Software Licensing in Cloud Computing

A CASE STUDY ABOUT RELATIONSHIPS FROM A CLOUD SERVICE PROVIDER'S PERSPECTIVE

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Software Licensing:

A Case Study about Relationships from a Cloud Service Provider's Perspective

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Abstract

One of the most important attribute a cloud service provider (CSP) offers their customers through their cloud services is scalability. Scalability gives customers the ability to vary the amount of capacity when required.

A cloud service can be divided in three service layers, Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS) and Software-as-a-Service (SaaS). Scalability of a certain service depends on software licenses on these layers. When a customer wants to increase the capacity it will be determined by the CSP's licenses bought from its suppliers in advance. If a CSP scales up more than what was agreed on, then there is a risk that the CSP needs to pay a penalty fee to the supplier. If the CSP invests in too many licenses that does not get utilized, then it will be an investment loss.

A second challenge with software licensing is when a customer outsources their applications to the CSP's platform. As each application comes with a set of licenses, there is a certain level of scalability that cannot be exceeded. If a customer wants the CSP scale up more than usual for an application then the customer need to inform the vendors. However, a common misunderstanding is that the customer expects the CSP to notify the vendor. Then there is a risk that the vendor never gets notified and the customer is in danger of paying a penalty fee. This in turn hurts the CSP's relationship with the customer.

The recommendation to the CSP under study is to create a successful customer relationship management (CRM) and a supplier relationship management (SRM). By creating a CRM with the customer will minimize the occurring misunderstandings and highlight the responsibilities when a customer outsources an application to the CSP. By creating a SRM with the supplier will help the CSP to maintain a flexible paying method that they have with a certain supplier. Furthermore, it will set an example to the remaining suppliers to change their inflexible paying method. By achieving a flexible payment method with the suppliers will make it easier for the CSP to find equilibrium between scalability and licenses.

Keywords: Cloud computing, Scalability, Software Licensing, IaaS, PaaS, SaaS, PCI DSS, CRM, SRM

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Mjukvarulicenser i molntjänster

En fältstudie om relationer från en molntjänsteleverantörs perspektiv

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Sammanfattning

Ett av de viktigaste attributen en molnleverantör (CSP) erbjuder sina kunder genom sina molntjänster är skalbarhet. Skalbarheten ger kunden möjligheten att variera mängden kapacitet efter behov.

En molntjänst kan delas in i tre serviceskikter, Infrastruktur-as-a-Service (IaaS), Platform-as-a-Service (PaaS) och Software-as-a-Service (SaaS). Skalbarheten av en viss service beror på mjukvarulicenser på dessa skikt. När en kund vill öka kapaciteten bestäms detta av CSP:s förhandsköpta licenser från sina leverantörer. Om en CSP skalar upp mer än vad som avtalats, finns det en risk att CSP:n måste betala en straffavgift till leverantören. Investerar CSP i alltför många licenser som inte utnyttjas, blir det en investeringsförlust.

En annan utmaning med mjukvarulicenser uppstår när en kund lägger ut sina applikationer på CSP:s plattform. Eftersom varje applikation levereras med en uppsättning av licenser, finns det en bestämd nivå av skalbarhet som inte kan överskridas. Om en kund vill att CSP:n ska skala upp mer än vanligt för en applikation, måste kunden informera applikationsförsäljaren själv. Dock sker det en missuppfattning då kunden förväntar sig att CSP:n ska meddela säljaren om detta. Det finns en risk att säljaren aldrig blir informerad och kunden hamnar i stor risk för att betala en straffavgift. Detta i sin tur skadar CSP:s relation med kunden.

Rekommendationen till CSP:n är att skapa en framgångsrik kundrelationshantering (CRM) och leverantörrelationshantering (SRM). Genom att skapa en CRM med kunden kan förekommande missförstånd minimeras och belysa ansvarsområden som råder när en kund lägger ut sin applikation hos CSP:n. Genom att skapa en SRM med leverantörerna kommer det att hjälpa CSP:n att upprätthålla en flexibel betalmetod som de har med en viss leverantör. Dessutom kommer det att vara ett föredöme för de övriga leverantörerna att ändra sin icke flexibla betalningsmetod. Genom att uppnå en mer flexibel betalningsmetod med leverantörerna kommer det att bli enklare för en CSP att hitta en balans mellan skalbarhet och licenser.

Nyckelord: Molntjänster, skalbarhet, mjukvarulicenser, IaaS, PaaS, SaaS, PCI DSS, CRM, SRM

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Abbreviations

AoC	Attestation of Compliance
CAPEX	Capital Expenditures
CDE	Card Data Environment
Council	PCI Security Standard Council
CRM	Customer Relationship Management
CSP	Customer Service Provider
IaaS	Infrastructure-as-a-Service
ICT	Information and Communication Technology
iTAP	IT on Tap
NIST	The National Institute of Standards and Technology
OPEX	Operating Expenditures
PaaS	Platform-as-a-Service
PAN	Payment Account Number
PAYG	Pay As You Go
PCI DSS	Payment Card Industry Data Security Standard
PKMA	Pyramid of Knowledge Management Awareness
QSA	Qualified Security Assessor
SaaS	Software-as-a-Service
SAD	Sensitive Authentication Data
SLA	Service Level Agreement
SRM	Supplier Relationship Management
TiCC	Tieto Compliance Cloud

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1. Introduction

This chapter contains a background of the problem that leads to a problem formulation, objective and the research questions of this research. The chapter will end with an outline for the remaining thesis.

1.1 Background

Cloud computing is growing in today's increasingly interconnected world and creating opportunities for businesses and society (Jaatun, 2009). Due to the emergence of cloud computing, a great deal of services for personal use has been presented to society for easier accessibility. Such services are for example, Dropbox for personal file storage on cloud and music streaming services such as Spotify for easy access to music on different devices. For businesses, cloud computing has emerged as a dominant trend by offering the opportunity to work more efficiently and more productively, while saving money and enhancing business and IT operations (IBM, 2010). Businesses that use cloud computing such as grocery chains or educational services are increasingly relying on cloud for several reasons, like storing sensitive data, developing products and managing supply chains (Guido, 2014).

Companies that are invested in using cloud computing are expected to invest in resources such as hardware, software, networking and storage. However, the cost does not end at buying computing resources, in addition to this the companies are expected to make physical space for these resources as well as maintain and make it operational. Another option for these companies is to become a customer of a *Cloud Service Provider* (CSP) in order to get the required computing and resources. A CSP is an entity that have a data center of their own, where they provides, delivers, maintains and manages cloud services. For companies that would mean there is no need for deploying any resources of their own. A key attribute a CSP offers their customer is scalability which means that the customer is free to use cloud computing as much as they want and whenever they want. This particular paying method in a cloud service is called *Pay As You Go* (PAYG) and is very convenient for companies that need different amount of cloud computing depending on different hours of the day or weekdays (Chandrasekaran, 2015). Scalability allows the CSP to better meet their customers' need (Buyya, et al., 2011).

A cloud service can be divided in three service layers (see Figure 1). The base layer is *Infrastructure-as-a-Service* (IaaS) that provides hardware and core services such as computing power, storage, networking and operating systems etc. The middle layer is Platform-as-a-Service (PaaS) and offers a platform for computing need, usually it is used for development to create applications, software etc. (Derrick & Ileana, 2013). The top layer is *Software-as-a-Service* (SaaS) that provides applications, software and web tools such as Google Drive and Outlook, which are accessible via different devices.

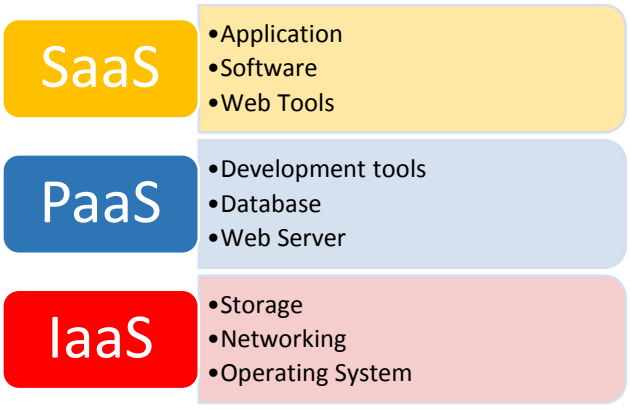

Figure 1. Cloud service models and some attributes each layer provides

As mentioned earlier, one of the key attributes a CSP offers to their customers is scalability. However, scalability has a different meaning for the customer and for the CSP. For a customer, scalability means the opportunity to use more cloud computing than usual whenever needed. Whereas, for a CSP, scalability comes down to amongst other factors how many software licenses the CSP have. These licenses determine if it is possible for a customer to scale up. A software license is bought from a supplier (licensor) by the CSP (licensee), which is an agreement between the two parties and is an authorization to use licensed material. The agreement limits the way a CSP can offer cloud computing for scalability services to their customers. However, as the licenses are purchased in advance, the CSP have no exact knowledge of the actual amount of capacity that will be utilized. If a CSP exceeds the limit, which leads to a broken agreement, then the CSP needs pay a penalty fee to the supplier. The challenge with licensing occurs on the whole cloud service model (Figure 1), that is from IaaS up to SaaS. On the IaaS level, the physical servers have been purchased from the suppliers but the hardware is maintained by the CSP. However, the suppliers still have an involvement because of the licenses that decides how much capacity is usable in the servers that can be offered to the customers.

Besides the CSP, the customers are also required to buy software licenses for their own applications that is used. The applications can be outsourced to the CSP in order run it on virtualized servers on the IaaS level and on the PaaS level. A customer that uses a certain application, a license will determine what parts of the program the company is allowed to use. If the usage extends to parts of the program that are not stated in the agreement, then there has been a violation of that particular software license.

1.1.1 Case under Study

Tieto is a cloud service provider (CSP) that mainly operates in the Nordic countries and offers several different cloud services to their customers. One of their popular cloud products is called iTAP (IT on a Tap), that offers billing methods such as *Pay As You Go* (PAYG). iTAP serves many different industries like media and retail that only pay for the cloud that has been used. From iTAP, Tieto has developed a product line extension called TiCC (Tieto Compliance Cloud) for customers that handle card data, such as credential information.

The new product TiCC, is an infrastructure that follows a framework called *Payment Card Industry Data Security Standard* (PCI DSS). PCI DSS is an information protected safety standard, developed by the PCI Security Standards Council (Council). The council demands that industries that handle

sensitive card data, such as bank and retail, need to be compliant according to the twelve PCI DSS requirements (see appendix 1). In TiCC many of the needed requirements are already complied which makes it easier for financial companies such as merchants and banks. Instead of setting up a whole environment in order to get compliant, companies can instead buy a service with a ready infrastructure from Tieto.

As mentioned above, TiCC is an IaaS offered by Tieto to its financial customers that handle card data. Besides offering the infrastructure, Tieto strives to offer and be responsible for the two remaining layers on top as well, PaaS and SaaS. However, as higher they get from IaaS to SaaS, the challenge with software licensing increases. On the base level, the challenge occurs between Tieto and their supplier. Further challenges with software licensing occurs when a customer outsource an application of their own to the IaaS/PaaS level, where each application has its own licensing agreement with a vendor. When a customer wants Tieto to scale up for certain application, the vendor of the application needs to be notified that the application will broaden its usage. If the vendor is not notified and the application is used more than the customer and the vendor agreed on, then that could mean consequences for the customer in terms of penalty fees of a broken agreement.

1.2 Problem Formulation

There is a challenge for a cloud service provider (CSP) that offer scalability when it comes to licensing agreement. A CSP needs to be very cautious with scalability in order to not break any software licenses with the supplier or third parties. As scalability is one of the main attributes for any cloud service, the CSP needs to find a way to continue offering payment methods as Pay As You Go (PAYG) in a more flexible way. That is offering a PAYG service without getting themselves negatively affected in terms of penalty fees and having a negative impact on their customers' business.

1.3 Objective and Research Question

The objective is to provide an understanding about cloud scalability with software licensing from a cloud service provider's (CSP) perspective. Furthermore, this study will develop strategies on how a CSP should manage the relationship with the customers and suppliers in a standardized product, where the customer is free of scaling up in cloud computing without violating any licensing agreements. The main research question for this study is following:

How should a CSP manage the required software licenses for a cloud product when offering scalability to their customers?

In order to be able to answer the main research question, a set of sub-questions has been created in the area of the cloud product, suppliers and customers that needs to be answered first;

1. *How did the CSP manage a previous cloud product with software licensing?*
2. *How is the chain of relationship composed from supplier to customer from a CSP's perspective in regards of software licenses?*
3. *How can a CSP obtain an agreement with their suppliers to minimize the challenges with software licensing?*
4. *What impact does scalability and software licensing have on the customers of the case study?*
5. *How could a CSP collaborate with customers without breaking any of their own software licensing agreements?*

1.4 Outline

The remaining chapters of the report will follow following outline:

Chapter 2: The choice of methodology is presented and discussed along with methods that have been used while conducting the report. The chapter ends with a quality of the study.

Chapter 3: The first part of the literature study which is a description about cloud computing in order to create an understanding for the remaining report.

Chapter 4: Second part of the literature study and the theoretical framework is presented which are the main findings for the report that will be used for the analysis.

Chapter 5: Third part of the literature study and the theoretical framework is presented which are the main findings for the report that will be used for the analysis.

Chapter 6: The result is presented from the conducted interviews in two parts. The parts are divided in accordance to the research questions.

Chapter 7: The first part of the analysis and discussion about the CSP and the supplier with the previous findings from the literature review.

Chapter 8: The second part of the analysis and discussion about the CSP and their customers with the previous findings from the literature review.

Chapter 9: The conclusion and recommendations of the report is presented. The research questions are repeated and shortly answered.

Chapter 10: The report ends with a discussion of the problem with a sustainability aspect. The chapter contains limitations and future research as well.

1.5 Delimitation

The company under study was delimited to the department of financial services (FS). Remaining department was not considered in this research. The focus was on scalability which is one of many attributes in cloud computing. Other attributes are mentioned for gaining a basic knowledge about cloud computing, however was not put in a context of a licensing perspective. The products under study were limited to two related products that are offered to financial customers that handle card data by the cloud service provider (CSP). Furthermore, the only standard that was relevant for these products is the Payment Card Industry Data Security Standard (PCI DSS). Other products or standards were not considered for the end result. The geographical area for the qualitative and quantitative interviews was limited to Sweden. Moreover, the qualitative interviews were conducted with relevant parties that have a association with the products. The quantitative interviews were only answered by companies that handle card data within the retail industry and banking that are required to follow the PCI DSS regulation.

2. Methodology

This chapter contains the methodological approaches this research followed. Furthermore, it explains how the interviews were conducted and ends with a section about the validity and reliability of the research.

2.1 Methodological Approach

The research is classified as explanatory research since it analyzes and explains why or how the phenomenon that was studied was happening. Furthermore, the study is classified as predictive as well since it provides "how, "why" and "where" answers to an existing products and also to similar to products in the future. The research followed a deductive approach as the study went from a more general instance to a more specific principle (Collis & Hussey, 2014). Thus, the investigation focused first on scalability within cloud in general before having a more specific look upon the investigated products and the related parties.

