital investment, the IT and administrative personnel as well as the maintenance cost. Thus, from a financial perspective, most of the case companies consider that cost savings is a major advantage of this technology, as the necessity of accumulating initial financial resources for IT disappears leading to the significant reduction of entry barriers especially for smaller sized firms. Moreover, the interviewees highlight that there can be a significant decrease of the IT and administrative staff, whereas past researches refer only to IT personnel. The elimination of maintenance costs is also mentioned as a benefit by both; cloud providers and 3PLs.

The category of strategic flexibility contains the benefits of compatibility and inter-organizational collaboration, the scalability and flexibility, the standardization as well as the responsiveness. All of the interviewees emphasize on the compatibility aspect and agree that a cloud-based software can be more effectively and easily integrated. Cloud technology significantly facilitates the connection of the supply chain members’ systems and subsequently leads to better inter-organizational information collaboration. Some interviewees mention the cloud’s advantageous feature of scalability and flexibility. Furthermore, half of the interviewees give emphasis on the necessity of the standardization. Especially the 3PLs suggest that the standardized nature of the cloud makes more effective and simplified their collaboration with the customers and other 3PLs. Moreover, as their customers outsource to multiple 3PLs, their collaboration with them is also substantially enhanced. Lastly, responsiveness is considered crucial by half of the case companies.

The last category of access to leading-edge IT resources includes the upgrades, the competitive advantage and the value creation, the focus on core competence and the access to specialized services as well as the ease of use and the accessibility. Many interviewees refer to the upgrading of the cloud-based softwares as a crucial benefit, since this is realized only once and enables all the customers to simultaneously have the same version of the modified platform. The above process is critical especially when a 3PL has a very large number of customers. Moreover, most of the case companies perceive that cloud computing constitutes a competitive advantage and facilitates the creation of value-added services. The access to highly specialized services offered by IT companies is also considered a central advantage. Due to the hosting nature of cloud technology, time and financial resources are not necessitated for building innovative IT solutions leading to increased focus on core competences.

The last category of the proposed model is the high level of security. Therefore, an important finding throughout the interviews of this research is that most of the case companies underline the high degree of security characterizing their cloud-based systems.

All in all, compared with the initial framework of perceived challenges and benefits (see Figure 2.2), the following modifications have been realized by the authors. Two new advantages are added. The first is associated with the security aspect, which is widely men-
tioned as a challenge in the previous researches, whereas the second includes the standardization that highly characterizes the current cloud-based systems. It can be noticed that the proposed model includes the standardized nature of the cloud both as a challenge and a benefit depending on the firms’ strategy. In case that the company aims at customized and special solutions, the standardization is perceived as a challenge. On the contrary, when the firm strives for better and simplified collaboration with the supply chain partners, it is apprehended as a benefit.

**Figure 5.1** Proposed model of perceived challenges and benefits of cloud at the post-implementation phase within the 3PLs (compiled by the authors)
5.6 Summary of differences between previous researches & empirical findings

Table 5.2. Summary of differences in perceived challenges

<table>
<thead>
<tr>
<th>CATEGORIES OF CHALLENGES</th>
<th>CHALLENGES</th>
<th>INITIAL MODEL</th>
<th>FINAL MODEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>SECURITY</td>
<td>Data Security</td>
<td>√</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Confidentiality &amp; Privacy</td>
<td>√</td>
<td>-</td>
</tr>
<tr>
<td>PERFORMANCE</td>
<td>Availability</td>
<td>√</td>
<td>Dependency on the internet</td>
</tr>
<tr>
<td></td>
<td>Lack Of Standardization</td>
<td>√</td>
<td>(High level of) standardization</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Lack of common standards across the industries &amp; the countries</td>
</tr>
<tr>
<td>FINANCIAL</td>
<td>Cost</td>
<td>√</td>
<td>-</td>
</tr>
<tr>
<td>STRATEGIC</td>
<td>Loss of control over data</td>
<td>√</td>
<td>Loss of control over processes</td>
</tr>
</tbody>
</table>
Table 5.3 Summary of differences in perceived benefits.

<table>
<thead>
<tr>
<th>CATEGORIES OF BENEFITS</th>
<th>BENEFITS</th>
<th>INITIAL MODEL</th>
<th>FINAL MODEL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Compatibility &amp;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inter-organizational</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Collaboration</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>STRATEGIC FLEXIBILITY</td>
<td>scalability &amp; flexibility</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Responsiveness</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Standardization</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>ACCESS TO LEADING-EDGE IT RESOURCES</td>
<td>Core Competence &amp;</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Specialized Services</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ease Of Use &amp; Accessibility</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Competitive Advantage &amp;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Value Creation</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Upgrades</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>COST SAVINGS</td>
<td>Initial Capital Investment</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>IT staff</td>
<td>✓</td>
<td>IT &amp; Administrative staff</td>
</tr>
<tr>
<td></td>
<td>Maintenance &amp; Upgrading Cost</td>
<td>✓</td>
<td>Maintenance Cost</td>
</tr>
<tr>
<td>SECURITY</td>
<td>Data Security</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Confidentiality &amp; Privacy</td>
<td>-</td>
<td>✓</td>
</tr>
</tbody>
</table>
6 Conclusion, Managerial Implications & Suggestions for Further Research

Based upon the experiences received after having conducting this research, the conclusions are presented in this final chapter. Reflections concerning managerial implications as well as suggestions for further research are given.