There are two different methodological approaches in social sciences to process information and data. These approaches are the quantitative and the qualitative methods. This particular study collected data with a mix between qualitative and quantitative methods (see figure 2). A qualitative method was used for gaining a deeper understanding of the complexity of the problem under investigation (Holme & Solvang, 1991). As the investigated product was in an introductory phase at the time this research was conducted, qualitative methods was useful for creating a deeper understanding about cloud services for financial customers that handle card data as well as the scalability aspect within cloud computing and software licenses. Whereas, the quantitative method was mainly used for validating findings in order to generate more complete data. Also, using results from the qualitative method enhanced insights attained with the quantitative method (Creswell, 2014).

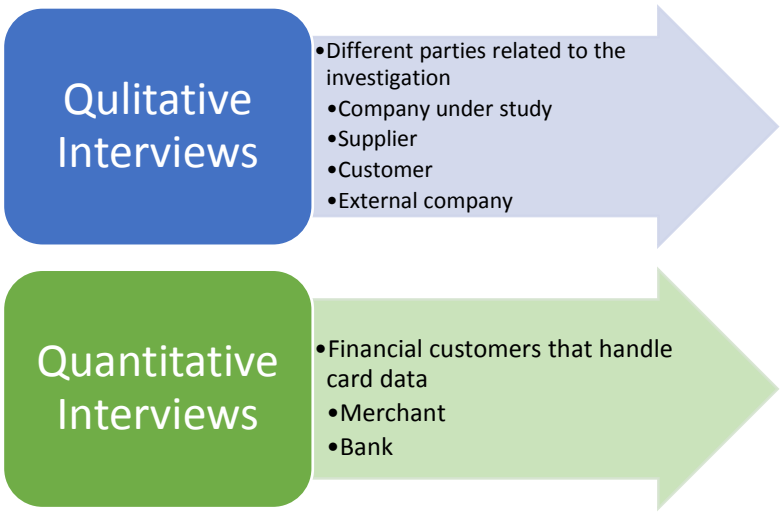

Figure 2. The mix method approach for the investigation

2.2 Case Study

A case study was conducted at a service company called Tieto, in the department of financial services (FS). The case study was mainly for exploring the products iTAP and TiCC by using a variety of methods to obtain in-depth knowledge (Collis & Hussey, 2014). As the main research question begins with "how", the case study strengthens the fact to what is already known through the literature

review and for later answering the question. This research method defines as an empirical inquiry that investigates a contemporary phenomenon within its real-life context. Meaning that the boundaries between phenomenon and context are not clearly evident, thus multiple sources of evidence are used (Yin, 2003).

2.2.1 Identify and Define Problem

In order to be able to formulate a problem at Tieto, a pre-study of two unconstructed interviews was conducted (see table 1). The interviews were for gaining knowledge about the products, the Payment Card Industry Data Security Standard (PCI DSS) and other relevant aspects for the study. The outcome of the interviews designed the problem formulation and the research questions. Also, part of the outcomes from these two interviews was partly discussed in the empirical findings of this study. The conducted interviews were on purpose with two employees that had different roles and relationship to the investigated products, in order to gain knowledge from an upper level and on the basic level. The role and company of the interviewees were following;

Table 1. The role description and company of the interviewees for the pre-study

Role Description	Company
Head of Cloud Services, Banking & Finance	**Tieto**
Service Deliver Manager	**Consultant Company**

The head of cloud was at the time responsible for the products at the company and clarified key points about the products, and their current relationship with relevant parties. The service deliver manager was at the time a hired technical consultant for being part of the team that was building TiCC. The interviewees was suggested and booked by the researcher's supervisor from the studied company. The interviews was held at company's headquarter in Stockholm and was about 60 minutes long each. The interviews was recorded by permission and transcribed afterwards. In order to avoid interviewer bias, the interviews was conducted together with a second researcher that worked within the same field but tackled a different problem. Besides the conducted interviews, the researcher attended a webcast about PCI breach scenarios and cyber threat landscape in order to create a greater view of the product.

The pre-study helped the researcher to find a gap of the problem with licensing between different parties and which created an insight of where challenges begin and end with such products for a cloud service provider (CSP).

2.3 Data Collection

A methodological triangulation was used for the data collection, meaning more than one method was used to collect and analyze the data (Collis & Hussey, 2014). Triangulation can reduce bias in data sources and methods. The primary source for this research was the qualitative and quantitative interviews with relevant parties and companies. Furthermore, additionally primary sources were reports and other relevant documents from Tieto as well as from other collaborating parties. The secondary source was theses, reports, and scientific articles. Furthermore, the theoretical concepts for the literature review will be from secondary sources like books and journals.

2.3.1 Literature Review and Theoretical Framework

The literature review and the theoretical framework were used as a complementary base for answering the research questions with relevant studies. Moreover, the review and the framework helped to create an understanding of common challenges within cloud computing and provided a broader view of a relationship between the customer, the CSP and the supplier. A relevant secondary source about PCI DSS was conducted from different databases and published articles and documents from the PCI Standard Security Council.

2.3.2 Qualitative Interviews

The main method for collecting data for the empirical study was through interviews where the interviewees was asked questions in order to find out what they do, think or feel about the investigated products (Collis & Hussey, 2014). For the qualitative interviews the interviewees was asked open questions that required a longer and developed answer. The qualitative interviews were useful for exploring and gathering broad information. Most of the interviews were conducted face-to-face at Tieto headquarters in Stockholm. Via this approach, comprehensive data was be collected and was useful for asking complex and/or sensitive questions (Collis & Hussey, 2014). Those interviewees that did not have the possibility to meet in person were interviewed through conference telephones from Tieto. The interviews with interviewees from the suppliers side was conducted at their company and will be referred as Supplier X. The table below (see table 2) represents the role and company of the interviewees, which was conducted through the research.

The conducted interviews at Tieto were done with the head of cloud and other employees that was involved in the team of building TiCC or with the security behind it. From the supplier's side, the chosen interviewees have an involvement with Tieto or knowledge about servers and licensing.

Table 2. The role description and associated company of the interviewees, interview method and the number of interviews with each interviewee

Role	Company	Conducted method	Number of Interviews
Head of Cloud Services, Banking & Finance	**Tieto**	Face-to-face	**2**
Service Deliver Manager	**Consultant Company**	Face-to-face	**1**
Lead Security Architect	**Tieto**	Face-to-face	**1**
Lead Auditor (QSA)	**Tieto's QSA**	Telephone	**1**
Software developer	**Tieto**	Face-to-face	**2**
Head of storage, data protect & recovery services	**Tieto**	Face-to-face	**1**
Power System Sales Expert	**Supplier X**	Face-to-face	**1**
CEO	**Customer of Tieto**	Telephone	**1**
Business Solution Architect	**Tieto**	Face-to face	**1**
Cloud Application Architect	**Supplier X**	Face-to face	**1**
Cloud Software Technical Sales Leader	**Supplier X**	Face-to face	**1**

2.3.3 Quantitative Interviews

For the quantitative interviews the interviewees was asked closed questions where the interviewees could answer with "yes", "no", a brief factual answer or a set of chosen alternatives. The quantitative interviews were conducted in form of a survey that was read out through a conference telephone at Tieto's headquarters in Stockholm. Those who did not have the possibility to answer the questions through telephone got the survey form sent to them through e-mail. The quantitative interviews were useful for gathering factual information. During these interviews the interviewees was asked hypothetical questions that was useful for encouraging the interviewees to think broader (Collis & Hussey, 2014). The focus group was limited to Swedish financial companies that handle card data within retail and banks, since these two industries cover the bigger part of the customer base that needs to be compliant according to the PCI DSS requirements. Furthermore, the questions were only read out to CTO's or IT- managers that had basic knowledge about PCI DSS and cloud computing within the company.

The asked questions was carefully structured and chosen after considerable testing with a few potential customers through telephone. The aim was to find out what the customers think, do or feel about the scalability aspect within PCI DSS and how important that aspect is for them. The aim of the survey was for helping to address one of the research questions (Collis & Hussey, 2014). Furthermore, the survey was constructed with a second researcher that focused on another area of

the same investigated problem. In total, 17 questions were constructed but only 14 questions were relevant for this particular study. 88 retail companies and banks were contacted but only 21 participated and answered the survey. From the 21 participated companies, 16 were from the retail industry and 5 were banks. These two industries were chosen after finding patterns of the two biggest PCI DSS certified companies from the qualitative interviews.

2.4 Data Analysis

This study conducted a cross-case analysis. Meaning the main case which in this study is the cloud product TiCC was analyzed along with a second level of case analysis which is iTAP (Mathison, 2005). Since TiCC is still an emerging product and a line extension, the analysis was first built upon the current situation of iTAP. After that, the analysis about TiCC could be constructed and conclusions could be drawn. Furthermore, a triangulation method was used for analyzing data in order to uncover unique aspects that might have been neglected when using a single method. While conducting the research, a data reduction needed to be made in order to filter out the usable data to the thesis (Collis & Hussey, 2014).

2.4.1 Analyzing Qualitative Data

In order to understand the current state of the company with the products, the transcriptions of the qualitative interviews were re-read multiple times. By doing that, key questions were found for the research in form of different themes. The key questions were found by highlighting the similar traces that was found in the transcripts. Thus, the key questions was very important in order to get started with the research but was changed multiple times along the way (Taylor-Powell & Renner, 2003). During the period when the qualitative interviews were conducted it became clear what themes the analysis should consist of. Examples of these themes are PCI DSS, licensing and the CSP's relationships. Furthermore, the qualitative data was coded as there were a large volume of data that had to be managed (Gibbs, 2008). By using coding from the transcripts and the themes, the analysis could be matched with existing studies and framework.

2.4.2 Analyzing Quantitative Data

The themes that were found from the qualitative interviews made it easier to construct a set of relevant questions for the survey (see appendix 2 & 3). The questions of the quantitative interviews were asked for strengthen the qualitative interviews from multiple the customers perspective within retail and banking. The data from the interviews were analyzed in terms of how these two industries relates to scalability and software licensing.

2.5 Validity and Reliability

In order to increase validity, the secondary sources that were used for the literature study and theoretical framework were analyzed to be from legitimate sources. To minimize participant bias, the interviews were conducted with several participants where similar questions were asked to each of them (Saunders, et al., 2009). Furthermore, the triangulation method for data collection and analysis increased the validity and the reliability of the research as it was investigated from more than one perspective (Collis & Hussey, 2014).

The qualitative data was collected through semi-structured interviews which has high validity. The reliability of the data was later increased as the interviews were recorded and transcribed. Furthermore, notes were taken during the interviews for avoiding inaccuracy. All data was not considered as quality data as some information do not content any value or was provided in a biased

way (Taylor-Powell & Renner, 2003). The number of interviews was in total of 13, which means that if had been more interviews then it could have resulted in even higher validity and reliability. However, each interview was unique as each interviewee had a unique role within the investigation. The different roles from the CSP and the supplier gave the research more than one perspective to analyze.

Before collecting quantitative data the analysis was planned to ensure that the data was meaningful and useful. High reliability for the telephone interviews were achieved by securing the questions on the survey before they were asked. The questions were only asked to CTO's or reliable IT-employees that had enough knowledge to answer such questions. Some of the surveys were sent to those who could not take it over the phone. Due to the time limitation, only 21 participated, however these 21 were enough for answering one of the research questions, as patterns were found on how the majority answered.

3. Cloud Computing

This chapter is the first part of the literature study about cloud computing. The chapter will give a deeper understanding about cloud in general, scalability, software licenses and ends with an explanation about PCI DSS.

3.1 What is Cloud Computing?

Cloud computing is an business model, in which services are carried out on behalf of customers on hardware that the customers do not own or manage (Pearson, et al., 2009). The IT- and business resources within cloud computing can be dynamically provisioned to the users need and workload. Such resources include servers, storage, network, applications and processes (Chandrasekaran, 2015). Cloud computing lets an end user run software applications and access data from any place and time, and from any computer. The user does not need to ever install, upgrade, and troubleshoot software applications physically on a local desktop or server (Landis & Blacharski , 2009).

The definition of cloud computing is interpreted differently by different companies. However, the main focus for companies that adopts cloud computing is following attributes:

- ***Collaboration***
- ***Scalability***
- ***Performance***
- ***Reliability***
- ***Simplicity***

The National Institute of Standards and Technology (NIST), a federal technology agency, who is responsible for developing standards and guidelines, and defines cloud as following: "*Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction*" (2011). Furthermore, the NIST has composed the cloud model of essential characteristics, service models and deployment models (Mell & Grance, 2011). The essential characteristics include offerings such as on-demand self-service that implies that the service is available to turn on and off as needed. Another characteristic is resource pooling which means that multiple users share a bank of servers (including storage devices and other computing resources) over the Internet, as an alternative of using dedicated servers. And a third one is rapid elasticity which means the cloud offering can be dramatically scaled up and down as needed (Landis & Blacharski , 2009). The four deployment models are private-, public-, hybrid- and community cloud.

In cloud computing service delivery models can be divided to bottom layer called Infrastructure-as-a-Service (IaaS), a middle layer called Platform-as-a-Service (PaaS) and a top layer Software-as-a-Service (SaaS). The layered architecture works in a way where a higher layer can be composed from the services of the underlying layer (Buyya, et al., 2011). "As-a-Service" means that a service model is offered as a cloud product where the consumer pays for whatever is used. One of the advantages with such service models is that the up-front cost tends to be less and it affords a greater level of easy scalability (Landis & Blacharski , 2009).

3.2 Cloud Service Models

The three service models IaaS, PaaS and SaaS reduces the effort that is required by the consumer to build and deploy systems (See figure 3). Each level of service provides abstraction and automation for installation, managing servers, deploy software, ensure security level, etc. Due to the service models, the consumers of cloud computing can focus more on their core business and less on the cloud infrastructure (Kavis, 2014). A core middleware manages physical resources and services such as Pay As You Go (PAYG). On top of the infrastructure services the development environment are built to offer application development and deployment capabilities. The deployed applications in the cloud can then be consumed by the end user (Buyya, et al., 2011).

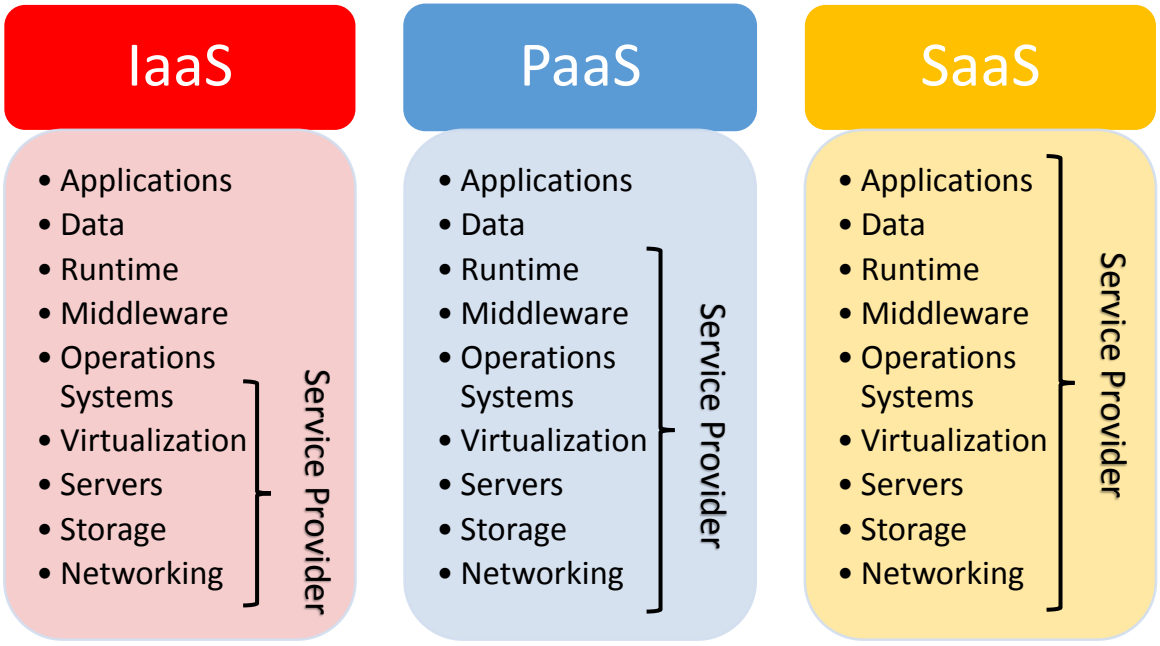

Figure 3. Cloud deployment models where the tasks are divided between the service provider and the cloud required company

3.2.1 Infrastructure-as-a-Service

NIST elaborates the bottom level IaaS as following: *"The capability provided to the consumer is to provision processing, storage, networks, and other fundamental computing resources where the consumer is able to deploy and run arbitrary software, which can include operating systems and applications"* (Mell & Grance, 2011).

IaaS is known as offering virtualized resources such as storage and computation on demand as well as enabling on-demand provisioning of servers running different choices of operating systems (Buyya, et al., 2011). Virtual infrastructure is a metered service that costs money when in use, same as utilities such as electricity or water. As mentioned above, IaaS gives consumers the opportunity on focusing more on building and managing applications and less on the infrastructure (Kavis, 2014) which includes the operating systems, virtualization, servers, storage and networking (See figure 3).

3.2.2 Platform-as-a-Service

The next level is PaaS and what IaaS is to infrastructure, PaaS is to applications (Kavis, 2014). NIST elaborates PaaS as following: *"The capability provided to the consumer is to deploy onto the cloud*

infrastructure consumer-created or acquired applications created using programming languages, libraries, services, and tools supported by the provider" (Mell & Grance, 2011).

PaaS make a cloud programmable and offers a platform where developers can create and deploy applications. Also, many programming models and specialized services such as data access and payments are offered as building blocks to new applications. (Buyya, et al., 2011). The only parts of PaaS that the consumer needs to manage or control is data and application and not the underlying infrastructure. Furthermore, the platforms integrate with third party software solutions which are known as plugins, add-ons or extensions, such as e-mail, database or payment. For the third party solutions there is a need of a service level agreements since the developers does not maintain or manage the technology behind the solutions (Kavis, 2014).

3.2.3 Software-as-a-Service

The top level of the stack is SaaS where complete application is delivered as a service to the consumer (Kavis, 2014). NIST elaborates SaaS as following: *"The capability provided to the consumer is to use the provider's applications running on a cloud infrastructure. The applications are accessible from various client devices through either a thin client interface, such as a web browser (e.g., web-based email), or a program interface"* (Mell & Grance, 2011).

The services that are provided by Saas which is the model of delivering applications can be accessed by the end users through Web portals. SaaS relieves the consumers from software maintenance and makes development and testing easier for providers (Buyya, et al., 2011). The consumer only needs to configure applications parameters and manage users. The rest is managed by a service provider (See figure 3). An example of a service would be customer relationship management (CRM), pay roll and other common business software's (Kavis, 2014).

3.3 Cloud Service Provider

A cloud service provider (CSP) is the party that strategizes, designs, invests, implements, transitions, and operates the underlying infrastructure that supplies the assets and resources to be delivered as a cloud service (Buyya, et al., 2011). A CSP offers cloud users standardized software services hosted on a shared public infrastructure through network access. Thus, user transfers personal or business data to the CSP. The business model for a CSP involves sharing infrastructure among many clients (Huntgeburth, 2015). At the IaaS level the CSP can offer basic computing and storage capability, such as cloud computing center. At the PaaS level the CSP can offer packaged IT capability, or logical resources such as databases, file systems, and application operating environment. At the SaaS level, the CSP can offer consumer or industrial applications directly to individual users and enterprise users (Ahson & Ilyas, 2011). The CSP usually bills cloud computing as a PAYG model (Suresh, et al., 2014), where the customers only pays for what has been used.

3.4 Scalability

Scalability is one of the major advantages that set cloud computing apart from advanced outsourcing solutions (Falatah & Batarfi, 2014). Scalability can be defined as following;

"Scalability of service is a desirable property of a service which provides an ability to handle growing amounts of service loads without suffering significant degradation in relevant quality attributes" (Lee & Kim, 2010).

There are four main aspects that scalability can be divided into. The first one is handling growing amount of service loads (Jogalekar & Woodside, 1998). That is a service provider is not aware of the size of the service consumers, nor can it be predicted. Scalability needs to be concerned with the capability of handling service load that grows or else the quality of the service will suffer (Lee & Kim, 2010).The second aspect is assuring schemes by means of scalability (Welzl & Muhlhauser, 2003). High service loads means high scalability which needs to be ensured assuring schemes of scalability. This because high scalability is not free of charge and by adding demanded resources the high scalability can be assured (Lee & Kim, 2010). The third aspect is being proportion to the cost with acceptable cost effectiveness (Jogalekar & Woodside, 1998) (Hill, 1990). By adding demanded resources for assuring schemes such as CPU and memory, there will be always a cost involved for running the schemes. When applying such schemes the cost must be proportional to the gained scalability (Lee & Kim, 2010). The last aspect of scalability is Quality of Service (QoS) without significant degradation (Jogalekar & Woodside, 1998) (Rana & Stout, 2000). The assuring schemes needs to meet the QoS attributes by ensuring that services satisfy the constraints. In a *service level agreement* (SLA) it is specified that services are to provide a certain level of quality (Lee & Kim, 2010).

As application often needs to scale up and down, there are varying load conditions that need to be met. Automatic scaling is a desirable feature of IaaS which allows users to set conditions for the time that they want their applications to scale up and down. The scaling is based transaction per second, number of simultaneous users, request latency etc., which are different application-specific metrics (Buyya, et al., 2011).

3.5 Software Licensing in Cloud

Traditionally, a software license agreement is used when a licensor is providing a copy of software to a licensee for its use. The importance of a software license is that it sets the terms that needs to be followed by the licensee under which the software may be used. The licenses are for protecting the licensor against the inadvertent transfer of ownership of the software to the licensee that holds the copy. Moreover, it gives the licensor the rights to retrieve the copy it provided to the licensee for certain reason. For example if the licensee breaks the terms of the agreement or stops paying the fee the licensee charges (Buyya, et al., 2011).

In terms of scalability a SLA is used between the cloud service provider (CSP) and the customer. SLA can guarantee a certain level of performance and if that level is not met, the service provider must repay the customer. The repayment can be in form of chargeback or fee reduction (Derrick & Ileana, 2013).

Software licensing is a part of an IT service delivery. Within cloud computing there are two types of licenses that are offered from vendors/suppliers, these fixed licenses and floating licenses. A fixed license enables software to be used only at dedicated workstations which restricts users. Floating licenses allow a maximum number of active simultaneous users for the bought software (Shaya, 2012). Different suppliers use different metric for pricing (M.K., et al., 2013). The licensor in this case is the supplier and the licensee depends on the business that needs a supplier, sometimes it is the CSP and sometimes it is a cloud user.

3.6 Cloud Security

Since the emerging of cloud computing there has been speculations that the data within the domain are more at risk. However, cloud computing has created a need to ensure that protection is applied

and that security policy becomes a part of the data through its lifecycle (Buyya, et al., 2011). It is beneficial for a cloud user to outsource their data to a CSP in terms of cloud security. If a security issue would occur, a CSP have more cost and technical resources to solve such issue (Derrick & Ileana, 2013).

Cloud security is a shared responsibility between the CSP and its customers, who are mainly from the financial sector that handle cardholder data. If payment card data is stored, processed or transmitted in a cloud environment, Payment Card Industry Data Security Standard (PCI DSS) will apply to that environment, and will typically involve validation of both the CSPs' infrastructure and the financial customer's usage of that environment. The allocation of responsibility between customer and provider for managing security controls does not exempt a customer from the responsibly of ensuring that their cardholder data is properly secured according to applicable PCI DSS requirements (Council, 2013).

3.7 Payment Card Industry Data Security Standard

PCI DSS is offered by the PCI Security Standard Council (Council) in order to provide an actionable framework for developing a robust payment card data security process (Council, 2015). The Council was founded by American Express, Discover Financial Services, JCB International, MasterCard Worldwide and Visa Inc. Participating organizations include merchants, payment card issuing banks, processors, developers and other vendors (Council, 2010). In payment card processing, PCI DSS applies to all entities, including merchants, processors, financial institutions and service providers. Also, for cardholder data environment (CDE) that is comprised of people, process and technologies that store, process or transmit cardholder data and/or sensitive authentication data (SAD) (Council, 2013).

All service providers with access to cardholder data must adhere to PCI DSS (Council, 2013). A service provider is defined as following by the Council (2006-2015):

> *"Business entity that is not a payment brand, directly involved in the processing, storage, or transmission of cardholder data on behalf of another entity. This also includes companies that provide services that control or could impact the security of cardholder data. Examples include managed service providers that provide managed firewalls, IDS and other services as well as hosting providers and other entities. If an entity provides a service that involves only the provision of public network access—such as a telecommunications company providing just the communication link—the entity would not be considered a service provider for that service (although they may be considered a service provider for other services)".*

3.7.1 Qualified Security Assessor and Attestation of Compliance

Organizations that handle credit card data according to the twelve PCI DSS requirements, needs to be validated by a *Qualified Security Assessor* (QSA) through an audit. Validation of the requirements is important to the effectiveness of PCI DSS by independent and qualified security companies. A QSA's work of quality, reliability, and consistency brings the confidence that cardholder data are adequately protected. A PCI DSS assessment performed by QSA is a critical factor as it has a tremendous impact on the consistent and proper application of PCI measures and controls (Council, 2015). Both organizations and CSP are required to be able to produce a compliance report from a QSA (Everett, 2009).

The evidence of compliance is called *Attestation of Compliance* (AoC) which is a form for merchants and the CSP. The AoC is a certificate that certifies that the relevant PCI DSS requirements have been met by the merchant and the customer. The AoC is signed by the QSA that is responsible for the certain assessment.

4. Customer Relationship Management

This chapter presents second part of the literature study and theoretical framework that will be used for analyzing the findings along with the qualitative and quantitative data. This chapter is for analyzing how a CSP can handle and minimize the misunderstandings of the delegated responsibilities with a customer.

4.1 What is Customer Relationship Management

Customer relationship management (CRM) is an iterative process that turns information about the customers into positive relationships (Swift, 2000). CRM can be defined as a process that creates and retains customers that are profitable for a business. The process can be created and retained with a long term relationship by delivering customer value and satisfaction (Kotler & Keller, 2006). Thus, acquiring new customers is very important for running a successful business, but maintaining customer relationship is just as crucial (Adhikari & Adhikari, 2009). The process involves IT-system for support. Another definition of CRM is a process that addresses all aspects of identifying customers, creating customer knowledge, building relationship and shaping their perceptions of its organization and its products. In this definition, an IT-system is not even mentioned as a supporting tool (Peelen, 2005). Nevertheless, an important part of CRM for a business is to identify different types of customers and develop specific strategies in order to interact with each customer. Also, a critical part for CRM is customer value, as it is increasingly seen as key source of competitive advantage (Payne, 2001). This particular value refers to economic value of the customer relationship to the business, and can be expressed as contribution margin or net profit. By incorporating customer value in decision-making process, businesses can measure and optimize its marketing efforts.

Companies usually know little or nothing about their customers which usually makes companies to offer standardized solutions for every customer. However, as closer they get to their customers they realize that each customer have different characteristics, requirement and behavior. Furthermore, the companies need to have flexibility solutions for each customer as their requirements changes from day to day. Even more, customers nowadays expect from their service providers that they already know them on a deeper level. The customers want to be treated as an individual instead of as a number (Swift, 2000).

To achieve lasting competitive advantage there are four competences that needs to be developed by the company. These are customer knowledge, relationship strategy, communication and the individual value proposition. These four competences need to be developed step-by-step by the company (Peelen, 2005).

4.1.1 Customer Knowledge

Customer knowledge is about identifying and learning about the customer the business is serving. Customer learning objects include what the customer purchased, preferable communication channel and how the customer may be characterized further. A company that wants to attempt to build a long term relationship with the customer must have customer knowledge in order to succeed. For a large number of customers, the company needs to develop competency or capability in order to develop individual customer knowledge (Peelen, 2005). With customer knowledge the company will achieve more information about segmentation, awareness, usage, concept, customer satisfaction, loyalty and pricing. The goal is to develop a long term relationship that profitable both for the

company and for the customer. The collected information about the customer must result in better help in time perspective, more targeted manner and more appropriate solutions.

4.1.2 Relationship Strategy

To develop long-lasting relationship with the customer, the individual customer knowledge from the previous element must be used. Companies that do not have a relationship strategy in place have a short-term horizon where the company has a limited interest in the customer and in the communication with them. Whereas in a long term horizon, the company rather "listen" and "tell" more than "sell" as well as have a broader and deeper interest of the customers that are right for the company (Peelen, 2005). The goal of CRM is to increase the opportunity to improve four crucial areas and meet the goals of each area in a strategically way. These are right customer, right offer, right channel and right time (see table 3) (Swift, 2000).

Table 3. The four "right" areas that needs to be planned strategically. Source: Swift (2000).

Right Customer	Right Offer	Right Channel	Right Time
Manage customer relationship throughout their life cycles Realize customer potential by increasing "share of wallet"	Efficiently introduce customers and prospects to your company and its products and services Customize your offering for each customer	Coordinate communications across every customer touch point Ability to communicate to customer's channel *preference* Capture and analyze channel information for continuous learning	Efficiently communicate to customers based on time "relevance" Ability to communicate with real/near-real time or traditional marketing

4.1.3 Communication

Communication may seem as an easy task between the customer and the company, however almost every customer expresses that the quality of the conversations is basic. It is not a very spontaneous act by either parties, also those time there is an engaging dialogue, it often lead to disappointment (Peelen, 2005). In order to create and maintain a relationship, the communication must be two-way, integrated, recorded and managed. Without it, a relationship cannot be maintained in an effective way as there will be lack of data and categorized communications (Swift, 2000). Many companies do not have experience in communication technique with their customers. Moreover, when there is an involvement of information and communication technology (ICT), it becomes even more complicated for the companies. To be able to communicate with the customer anywhere, anytime and anyplace, a network of communication channels needs to developed (Peelen, 2005).

4.1.4 Individual Value Proposition

Most of the time, when a company takes the initiative to develop a relationship with an individual customer, they usually also get offered an individual proposition. That means that the price of the

product or service is adapted to the individual circumstances (Peelen, 2005). The company has the ability to supply customization that might be composed from a standard product that has been produced on a large scale where “only” the assembly needs to be flexible. Also, in interaction with the customer, the service may be in control towards the customers wish.