6.1 Conclusion

This thesis explores what cloud-based services are used and/or provided in the 3PL industry as well as what challenges and benefits are perceived by the 3PL firms and their cloud providers. The answers of the two research questions are summarized in this section. Firstly, the empirical findings of this research reveal that all of the companies use and/or provide Software as a Service (SaaS). More precisely, in most of the cases, TA software is described by the interviewees as a cloud-based system with basic and more advanced functionalities widely applied in the 3PL industry nowadays. An optimization planning software, a TMS and an order management system, all based on the cloud, are also used and/or provided by some of the case companies.

All of the interviewees are strong supporters of cloud-based systems; a fact that has to be highlighted. Regarding to the second research question, it has been found that 3PLs benefit from cloud technology in terms of cost savings, strategic flexibility, access to leading-edge IT resources and security, whereas the challenges faced, are related to performance and strategic aspect. The authors identify the different phases of cloud computing implementation in the 3PL sector and propose an additional one. As a final step, a model of perceived challenges and benefits of cloud in 3PL firms has been compiled and presented by them.

6.2 Discussion of Managerial Implications

This thesis could considerably provide executives with a thorough understanding of the cloud-based services, and their challenges and benefits. Taking into consideration the real-life insights from 3PL companies that already use and/or provide this technology, they are empowered to make better decisions. More precisely, in case that their firm already use and/or provide these types of services, they are assisted in leveraging the cloud at its full potential. On the contrary, executives of 3PL firms, which have not adopted it yet, can base their decisions for adoption, on the shared experiences of this thesis interviewees who have already embraced and implemented cloud technology.
6.3 Suggestions for further research

This thesis provides several possibilities for further research. Firstly, as six companies participated in this study, a research that could include a larger number of interviewed firms could lead to additional useful findings. Secondly, as the authors focused only on 3PLs, it would be interesting if a research was conducted within the field of the other types of logistics firms aiming at gaining insight into the usage of cloud computing and its perceived challenges and benefits in a different sector such as carriers and intermediaries. Furthermore, a study can be made in order to explore how the aforementioned perceptions differ across the different countries, company sizes and application types.

What is more, as this thesis includes only the perspectives of 3PLs and their cloud providers, it could be useful to involve the side of 3PLs’ customers so that the impact of this technology - used and/or provided by 3PLs - can be demonstrated in its full spectrum. Since the cloud-based services, and their challenges and benefits in 3PLs have been identified by the authors of this thesis, a quantitative research could be a next step. In this way, the findings of this study, and more specifically the proposed model, can be applied and tested to a larger scale and an investigation on the relative importance of benefits and challenges can be made. Finally, due to the fast-paced advancements that take place in information technologies, a longitudinal study can be conducted in order to shed light on the development of cloud-based services and the possible changes in the firms’ business model.
Reference List


Appendices

Appendix 1: Semi-structured interview template cloud providers

The purpose of this paper is to investigate the current state of use of Cloud and analyze the challenges and benefits which might be reached when using or providing cloud computing services in the 3PL industry. The authors desire to cover both perspectives:

A) 3PL firms, which use or offer (or both) cloud computing, and
B) Cloud providers, which provide cloud technology to 3PL companies.

The information obtained through this interview will be used only for scientific purposes at Jönköping International Business School (JIBS), Jönköping, Sweden.

CLOUD PROVIDERS OF 3PLs

1. Could you tell us about the services that your company provides to its customers?
2. Does your company provide cloud services to 3PL firms and what types of services?
   What are the differences with companies of other industries?
3. Do you adjust your services if the client is a 3PL firm?
4. Do you have many logistics firms as clients?
5. Which is the most demanded cloud service that you provide in general and specifically to those firms?
6. Has any of your customers complained in the post implementation phase about problems caused by the Cloud usage?
7. How do you perceive the benefits and challenges of the cloud usage in the logistics sector?
8. Which cloud service(s) do you recommend to your clients mostly within the 3PLs industry?
9. Do you think cloud logistics will be more widely used in the future?
10. Which are the prerequisites so that a 3PL firm can fully take advantage of the benefits of cloud?
11. Are there any cases where a firm should not use the cloud services? Have you ever advised a 3PL firm not to implement cloud computing and why?
Appendix 2 : Semi-structured interview template 3PLs

The purpose of this paper is to investigate the current state of use of Cloud and analyze the challenges and benefits which might be reached when using or providing cloud computing services in the 3PL industry. The authors desire to cover both perspectives:

A) 3PL firms, which use or offer (or both) cloud computing, and
B) Cloud providers, which provide cloud technology to 3PL companies.

The information obtained through this interview will be used only for scientific purposes at Jönköping International Business School (JIBS), Jönköping, Sweden.

3PLs

1. Could you tell us about the services that your company provides to its customers?
2. Do you use cloud technology, offer it or both?
3. How would you define the service(s) that you use/provide in the Cloud?
   3a. Is it Software, Infrastructure, Platform or both Software and Platform? 3b. Which software/infrastructure/platform do you use in particular and how?
4. What is the time horizon of your contract and why? (if user)
5. What is your relationship with the cloud provider/customers of yours? Do you feel that there is trust and good communication?
6. In this post implementation phase of the cloud in your company, what are the benefits that you can claim? (if user) What benefits do you think cloud services offer to your clients? (if provider)
7. What do you consider as challenges deriving from the Cloud use in your company? (if user) What do you consider as challenges of cloud services for your clients? (if provider)
8. What do you see as the main challenges when working in a Cloud environment?
9. After weighing/evaluating the pros and cons of cloud services in your company, are you satisfied? What would you recommend to change and in what way?
10. Has the use of Cloud changed your business model? Which core aspects of your business have been affected? (Target customers, strategy, organizational structures)