4.1.5 Processes and Systems

For many companies, the achievement of the four competencies can dependent on IT systems. The systems must make it possible for the company to develop customer knowledge in an efficient manner. Also, the system must implement a relationship strategy in order for a dialogue to be conducted and supplying customized products. For other companies where the relationship with a smaller group of customers must be maintained, there might not be any necessity of an IT system for achieving the four competencies. Whereas, a larger group of customers represents a low value to the company which means that an IT system becomes inevitable. For a company with a larger customer base, following ten action points can be followed that could lead to strategic advantages (Kumar & Werner, 2012);

1) *Integrate and consolidate customer information*
2) *Provide consolidated information across all channels*
3) *Manage customer cases*
4) *Personalize*
5) *Automatically and manually generate new sales opportunities*
6) *Generate and manage campaigns*
7) *Yield faster and more accurate follow-up*
8) *Manage all business processes*
9) *Give top managers a detailed and accurate picture*
10) *Instantly react to changing market environments*

A CRM technology can empower more customer contact personnel and more informative business intelligence about the customers and prospect. An active CRM will make data available to users that manage relationship with a set of customers that aims to increase profit and decrease churn/disloyalty. The active CRM can make the company feel that they are actively and regularly handling the needs of their customers and taking advantage of each contact between the two parties (Swift, 2000).

4.1.6 Lean Strategy towards Customers

The core principle of lean manufacturing is effectiveness of an organization to continuously change in pursuit of improvement and excellence. This also means that people within lean needs to develop the capability to communicate effectively (Gîfu & Teodorescu, 2014). Lean is sustainable approach for customer-centric organizations that focuses on the reduction of waste and the improvement of process efficiency. This business strategy is based on customer satisfaction where goods and services are delivered on what the customer needs and when the customer need it. This while using minimum materials, equipment, space, labor and time.

Managing lean communication requires a proactive approach as it needs perceptions about what is important. Thus, people can make informed decisions that will create right results (Shaffer, 2011/2012). Organizations that have adapted lean principles to the process of outsourcing have mainly focused on procurement and supply chain management processes on the customer side. For

outsourcing, the lean model means for instance management commitment and support, robust communication, vendor education and training, employee empowerment and vendor performance measurement. The importance relies on a clear understanding between the two parties' policies and responsibilities as well as realistic assessment of the risk involved in the outsourcing process and the parties' appropriate mitigation. For a successful lean outsourcing communication technique, the two parties' strong bond is essential in terms of team work and positive relationship (Felio & Kiselstein, 2014).

4.1.7 Customer-Service Provider Relationship

A company that has no or little knowledge about their customers can follow different models for creating the knowledge. Those companies that do not have enough experience in knowledge management can follow "The Pyramid of Knowledge Management Awareness" (PKMA) can be followed (see figure 4). The pyramid will help to create knowledge for a strategic relationship with the customer. The higher levels of the pyramid can only be reached if the bottom levels have been completed successfully (Wilde, 2011).

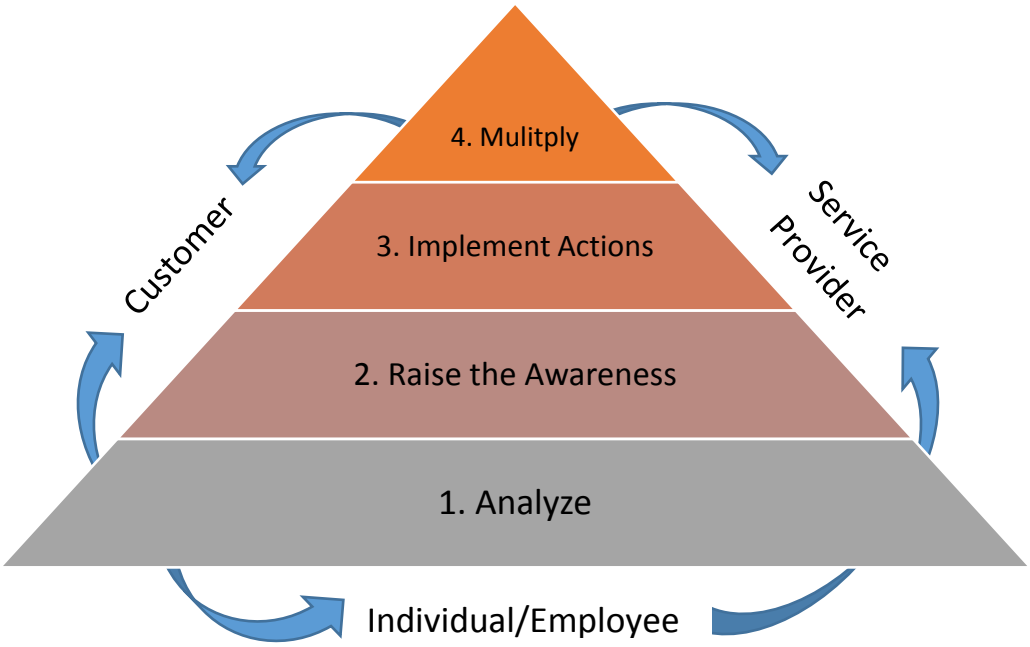

Figure 4. The Pyramid of Knowledge Management Awareness. Source: Wilde (2011)

The first step is to analyze the current knowledge situation in the company. This can be done through a questionnaire among the employees on how much they know about the customers. The second step is to raise awareness of the needs and the benefits among the employees. This step will help them to look upon the previous made mistakes. The third step is to implement action plans with points to follow. Actions could be for example introducing regular training for employees within customer knowledge. The fourth step is to share and multiply relevant information (Wilde, 2011).

5. Supplier Relationship Management

This chapter presents the third part of the literature study and theoretical framework that will be used for analyzing the findings along with the qualitative and quantitative data. This chapter is for analyzing how a CSP can handle their relationship with the suppliers in order to obtain a more flexible payment method.

5.1 What is Supplier Relationship Management?

The Japanese showed the west a new way how value can be added to an organization by creating partnerships with the suppliers. They changed the view of suppliers in terms of optimizing cost, quality and putting the customer service first (O'Brian, 2014). The key to competitive success is the amount of information a business can gain from their supply chain partners. Businesses need to manage their supplier relationship by procurement which is a complex process (Sollish & Semanik, 2012). Supplier relationship management (SRM) can be defined as a collaboration or partnership with specific suppliers which businesses usually focus on (D. H, et al., 2014). A SRM that is well-executed can provide businesses competitive advantage, reduce cost and supply risk. It can also improve efficiency and effectiveness. There are 20 SRM pathway questions that can be answered by a business in order to determine if they are in great shape or not. These questions (see appendix 4) can help a business to develop actions in order understand the great value from the supply base (O'Brian, 2014).

5.2 Supplier Negotiation

Supplier selection is critical issue in chain management since the organizations should collaborate with their suppliers, in order to get the needed parts for production in an efficient way (Lee, 2014). An aspect that both the organization and its suppliers share is to obtain the maximum value for its investment in goods and services. A negotiation between the two parties can be done to reconcile when there is much value at stake (Sollish & Semanik, 2012). Successful negotiation with suppliers can provide huge cost savings. These negotiations require careful preparation and planning, a good understanding of the desired outcomes, and the ability to view suppliers as partners rather than opponents. Also, the organization should take the lead in negotiating with suppliers. Following are three key questions that should be considered when planning for a negotiation with the supplier (Berk, 2010);

- How do we negotiate with suppliers?
- Do we know our objectives and plan a strategy prior to entering the negotiation?
- What has our history been in attaining what we want in a negotiation?

A business transaction involving commercial buying and selling requires both a valid offer and acceptance. There is a gap here since the buyer can only spend a certain amount but the supplier's offer contains a significantly higher amount. By engaging in negation the both parties can reach their respective goals. A buyer usually spends their time to obtain more favorable terms for their own organizations by negotiating with the supplier. That is why a negotiation requires planning, research and an execution plan that will make the organization achieve their outcome successfully.

5.3 Japanese-Style Partnership

A Japanese-style partnership (JSP) is an exclusive or semi-exclusive supplier-purchaser relationship that focuses on maximizing the efficiency of the entire value chain. The goal with this particular kind

of partnership is to increase quality while minimizing the total value-added costs that arises for both the supplier and the purchaser. By creating a value chain where the both the supplier's and purchaser's costs and problems are visible, the parties can solve the problems together and expand. JSP takes advantage of economies of scale in both production and transaction cost (Dyer & Ouchi, 1993). Following are some of the key point of a JSP (Henry & Mayle, 2002):

- Long term relationships and commitments with frequent planned communication, which reduces transaction costs and eliminates intercompany inefficiencies (Henry & Mayle, 2002).
- Mutual assistance and a focus on total cost and quality, working together to minimize total value chain costs (not just unit costs) (Henry & Mayle, 2002).
- Willingness to make significant customized investments in plant, equipment, and personnel as well as share valuable technical information (Henry & Mayle, 2002).
- Intensive and regular sharing of technical and cost information to improve performance and set prices, which share equally the rewards of the relationships (Henry & Mayle, 2002).

5.3.1 Benefits with JSP

Organizations that implement JSP with their suppliers will experience three benefits. The first benefit is fewer direct suppliers. By having fewer direct suppliers could lower costs while increasing quality. Also, it can create value by providing economies of scale and experience curve benefits that lower either transaction costs or production costs (Henry & Mayle, 2002). The second benefit is customized investments. JSP's require various types of investments in customized assets by one or both firms in order to optimize the production and flow of goods and services (Henry & Mayle, 2002). The third benefit is forced competition. As the two previous benefits push on that a partnership is preferable over rotating business among large number of suppliers, the third benefit highlights vertical integration. Vertical integration removes the supplier from the discipline of the market and because the supplier has a captive customer base, the competition gets eliminated essentially (Henry & Mayle, 2002).

5.4 Managing Supplier Relationship

A company that is interested in creating a JSP with their suppliers needs to develop groundwork for a more productive relationship. There are several aspects a company needs to consider in order to strengthen their bond with the suppliers. Some of them are meeting with suppliers regularly, improving communication and reviewing performance (Sollish &Semanik, 2012).

5.4.1 Meeting with Suppliers Regularly

A company that wants take their relationship further with the key suppliers needs to arrange meetings with them regularly in form of supplier reviews or executive conference. These meetings will give the company and the supplier the opportunity to align and leverage the strategic relationship (Sollish & Semanik, 2012). However, it is not easy to always schedule a meeting where both management groups can attend. There are other ways to maintain the contact, for example using supplier surveys or improvement teams. A supplier survey can provide information on how effective the supplier really are for the company or how the supplier views the company as a customer. Improvement teams can provide the suppliers the opportunity to be involved in a company project, regardless what role they have in the supply chain. By involving a supplier in a team will benefit the company as it is a way to leverage talent within the supply base (Sollish & Semanik, 2012).

5.4.2 Improving Communication

Effective communication is a key aspect for a strong relationship when it involves different levels of personnel. Communication can make the suppliers to respond faster when the company is in need of them and the service levels will rise. Improving communication can include website information where information about the supplier is posted. It can also be improved by producing newsletter where the supplier can understand their customer on a higher level and experience what is happening within the organization (Sollish & Semanik, 2012).

5.4.3 Reviewing Performance

The reviews of performance are generally presented in a report format with supplier's goal or standard for a determined time. In fact, a performance scorecard is a popular communication method for delivering supplier reviews. Score cards is a great way of obtaining supplier feedback and learn how to align the processes in a better way (Sollish & Semanik, 2012).

Developing Performance Improvement

Following are defined steps for improving the development performance that has been produced by a management team (Sollish & Semanik, 2012);

1) *Analyze existing conditions.*
2) *Determine the gaps that exist between the actual conditions and the desired state.*
3) *Develop plans to eliminate (or reduce) the gaps.*
4) *Implement the plan.*
5) *Measure improvements.*
6) *Repeat the cycle*.

6. Results

The result is divided in two parts, the first part are the collected result for the first two research questions. This part provides an understanding of Tieto's current state and its relationship with customers and suppliers. Furthermore, the investigated products will be presented. The second part is the collected result for the remaining three research questions.

6.1 Part 1 - The Cloud Service Provider

Tieto was founded in 1968 and is the largest Nordic IT service company. To simplify cloud businesses for their customers, Tieto offers their customers Industrial Cloud Solutions. Industrial cloud is for those industries that want a cloud solution that fits them better instead of purchasing a general standard cloud service that would not be as specific for the particular industry (Tieto, 2015). Examples of industry cloud are government cloud for compliance with laws and regulation and finance cloud for Payment Card Industry Data Security Standard (PCI DSS) compliance required industries.

6.1.1 The Chain of a Cloud Offering

In a cloud offering there are more than one parties involved to give the end customer the cloud service that is expected. The interviews with Tieto's employees resulted in a general mapping of the parties involved in a cloud offering from a cloud service provider's (CSP) point of view (see figure 5). These particular parties are those Tieto needs to manage software licensing with, in two different ways when it comes to a PCI DSS cloud offering.

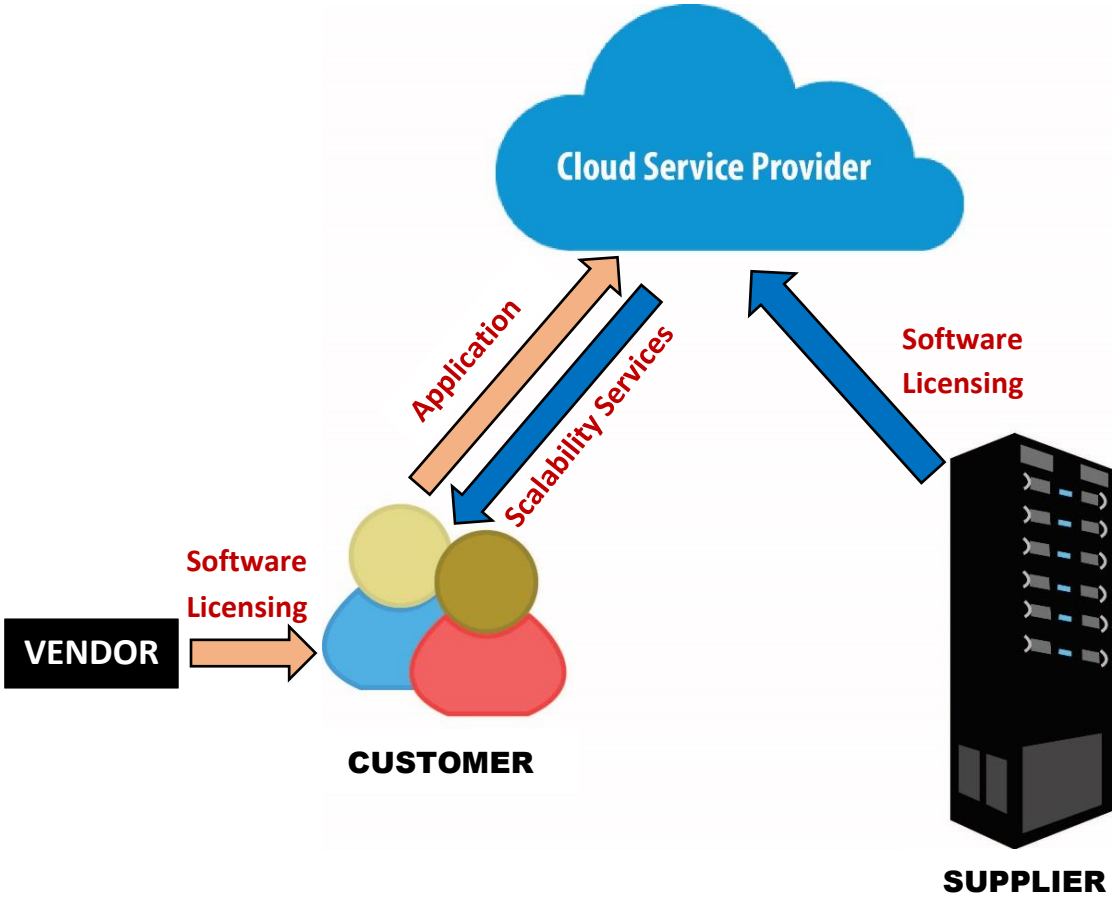

Figure 5. The general picture of all of the parties that the CSP needs to manage software licenses with

One of the main challenges Tieto have with software licensing is the scalability issue. As Tieto is a CSP, they manage, implement and operate the underlying infrastructure that supplies the resources to be delivered as a cloud service. The customers of Tieto are the party who use the resources of the cloud service and pay for what they use (PAYG). That means that Tieto needs to give their customer flexibility to scale up by adding capacity or scale down when needed. The capacity gets scaled up and down in the servers that Tieto have in their data center. In the servers the sensitive data from the customers are stored. To be able to scale up and down in the servers, Tieto needs to buy software licenses from different suppliers (see figure 6). There are several suppliers as there are different operating systems used by different customers that each supplier represents. Tieto needs to invest in excess capacity by investing in licenses in order to be able to offer scalability to their customers. This challenge with software licensing occurs on the IaaS level of the cloud service.

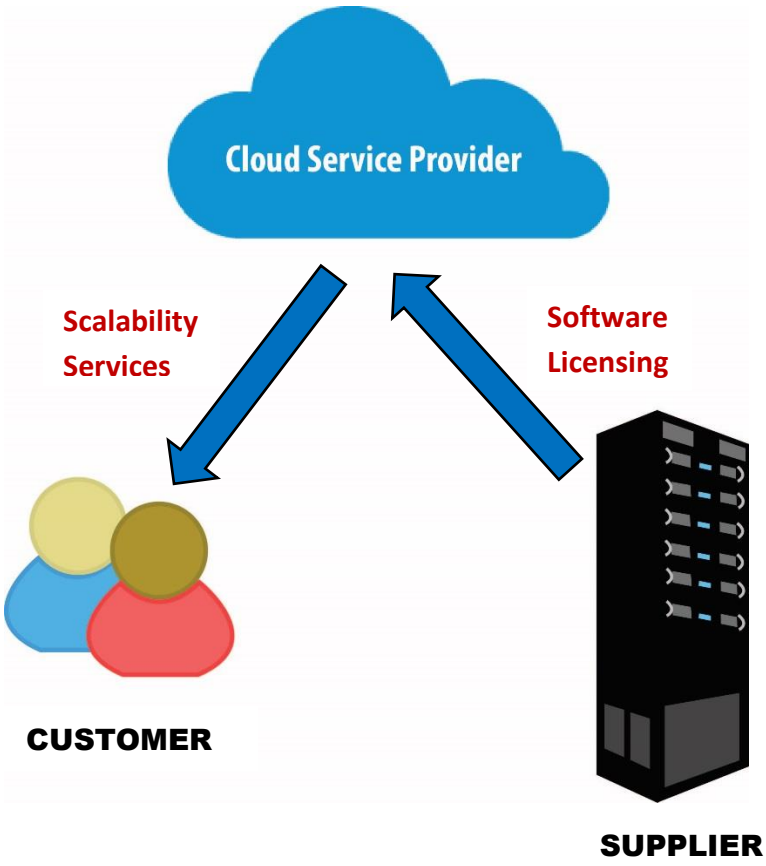

Figure 6. The chain of a cloud offering that determines the maximum capacity usage of the end-customer

There is a second challenge with software licensing that Tieto needs to deal with that involves their customers' applications and the vendor of the application (see figure 7). Customers that use a cloud service from Tieto have the opportunity to outsource their own applications on to Tieto's infrastructure and platform. Such application can be payment systems that a retail business need for their daily services (Head of Cloud, 2015). The applications can be outsourced to Tietos's platform and be maintained from there. The applications are bought from third party vendors which the customers have a software licensing agreement with. The licensing agreement decides in what extent the applications can be used. This means that when these customers outsource their applications to Tieto, they need be aware of how much they can use the applications in terms of

scalability. When the customers want Tieto to scale up one of their applications which could exceed the maximal usage, then it is the customer's responsibility to notify the vendor about it.

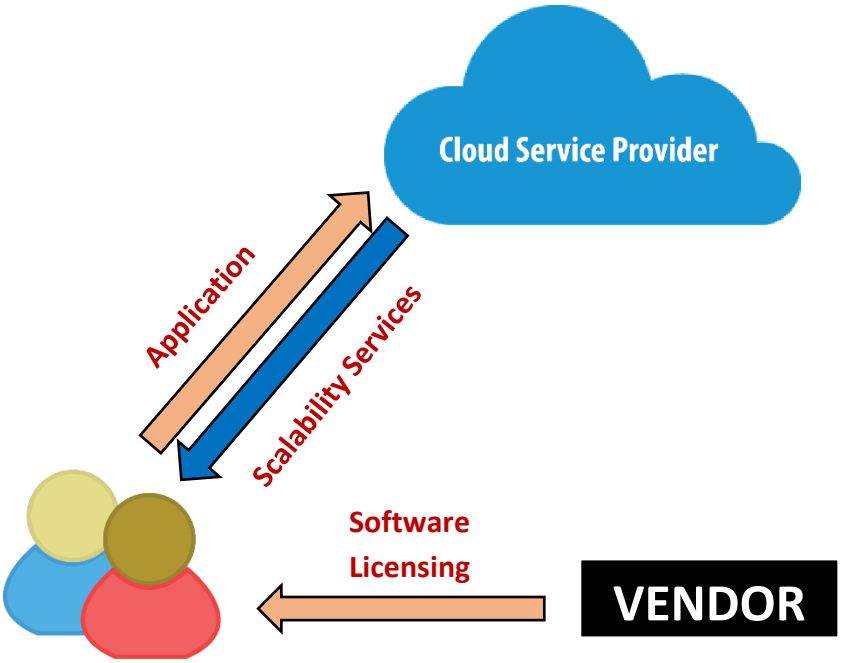

Figure 7. A customer that outsources applications to the CSP bought from a vendor

6.1.2 iTAP

A challenge that many of Tieto's customers faced were expensive IT resources and the lack of necessary skills in their IT departments (Tieto, 2015). Some customers were boxed in a certain level of IT and had to invest in new systems if they needed more. Tieto's solution for these customers problem is IT on tap (iTAP), which started as an IaaS solution where payment is based on what the customer use. iTAP is a standardized product that is designed for industries like retail, media and other industries (Head of Cloud, 2015). These customers' can focus on their core business by not owning resources for setting up a whole cloud environment but can instead buy the needed capacity for their systems on flexible terms as a service. iTAP gives customer the ability to transform fixed costs into variable costs that helps organizations to respond better to market changes (IBM, 2015). In other words the customer can use IT in a more convenient way where scalability makes it easier for customer to adapt SaaS, PaaS or IaaS for their business needs (Tieto, 2015). For a customer that uses iTAP, Tieto take cares of the technology, processes, information security etc. Also, optional services can be added upon the product depending on the business application (IBM, 2015).

While serving financial customers with iTAP, Tieto faced a challenge with customers that handle card data and that were obliged to be PCI DSS certified. In order to meet these customer requirements, Tieto needed to make part of the iTAP environment certified according PCI DSS version 2.0. However, every new customer that needed a PCI DSS compliant environment, Tieto had to set up new environments for each customer. As each customer's environment needed to go through an audit in order to receive an Attestation of Compliance (AoC) from the Qualified Security Assessor (QSA), it became a very expensive solution for Tieto. Thus, if all of the financial customer were put in a shared environment with other customers from different industries, then these customer would had to be compliant as well (Head of Cloud, 2015). That would mean an extra cost for these non-financial customers that have no need of being PCI DSS compliant.

The reason why financial customers wanted to outsource parts of their PCI DSS environment to a product like iTAP, is because of avoiding the costs of setting up an own entire IT environment. This is also beneficial as the knowledge of being PCI DSS certified is lacking since their core business is far from IT-systems. In order to decrease the cost for both parties, Tieto has formed a new product line extension called TiCC.

While managing iTAP, there have been challenges with software licensing for Tieto. The reason is that Tieto buys a certain amount of licenses from their suppliers but there are times when a customer needs more capacity than usual and then the licenses needs to cover that. There are more than one supplier involved in this cloud offering. The reason behind it is simply because the customers of iTAP use different operating system. Each supplier manages a specific operating system in the servers. These suppliers are big organizations that are very competent in the area of cloud computing. Supplier X that was mentioned in the methodology chapter earlier has been involved in the very beginning in development of iTAP by offering suitable server solutions. The main challenge with the software licenses from the suppliers is the fees that need to be paid if Tieto scale up too much for customers since they did not estimate the amount for scalability enough in beforehand. These fees must be paid to the supplier if they detect that a certain server was used for scaling up more than usual.

6.1.3 TiCC

Tieto Compliance Cloud (TiCC) is exclusively designed for the financial industries that handle card data (Head of Cloud, 2015). TiCC is being built to be compliant to the latest version which is PCI DSS 3.0 and is part of Tieto's financial service (FS) department. Like iTAP it is a standardized infrastructure solution where the payment is based on what the customer use (PAYG). TiCC benefits customer that need to have a certified PCI DSS environment but does not want to own servers or maintain the environment. Being a product line extension, there has yet not been any problems with attracting customers to this product. In fact, customers of ITAP are successfully being moved to TiCC as 70-80% of iTAP's customers are financial customers. Also, as the parent brand already has such a strong reputation, there has been a customer demand even from new customers that has not used iTAP before (Head of Cloud & Business Solution Architect, 2015).

TiCC's environment is divided in two parts, Cardholder Data Environment (CDE) and Connection. The CDE is where the physical servers exist whilst the remaining parts are in the Connection (Lead Security Architect, 2015). This is an essential product as it allows companies to continue with their core businesses without focusing too much on the twelve requirements of PCI DSS (see appendix 1). The standard will secure organizations sensitive credential information of the end-consumer that uses VISA or Mastercard when making a purchase. The companies that do not implement PCI DSS for card handling will not be allowed to continue their businesses with an environment that does not adhere to the standard. If they ignore the standard, there is a risk of receiving a penalty fee for handling sensitive data in an insecure way (Head of Cloud, Lead Security Architect & Customer of Tieto, 2015). A second reason, why a standardized infrastructure such as TiCC is important for customer is because of the lack of knowledge about being PCI DSS compliant. Many customers do not really understand what PCI is really about and that is because their core business focuses on something else and they do not have the time for it. By outsourcing this service makes it easier for them as they face hardship in knowing what kind of environment should be set up in order to be accurately compliant and get approved from their QSA (Head of Cloud, 2015).

The idea behind TiCC is to relieve the financial customers' part of their responsibilities of becoming certified. However, these companies still need to implement part of the IT- environment within the organizations workspace. Another factor is that since TiCC has its own environment, it is highly protected as it protects sensitive data such as card numbers. Physical shielding of the environment makes a difference in terms of protection of payment account number (PAN) and sensitive authentication data (SAD) (Head of Storage, 2015). As TiCC is a standardized infrastructure that is being formed with a help of a QSA, there is only need for one audit for this environment instead of several audits for several environments (Lead Auditor, 2015). Companies that will be part of the infrastructure will receive an AoC to show their QSA that their outsourced environment that is Tieto's hardware on TiCC is certified. The AoC is proof to the customers QSA that the data center, the servers and the racks are locked. In the end the QSA will certify that the standard is implemented correctly and the end-consumers card number is not traceable anywhere (Head of Cloud, 2015).

As Tieto relives some responsibilities from their customers that need to be certified with a standardized infrastructure, the company wants to be able to offer a product that covers the upper layers as well. However, standardized PaaS and SaaS may not match the customer's environment, since it is not as easy for Tieto to offer these solutions as a standardized IaaS. The reason is that applications like HR-system or e-banking that are used by the financial customers are different from company to company. For example, in the retail industry there is several payment applications instead of one standard that is used by every company (Head of Cloud, 2015). Instead, when Tieto offers to manage the customer's level as well, the customer rather bring their own application to the cloud service than using SaaS solutions from Tieto. Furthermore, each of this application has a specific software licensing agreement between the customer and the application vendor that states the amount of the usage. When a customer wants to take advantage of Tietos scalability aspect within TiCC and scale up for a certain application, then there is a risk that usage will become more than what was stated in the license. This becomes a challenge for Tieto as the customer expects that their vendor will automatically be notified. Thus, if the vendor is not notified there is a possibility that the customer will be punished in terms of penalty fees. There is clearly a lack of customer knowledge that causes these misunderstandings.

6.2 Part 2 – Gaining Perspective from all Parties

This part of the results is the collected interviews with Tieto, a supplier and customer. Furthermore, the results from the survey are presented that was conducted with two different industries that need to be certified according to PCI DSS.

6.2.1 Tieto and Supplier X

One of the research questions is about how a CSP can obtain an agreement in their advantage with their suppliers in order to minimize the challenges with software licensing. To be able to answer that question, interviews were conducted with Tieto and one particular supplier that is referred as Supplier X.

Tieto's Perspective

For any cloud service offered to customers by Tieto, there is a need of servers in form of capacity for storing and securing sensitive data. The capacity is decided in terms of software licensing bought from the server supplier that determines how much the customer are free of scaling up and down on their applications. The challenge was expressed on the first interview with the Head of Cloud of Tieto (2015).

"Generally when it comes to cloud services, there is a challenge to get all of the licenses to interact with all of the parts of the service. Especially when it comes to SaaS, where the interaction is mainly with all of the cloud suppliers." – Head of Cloud, 2015

The main identified challenge for Tieto is to make the software licenses scalable from the supplier's side. That is if a customer needs scale up more than usual, then the licenses bought from the supplier need to somehow increase in amount. The wish is to have a more flexible payment model with the supplier where the Tieto pays the bill for the licenses after a customer's usage.

"Since, we do not own the licenses, we need a renting model from the suppliers, where we somehow pay for the licenses afterwards. If not that, we need a system that's solves if we buy too much licenses but the customers decides to not scale up. Then we found ourselves in a situation with too much licenses and a big loss of investment. What we want is a pay per usage model from the suppliers". – Head of Cloud, 2015

On the other hand, if Tieto do not buy enough licenses and scale up the services by themselves in their datacenter, then there is a big fee to pay to the supplier. Either way, there is a loss-loss situation. When it comes to a product as TiCC, the challenge mainly occurs on SaaS level where Tieto puts the applicationa. Such application within the financial industries that handle card data can be a bank or a card system, where the customer wants to pay per user. Tieto needs to understand here how much capacity does each customer need and how many licenses is required for scaling up.

On the second interview with the Head of cloud that was conducted three months after the first interview, some of the challenges were resolved with the licenses from the supplier. One of Tieto's largest suppliers had made an agreement with Tieto to take payment only after the customers' usage.

"We have now made an agreement for TiCC where we use the 90 days model. That is we pay 90 days after for the licenses instead of paying upfront. Now we will be able to first calculate how the customers need to pay depending on their scalability terms and then pay the supplier."

However, the challenge with the rest of the suppliers remains and the Head of cloud hopes for a more flexible paying method from them as well. There is one particular supplier that seems to be nonnegotiable and Tieto does not know how to continue to handle their licenses without losing money.

"We have a position where we can put pressure on the suppliers since we use large volumes from them. If we were a smaller company that needed less volumes it would be harder to affect them". – Head of Cloud, 2015.

Supplier X's Perspective

The qualitative interviews with Supplier X resulted in their perspective of their offerings to Tieto for the cloud product iTAP and the relationship between these two parties. The supplier has been involved from the very beginning in order to provide the best solution to Tieto. However, there have been challenges in offering a flexible paying method for the services.

"A problem many our customers (such as Tieto) have are that the software part is very expensive. When the customers buy software licenses and third party software, the price model for the licenses is outdated as it was fixed prices from 20-25 years ago for the platform. Basically, the price model is

rather on the size of the server instead of the functionality. Even though a big server does the same job as a small server, it would still cost more for service companies like Tieto to buy it. Part of the licensing is to control the parts that has been bought from us in their data center, such as operating systems, data base etc." – Power System Sales Expert, 2015.

The solution for Tieto was to buy the small- and middle-sized servers for their data center instead of the bigger ones that basically had the same functionalities but was much more expensive. Furthermore, Tieto already had licenses for the middle-sized servers for their other cloud services. However, the bigger servers had core functionality that the small- and middle-sized did not have, which is the on/off functionality. The on/off functionality is the function that scales up when the customer needs more capacity and scales down when the customer needs less.

"iTAP was supposed to be built as a cloud delivery model with an on/off- functionality which the bigger servers actually have. The on/off – functionality can be used for building an on demand model. But the bigger servers were not an option for Tieto, because of the license effect. Instead we needed to build some kind of flexibility for iTAP, as iTAP offers a flexible solution to their customer, where they can add capacity as they go. We suppliers on the other hand, do not have a decent model for the small/middle-sized machines where the customer pays depending on the usage. The best we could do for iTAP was to sell the machines and offer Tieto a special bundle with software package on the top". – Power System Sales, 2015.

The challenge with the licenses still remains as the supplier needs to be aware of the amount of licenses that Tieto has bought and if the capacity has exceeded the maximum level. Now that this has expanded to TiCC, it has to fulfill the PCI DSS requirements as well.

6.2.2 Tieto and Customer

Another research questions is how a CSP could collaborate with their customers without breaching any software licenses of the customers' application. To be able to answer that question, interviews were conducted with Tieto and one of Tieto's customers that use iTAP.

Tieto's perspective

The interviews with employees that were relevant for the study resulted in a second challenge with scalability and software licensing. The challenge occurs with the applications that the customer brings to Tieto's cloud services such as iTap and TiCC.

In every cloud service, especially when you go higher up on the levels, we usually deliver SaaS as a whole package and where we put on an application like a bank system or a card system. Then the customer want to pay per usage and then we as a CSP need to understand how much cloud computing is needed per user. How many licenses do they need for scalability? – Head of Cloud, 2015.

"Many cases when the customer brings their own applications or own third party software, the software licenses is owned by the customer. The gap is that these customer needs to understand that when we scale up a certain application of theirs, then they need to buy more licenses from their vendors. Or else, it becomes a problem when Tieto scales up without increasing the amount of licenses. Either the whole application will stop running or there is an audit on the application by the vendor, and there is a risk that they need to pay a very big penalty fee as compensation." – Head of Cloud, 2015.

Furthermore, the Head of cloud was determined about the communication with the customer was a part of the problem. There has yet not been found any model for informing the customers when Tieto scales up their application. The customer must be aware of the consequences when Tieto scale up. The customers understand that Tieto can easily scale up but the customer must also be prepared to take the licensing implications.

"The bigger problem is the difficulty of describing the PCI impacts. Everyone wants it easily but the difficulty depends on where you draw the line. The biggest problem is how to cooperate between systems and operative systems (…). So customers build on their own things. If they had led us handle everything then it would be easier (…). Then you offer a service, you can make sure everything below is complete" – Lead Security Architect, 2015.

A Customer of Tieto

This particular customer of Tieto uses iTAP and has been moved to TiCC's environment as the customer needs to be PCI DSS compliant since it is a bank partner. The interviews resulted in creating a customer's perspective that has used iTAP and will use TiCC. Furthermore, the interviews for investigate the relationship between the two parties and if there are potential to take relationship to the next level of collaboration.

"In the current situation, it is a service that is integrated with other providers where the PCI requirements are included for card handling. Then we are handling our solutions, our integration as well as the underlying providers, where Tieto is one of the biggest ones. We have a yearly PCI checking for updates and for doing the right justifications, where Tieto is a huge part of it as they need to be compliant properly. Or else, our QSA will not approve us for following the PCI framework in a right way if Tieto does not handle the outsourcing parts". – Customer of Tieto, 2015.

The relationship with Tieto has not changed as these two parties have been collaborating in other services for many years. The reason why they decided to be a part of iTAP was because of having the possibility to vary their volumes on an easier level than buying capacity all the time.

"The next natural step for us was to be a part of TiCC, only because of the reasoning between the managers that we needed the latest compliance environment. It was rather a reason than a choice. It is not that we sell card services more now when we are part of TiCC, instead there is something in the environment that makes it better for us. We need to constantly fight against fraud and protect everything that is sensitive". – Customer of Tieto, 2015.

6.2.3 Financial Customers within PCI DSS

To answer the research question about what impact scalability and software licensing have on the customers within the case study, a survey form was created for this (see Appendix 2 and 3). The survey was conducted with two different financial industries; retail and banking that handle card data and need to follow the PCI DSS requirements. The survey resulted in the importance of scalability for these companies and how software licensing affects them. The surveys were answered by CTO and IT-managers from the 21 participated companies, 16 from the retail industry and 5 from the banking industry. Following figures (see below) is the result from the survey questions regarding scalability. The x-axis shows the number of participated interviewees that chose a preferable answer on the y-axis.

Result from the Questions about Scalability

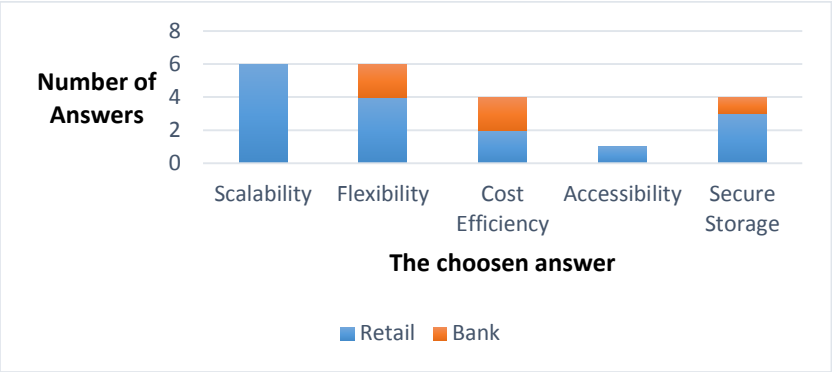

Figure 8. The chart shows the most important attribute within cloud computing for industries that need to be PCI DSS compliant

Figure 9. How important is the scalability aspect within the card processing section when using cloud services?

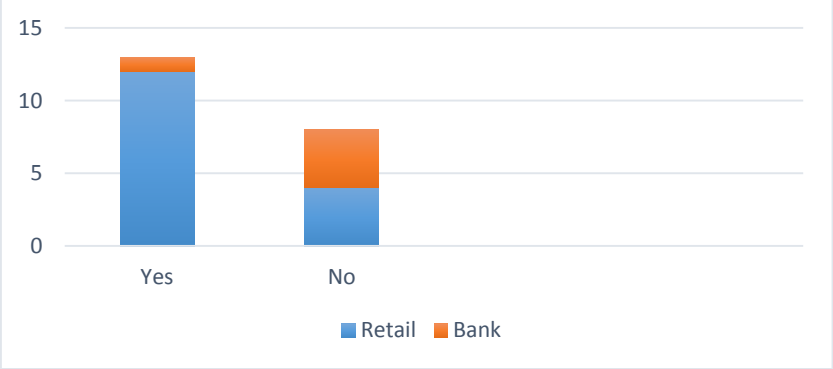

Figure 10. Would it considerable to pay more for a cloud service that is more scalable than the service that is used currently?

The result of the surveys shows that scalability is a more important aspect for the retail industry than for the banking industry. Furthermore, it shows that when outsourcing an application or software, the retail industry needs space for scalability as their peak hours varies from day to day. Thus, having a CSP that offers scalable services is a crucial fact. As licensing determines how much a CSP can scale

up and down for the customer, it is really important to find a preferable payment model from the suppliers.

Results from Questions about Software Licensing

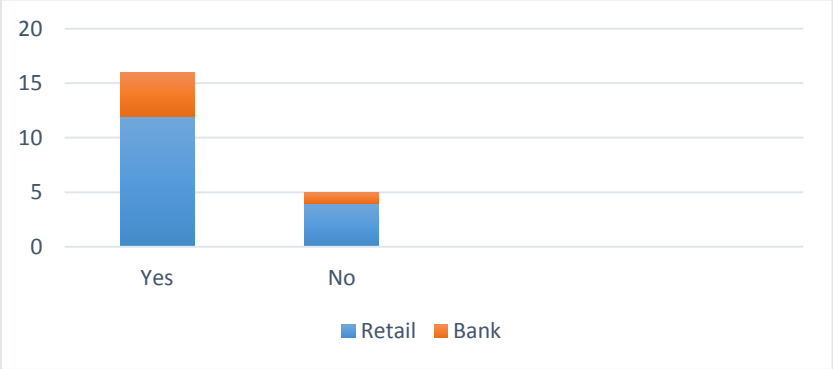

Figure 11. Are you satisfied with your current licensing agreements with your vendor of application within PCI DSS?

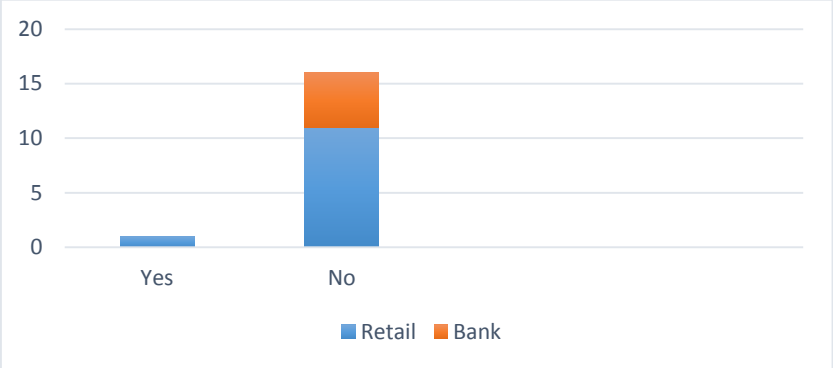

Figure 12. Do your cloud relationships (such as your CSP) get affected because of your licensing agreement with you vendors?

The survey questions about the software licenses resulted in that customers do not perceive any problem with their application vendor nor does this vendor interfere their relationship with the CSP's. This shows that even though the licenses are from the vendor to customer, the challenge occurs more on the relationship between the customer and the CSP. As the customer outsource their data and applications to the CSP, it comes more naturally that the challenge must be tackled by the CSP rather by the customer where the responsibility issue really is.

7. Managing Software Licensing from Suppliers

This chapter will explain Tieto's current relationship with Supplier X and how they handle software licenses within iTAP. Furthermore, the analysis will provide a recommendation on how to minimize the challenge with licensing with suppliers in the new line extension, TiCC.

7.1 Current relationship

When iTAP was emerging, Tieto faced a challenge with the needed software because of the licenses that was very expensive. The licenses were amongst other from Supplier X and other third parties that provided licenses for monitoring, applications etc. The price model for the licenses from Supplier X was outdated as it was fixed from 20-25 years ago for a platform that used processor class for measuring. Basically, the price model was based on the size of the server instead of the functionality. Even if a big server did the same job as a smaller server, the price tag for the bigger servers was too expensive for service companies like Tieto. The solution for iTAP was to buy the small and middle-sized servers for the data centers which resulted in missing the on/off –functionality that the bigger servers have to control the scalability aspect. This in turn created a new challenge for Tieto as the whole revolutionary aspect with iTAP was the possibility to offer their customers a scalability service with Pay As You Go (PAYG) and scaling applications whenever needed. Furthermore, as different suppliers use different operating systems, iTAP needs to have licenses from different suppliers where the price model differs from the processor class. The kind of relationship Tieto has with their suppliers for iTAP, is more of a CAPEX based instead of OPEX (Head of Cloud, 2015). Meaning, Tieto pays their suppliers in a lump sum for the servers and licenses instead for a monthly payment. This in turn means that if their product iTAP scaled up too much for a period of time that would mean a penalty fee for Tieto from the licenses. Thus, the licenses limit the amount of usage that was paid for in advance.

In order to keep iTAP's core functionality, that is offer customers a billing method such PAYG, Tieto currently needs to buy a great amount of licenses from different suppliers to meet the customer's scalability demands. Tieto must always have the maximal amount of licenses as possible, in order to be ready for any customer that wants to scale up more than usual. However, if few or no customer scale up for a period of time, that could mean a big loss for Tieto as the bought licenses are not getting used by the customers.

7.2 A new supplier approach for TiCC

Learning the hard way with the licenses from iTAP, Tieto negotiated a beneficial agreement with one of the suppliers for TiCC. In fact, Supplier X which is one of Tieto's biggest suppliers changed their way of billing Tieto. Negotiation lead to a more OPEX relationship instead of a more CAPEX based relationship as they now have for iTAP. With OPEX, Tieto can now pay a monthly fee for the usage of the servers, instead of paying upfront. This is a great deal for Tieto, as the payment will be based on how much the customers will scale up and down which means that Tieto will pay these suppliers only after they have received a payment from their customers.

This flexible payment method is very similar to PAYG that Tieto offers their customers. Tieto can for TiCC scale up and down as much they want for customers that use Supplier X's operating system and then pay bill to Supplier X for what has been used. This makes it easier for Tieto to handle the customer's request of the scalability aspect even with licensing. However, as Tieto have a pool of multiple suppliers with different licensing agreements, the problem with licensing remains with other

suppliers that still holds on to the inflexible paying method. Tieto needs to somehow set an example for these suppliers by taking the opportunity in act to create a more valuable partnership with Supplier X.

The relationship between Tieto and Supplier X that offer a more flexible paying method would benefit from a successful supplier relationship management (SRM). As Supplier X is already going towards what is best for their customers such as Tieto, there is potential to take it further. Many of Tieto's customers use the operating system from this particular supplier, which means creating a successful SRM should start here. By implementing a beneficial relationship with Supplier X will make Tieto to focus on the larger customer base that use the operating system from Supplier X and minimize the focus on licenses that is bought from the remaining suppliers. A successful SRM with Supplier X could be further customized to meet the customer needs and demands and thereby hit a new kind of market.

A management team in the department of financial services (FS) should fill out the form with 20 pathway questions (see appendix 4). Then it will be evident that Supplier X is in fact a good fit for Tieto to begin a SRM with. Below is a draft of how some of the pathway questions can be answered by a management team (see table 4).

Table 4. A draft of how SRM questions can be answered by a management team from Tieto about Supplier X

SRM Pathway Questions	
1. What is the contribution we need from our supply base and why?	***A flexible paying method that makes it easier to bill the customers after their cloud usage.***
2. Which suppliers are important to us and why?	***Supplier X, as most of the PCI DSS certified customers uses the operating system from them.***
5. Are we getting the most from our suppliers and how can we be sure?	***The buying-selling relationship with Supplier X has been going on for a long time which has led to some beneficial agreements.***
15. Which of our important suppliers hold the potential to make a dramatic difference to our business and why?	***Supplier X, since they understood the difficulties with CAPEX payment for us and has instead offered us OPEX payment.***
16. Are we working collaboratively with those critical suppliers towards jointly agreed goals that will make a dramatic difference?	***Yes, a closer relationship with Supplier X could make a dramatic difference and increase the customer value for cloud users.***

7.3 Conducting a Strategic Relationship

There is some groundwork that needs to be established before a successful supplier relationship management (SRM) can take place. First of all, there is a need of a framework of strategies that has been worked before in other cases and is suitable for Tieto. In this case, the most strategic relationship between the two parties would be Japanese-Style Partnership (JSP). By creating an exclusive or semi-exclusive relationship that focuses on maximizing the efficiency of the entire value chain will enhance the end customers' value. The JSP would help Tieto to create a great portfolio together with the Supplier X especially formed for the Payment Card Industry Data Security Standard

(PCI DSS) compliant required customers. This would mean that Tieto would gain market space for a certain operating system that is offered through a more flexible method and minimize the inflexible method with the remaining suppliers. By working together, the value chain costs within TiCC will be minimized and the focus will be on the total cost and the quality that will be offered to the customers of TiCC. Also, as Tieto have a long history with Supplier X it means that it only requires more positive attributes and features in the existing partnership instead of creating a whole new kind of partnership.

As stated in the literature study, there are several benefits for Tieto if they succeed to create a JSP with Supplier X but there are also three core benefits that will bring them competitive edge. The first one is fewer direct suppliers which could mean lower costs in terms of service and maintenance, while increasing the quality of TiCC. The second benefit is customized investments, which is required in a JSP in order to optimize the flow of goods and services. With customized investments, Tieto and Supplier X can hit a new market by customizing after the customers demand and needs. Furthermore, as the Council is putting more and more pressure on the entire card handling industries, the amount needed certification will increase which mean that the two parties have the opportunity to create more customized products depending on the customer needs. The third benefit would be forced competition which means that a JSP will push Supplier X to continue to compete and innovate. The forced competition will make Supplier X to always try to provide the most suitable solutions to Tieto.

A JSP will not happen overnight which means that Tieto needs to clearly show the benefits with a close collaboration between the two parties. In order to eventually reach the strategic choice of SRM, Tieto should start with meeting the supplier regularly, improve communication and review performance.

7.3.1 Meeting the Supplier Regularly

In a PCI DSS environment it is crucial for the supplier and service provider to meet regularly. As TiCC handles sensitive data, the both parties must always take mutual actions and minimize misunderstandings. With regular meetings, Tieto has the opportunity to teach and show Supplier X more about their business. This is partly fulfilled as Tieto has a long history with Supplier X, which means that both parties is aware of each other's needs and demands in different products and services. Furthermore, Supplier X was involved from the very beginning of the emerging of iTAP. In order to be able to create a somehow good offer for Tieto when it came to the servers, Supplier X needed to create knowledge about iTAP. Knowledge such as how iTAP will work and if it is beneficial for Supplier X to be a part of it. This previous knowledge from an earlier product can get stronger in terms of usage, customer satisfaction, loyalty and pricing for TiCC. If Supplier X creates a good knowledge base about TiCC, then it will create the opportunity to make their long term relationship even stronger that will be profitable for both parties. Tieto can create the opportunity for Supplier X to get the acquired knowledge base by involving them in making of TiCC samewise as iTAP.

One of the greatest factors with a JSP is that if both parties commit to such partnership, regular meetings will come more naturally. Scheduling regular meetings between two significant teams might not be the easiest task but there are other ways to keep the supplier close to the company. Tieto can involve Supplier X in other projects about cloud services and products or even in other project outside the cloud computing area.

7.3.2 Improving Communication

If Tieto succeed to create a JSP with Supplier X, then the communication will come more naturally as both parties need to update each other within the involvement of the product. The hard part of the communication was earlier about how to manage the licensing in a more effective way, which has already been solved. Now, when Tieto has are flexible payment method from Supplier X, the communication would be more about how to increase the customer value for financial customers that handle card data. Furthermore, as both of the companies runs within the IT industry, makes it easier to create a suitable communication channel that both parties are comfortable with.

7.3.3 Reviewing Performance

Now that Supplier X has given Tieto a more preferable paying method, a good approach for Tieto would be reviewing this performance and give feedback. This will make Supplier X understand how valuable they are for Tieto's cloud services. This is also a great way of reviewing the license agreement to minimize or even eliminate the gaps of the problem until the next reviewing period. By continuously reviewing the licenses will create a more favorable partnership that both parties can benefit from over and over again.

7.4 Supplier Negotiation

Tieto has a strong market position since the company is currently Nordics largest IT Service Company and also an important customer to Supplier X. This position and importance gives them the power to negotiate with Supplier X for better terms. Taking advantage of this negotiating power, Tieto can require creating a stronger bond between them and Supplier X. This requirement would not have been easy to bring if Tieto did not have such strong market position.

In order to negotiate such partnership, Tieto must take the first step towards it and lead the negotiation. As their market position is strong, they have enough power to negotiate such terms. The strategy for entering such negotiation needs to be of proper value added reasons of the product TiCC. As TiCC is a standardized line extension, it has already received a positive vibe from the customers. This means that the product is already doing well in the market without even being finalized. This is a future advantage not only for the Tieto but for the Supplier X as well if they follow the terms of negotiation. The history of attaining such relationship is based on previous inferior terms where Tieto had a challenge with meeting the customer demand because of the suppliers' licensing agreement. Now however, the suppliers can take a step further on the positive direction and collaborate with Tieto which in turn could mean more needed services from the supplier while the customer base for PCI DSS required industries grows.

When Tieto has obtained the desired relationship with Supplier X and established some groundwork with them, then the next natural step for negotiation can be taken. This time the negotiation should be with the remaining suppliers that still have not shifted to a more flexible method. By showing these suppliers that having OPEX instead of CAPEX will be beneficial for both parties, can decrease the suppliers insecurity about a more flexible payment method. It will be a winning situation for these suppliers as Tieto can afford to pay back to them by creating more attention around these suppliers and create more space for them within the company. As some suppliers are heading towards a more flexible paying method already, there are some that still need a push towards the right direction and get evidence that by creating a closer collaboration can benefit both parties. Tieto can prove that by showing the beneficial factors that they will obtain with Supplier X. Furthermore,

when negotiating with the remaining suppliers, Tieto can afford to decline undesirable suggestions of payment from these suppliers. Tieto will have the power to say no since their relationship with Supplier X can be enough profitable. Therefore, Tieto should seize the opportunity and make changes on the licenses with the remaining suppliers even though they might be not interested in a more SRM based relationship.

7.5 Summary

By focusing on their partnership with Supplier X, Tieto can bring more value and satisfaction for customers that use operating systems from Supplier X. This in turn can create a new market opportunity for Tieto which could lead to a more increased customer base. Furthermore, if Tieto manages to create Japanese–Style partnership (JSP) with Supplier X, then the licensing effect from the remaining suppliers will decrease. The reason is because a JSP will make Tieto benefit from having fewer suppliers to manage licensing with but still get the same or more amount of profit (see figure 13). If Tieto can say no to certain terms pf payment to the remaining suppliers, then these suppliers would be forced to reconsider their payment offer or even consider creating a successful Supplier Relationship Management (SRM) with Tieto as well.

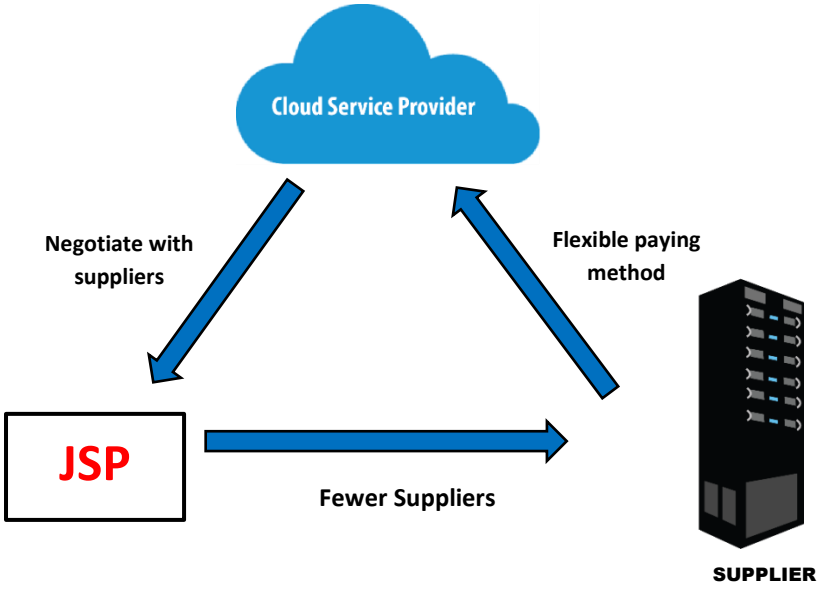

Figure 13. A Japanese-Style Partnership with suppliers that offer flexible paying method, could mean fewer suppliers for the CSP to manage licensing with

8. Managing Software Licenses with the Customer

This chapter will explain Tieto's current relationship with their customers when it comes to their applications with software licenses. Furthermore, the analysis will provide a recommendation on how to minimize the challenge with the responsibilities in the new line extension, TiCC.

8.1 Delegated responsibilities of Software Licenses

There are several reasons why Tieto wants to offer the upper layers as well instead of only providing a PCI DSS standardized product on the IaaS level to their customers. One reason is that some industries that are required to follow the Council's demand has not enough IT-support to manage these applications in an effective way, which means there is need of cloud service provider's (CSP) as Tieto that can manage the applications instead. Another reason is that if Tieto only offers the infrastructure but declines to take care of the customers systems and applications, then the customers can easily walk to their competitors (Business Solution Architect, 2015). Additionally, the main reason is to be able to have the scalability options for the business as it can be too expensive to manage such attribute in an own IT- environment. The survey resulted in that scalability is in fact a very important attribute for the retail industry. Since the retail industry is one of Tieto's biggest customers for product TiCC, scalability is one of the factors that cannot be excluded when a customer outsource their applications. The survey also resulted in that the issue with licensing is mainly between the customer and the CSP since the majority of the customers do not experience any problem with the vendors of the applications.

When a company wants to run their applications on TiCC then some of the responsibilities get transferred from the customer to Tieto. However, a common misunderstanding is that the customer expects Tieto to be responsible of their vendor's software licenses as well. Even though an application runs on Tieto's platform, the PCI DSS responsibility delegation remains. The responsibilities here need to be clarified between the parties in order to minimize the misunderstandings. In iTAP these misunderstandings have been occurring many times which in turn has been affecting the customers businesses in terms of penalty fees. Furthermore, if this misunderstanding continues with TiCC, then the relationship between the customer and Tieto can be affected in a negative way.

A solution for these customers would be to only use Tieto's applications for running their businesses. This would mean no challenges with software licenses at all for Tieto (Head of Cloud, 2015). However, industries may have system and application that already are effective and that the employees are educated to use. In order to change system and applications would mean an extra cost for the customers since there is a need for new tools and educate the staff. In the end, if Tieto only offers this particular solutions that is only their own manageable applications, that would limit the customers need and demands which could result in leaving Tieto for a another CSP.

8.2 Implement a CRM system

In order to address these customers in more effective way to minimize uncertainties and give clearer description of the responsibilities, Tieto should implement Customer Relationship Management (CRM) with an IT- system. An effective CRM-system would help Tieto to create a long term relationship with current and new customers, and deliver them more value in customer satisfaction. This system will give Tieto the accurate picture of each customer that uses TiCC and their licenses

that comes with the outsourced applications. As Tieto will receive more information about each customer, it will help them to serve them individually as each customer has different issues with applications and licenses. The following information should be included in the system when a customer outsources an application:

- Customer's Name
- Type of Application
- Licensing Type
    - User amount
    - Vendor
- Who to notify if amount will be exceeded

These four bullet points will help Tieto to address the customers in a more effective way and increase the customer satisfaction with existing and new customers. When Tieto gets an order for scaling up a certain application, the CRM system will show that the user amount in the licensing agreement is less. An automatic message can be sent to a contact person from the customer's business to notify their vendors. By sending a notification, Tieto will fulfill their part of minimizing the gap of the responsibilities between the two parties. This action will make the customer feel more loyal to Tieto.

In addition, the CRM- system would help Tieto to fulfill the four capabilities of CRM. However, the four capabilities need to be managed further without an IT-system.

8.2.1 Customer Knowledge

Customer knowledge is a crucial fact if Tieto wants to manage the challenge with licensing in a more effective way. The knowledge can be created by using the Pyramid of Knowledge Management Awareness (PKMA) (see figure 14). Creating customer knowledge can benefit Tieto in several ways. One of the beneficial possibilities could be that Tieto learns that there actually are customers that would benefit from replacing an application with one of Tieto's own SaaS solutions. By selling one of their own solutions to the customer will relieve them from the licensing effect. Or maybe that the customer is in need of other services that Tieto can offer.

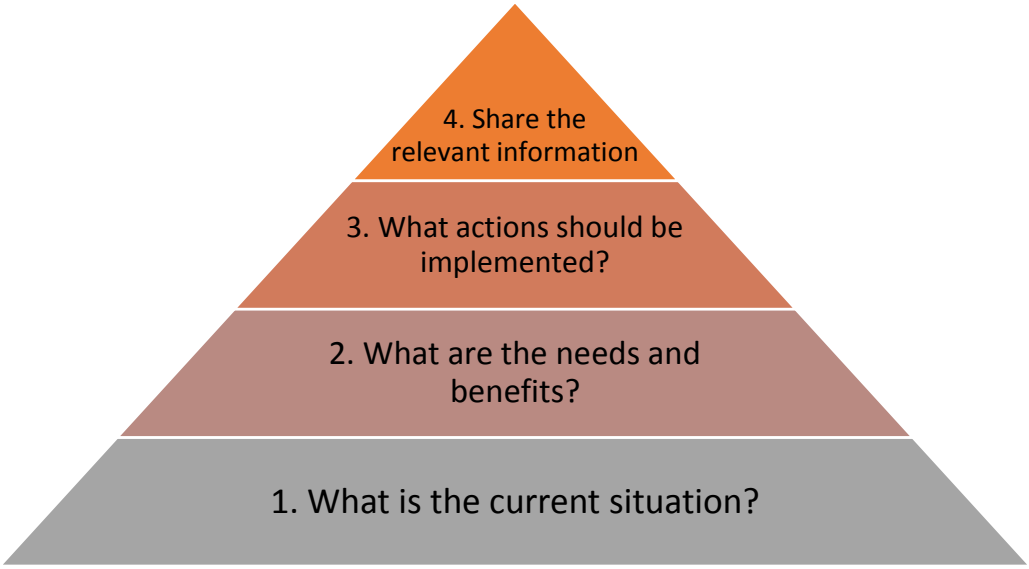

Figure 14. PKMA for customers of TiCC

The first step of PKMA is to analyze the current situation with customers and their applications with licenses. The analyze should include answers to questions such as *"How have we been managing software licensing in iTAP?"* and *"How have the responsibility issues been affecting us?"*. By answering questions like these, the situation with licensing will be minimized as the staff will learn mistakes from the previous product and not make the same mistakes for TiCC. The questions can be answered in various ways, an example is by a questionnaire that should be filled out by the team of iTAP. Furthermore, a questionnaire can be formed for the customer as well in order to gain the customer perspective for iTAP and licensing. The team behind TiCC should be responsible for forming these questions and send it to the iTAP team and its customers. The collected answers can be compared against each other and find obvious patterns. The questionnaire for the customer can include the knowledge they have about PCI DSS and the delegation of responsibilities there as well (see appendix 1).

The second step is to create awareness from the learned mistakes of iTAP. The team of TiCC needs to understand the customers' needs and benefits. Can their application be replaced with one of Tieto's or why do the customer need to scale up more than what is stated on the agreement with vendor? By creating awareness will highlight the way Tieto has been managing the challenge with customers and how it should be changed in a way that benefits Tieto. The awareness should include the high importance of PCI DSS and that every card handling customer needs to follows this framework. The goal with the awareness is that no fees should be paid by the customer.

The third step is to implement action points in order to be able to manage the software licensing in a more efficient way. Such actions could be implementing a reminder of some kind (with or without an IT-system) that will notify the customer if they wish to scale up more than what they have paid the vendor for. Actions can also be that every customer gets a contact person from the TiCC team which will make it easier for both parties to inform each other and keep in touch.

The last step of PKMA is to multiply relevant information and share it. The CRM system should be introduced here and the team should get the acquired training for handling such system. Furthermore, valuable information or knowledge should be shared with the customers as well.

8.2.2 Relationship Strategy

Tieto needs to create a proper relationship strategy with the customers of TiCC in order to develop a long-lasting relationship. If Tieto invest in a relationship where they "listen" and "tell" rather than "sell", the misunderstandings of the responsibilities will minimize. The relationship strategy will be different for customers that are interested in such relationship and for those customers that are not interested in an invested relationship. Tieto needs to be clear about such relationship as it will mainly benefit the customers, as they are the one that needs to pay a fee when a misunderstanding occurs. Also, for those customers where the core business is on something rather than IT, such relationship with the Tieto can be beneficial in terms of having a better insight in licensing and the PCI DSS framework.

Furthermore, Tieto must follow the four "rights" accordingly in order to be able to have a steady CRM between them and the entire customer base. The four "rights" to follow are right customer, offer, channel and time. The four "rights" can be crucial for Tieto for managing the customers and minimizing the gap of the licensing problem between the two parties. Even though the licenses are the customers' responsibility, Tieto will increase the customer loyalty by only reminding them of

looking over the licenses every time they ask for scaling up a certain application. For example the right offer for a certain customer might be a customized product whereas another customer's right offer is a standardized product.

8.2.3 Communication

The Head of cloud expressed on interviews (2015) that the main problem with these customers is on the communication level. Depending on how Tieto communicates with the customer will reflect on the customer satisfaction. Besides the lack of knowledge when it comes to software licensing there is also a hardship in understanding the technical terms of PCI DSS. Especially about how the standard should be followed and how it protects the business and end-consumers (the cardholders).

The communication strategy that should be followed by Tieto in order to address their customers in a more effective way is a lean communication strategy. Implementing lean communication for TiCC will primarily minimize misunderstandings and clarify the responsibilities by highlighting the importance of a good or service without wasting resources. Lean communication will reduce the gap of the problem as the lean strategy will help PCI DSS required industries to learn to communicate in a more effective way. The factors that need to be more highlighted with communication is how to manage software licenses, the basics of PCI DSS, and the roles and responsibilities when managing applications. It is important to choose a communication channel that suits both parties. Furthermore, in the communication part, the team needs to be prepared for team work with customers. The team work will create a more positive relationship between them.

8.2.4 Individual Value Proposition

The individual value proposition will differ from customer to customer. The proposition will depend on how many licenses that is involved and how much the customer is willing to participate in the relationship for understanding the roles and responsibilities. As mentioned above some might need a customization of TiCC whereas other are pleased with the standardized product. Depending on the customer's need, the roles and responsibilities will differ.

8.3 Summary

By creating a CRM – system between the customer and Tieto will benefit both parties as the roles and responsibilities will be clarified of the outsourced application. By approaching a leaner way of communication could be an opportunity for Tieto to teach their customers the conditions when scaling a third party application. The existing customers would get more customer value from the CRM as they would receive a more customized solution depending on the applications and the amount of licenses they own.

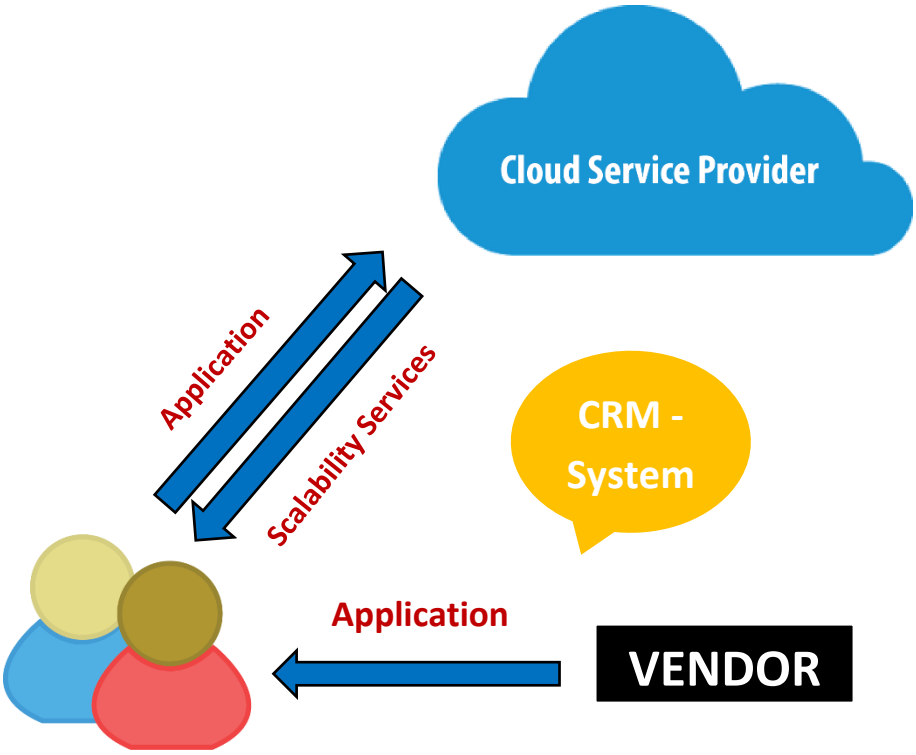

Figure 15. A CRM-system would minimize the misunderstandings when a customer wants to scale up their applications that are outsourced to the CSP

9. Conclusion and Recommendations

Following chapter will summarize the analysis and findings by answering each research questions followed by the main research question.

9.1 Purpose and Research Questions

The objective of the study was to provide an understanding about cloud scalability with software licensing from a cloud service provider's (CSP) perspective. Furthermore, this study was supposed to develop strategies on how the CSP should manage their relationship with the customers and suppliers in the product TiCC, where the customer is able to scale up without violating any licensing agreements. A deeper knowledge was created about the investigated products and the chain of the cloud offering from a supplier to a customer. This was done through interviews and documentations from the company. By analyzing the current situation of the company with relevant parties, the gap with licensing was found.

In order to be able to answer the main research question, it needed to be divided in four different areas. Product, relationship chain, supplier and customers (see figure 16).

Figure 16. The four areas of the sub-research questions

Following research questions was created for this study;

"How did the CSP manage a previous cloud product with software licensing?"

The product iTAP offers a flexible paying method to their customers where the customer is free of scaling up and down depending on how much capacity they need. However, Tieto does not have a flexible method with their suppliers where they can pay for the capacity after the customer's usage. Instead, Tieto needs to buy the maximal amount of licenses upfront from different suppliers in order to always be ready for using extra capacity in the servers when the customers need it. Tieto struggles with predicting the amount of licenses in advance that is needed for customers' scalability. The reason is that the customers' scalability curve varies from week to week. If the customers do not ask for scalability a certain week then Tieto loses in their investment of licenses. If the customer scale up too much, than Tieto needs to provide the needed capacity even if the licensing agreement states less. In that case, Tieto needs to pay penalty fee to the supplier for a broken agreement. Furthermore, as some of customers are required to be Payment Card Industry Data Security Standard (PCI DSS) compliant, Tieto had to create one IT-environment for each customer which was an expensive solution. That is the reason why TiCC was created, a product line extension where every PCI DSS required customer can be put in one environment with a standardized IaaS solution. However, the inflexible paying method for this product line extension remained with some of the suppliers.

"How is the chain of relationship composed from supplier to customer from a CSP's perspective in regards of software licenses?"

For answering this research question, three relationship maps were created, one general and two specifics (see figure 17). The chain of relationship were created from the CSP's perspective in a PCI DSS cloud offering. In a cloud offering there are more than one party involved to give the end customer the cloud service that is expected. Furthermore, the licensing challenge occurs in two different chains of the CSP's relationship. It occurs in one side with the customer and on the other side with the supplier. On the customer side of the challenge, there is also the vendor of the customer that needs to be considered.

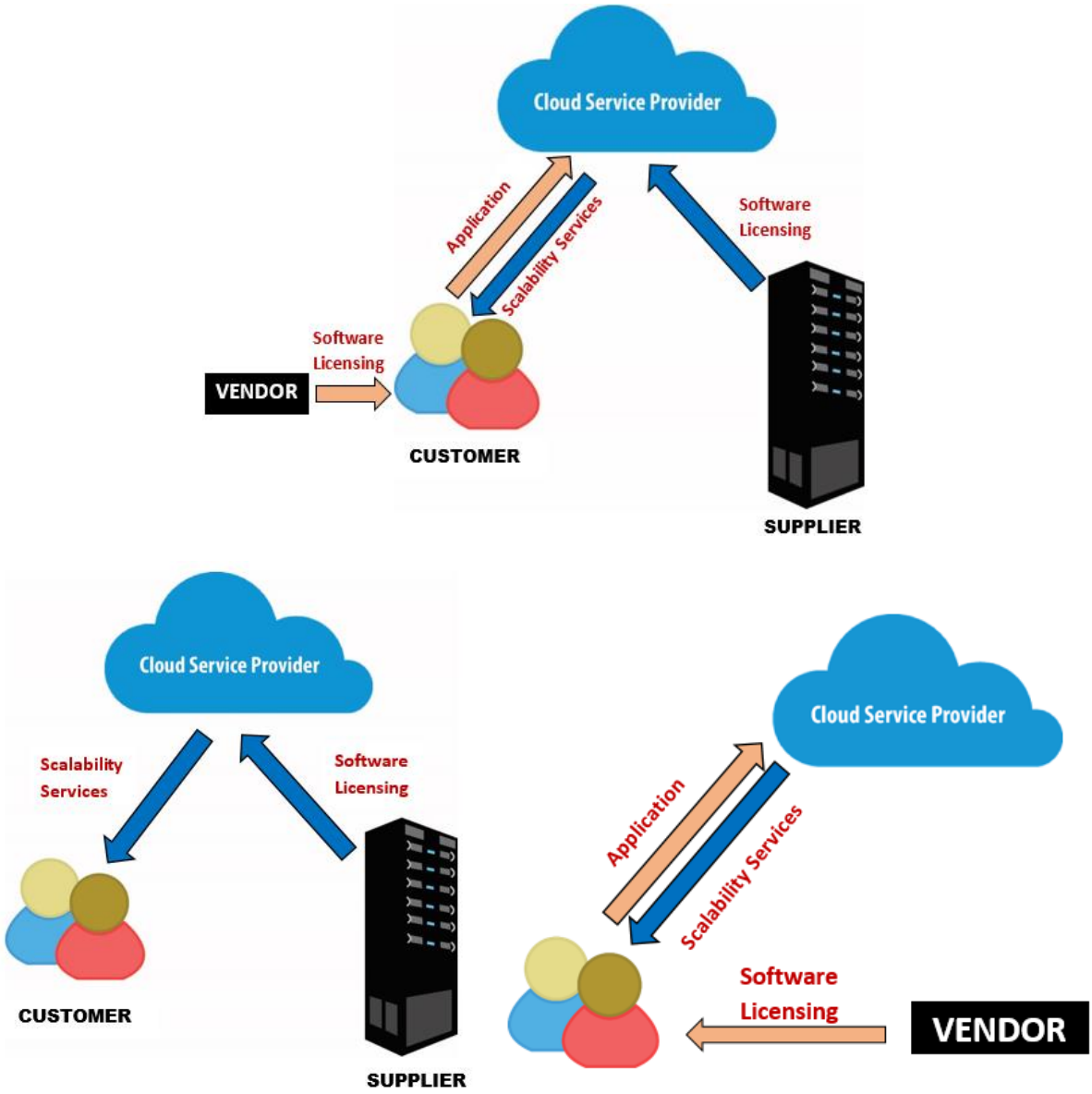

Figure 17. The mapped relationships from a CSP's perspective according to software licenses and scalability. The upper picture represents both of the relationships and the bottom pictures are more specific relationship picture with supplier and customer.

"How can a CSP obtain an agreement with their suppliers to minimize the challenges with software licensing?"

In order to minimize the challenges with licensing, Tieto should focus on their relationship with Supplier X that has offered them a flexible payment method for TiCC. As Tieto's larger PCI DSS required customer base uses the operating system from this particular supplier, there is a market opportunity here to meet the customer needs and demands on a higher level. The recommendation for Tieto is to create a successful Supplier Relationship Management (SRM). This relationship management should be negotiated with Supplier X to create a Japanese-Style partnership (JSP) between them. A JSP would benefit both parties in terms of maximizing the whole chain of cloud offering. As Tieto is an important customer of Supplier X and have a strong market position, there is a certain negotiating power that Tieto have. This advantage makes it easier for Tieto to create such JSP that would lead them to a successful SRM. This in turn would make it easier for Tieto to say no to the remaining suppliers in some terms and push them to more flexible paying method.

"What impact does scalability and software licensing have on the customers of the case study?"

A survey was conducted with 21 participants from retail companies and banks. Both of these industries are required to be certified according to the PCI DSS framework. The survey resulted in two different aspect of cloud computing. First aspect is that scalability is a more important factor for the retailers than the banks. Thus, the retailer's scalability curve is different from day to day but the banks can hold it on a constant level. As retailers are one of TiCC's biggest customer bases, there is no option but strive towards a more flexible payment method from the suppliers. By gaining a more flexible payment method from the suppliers, Tieto can stop buying too much or too less of licenses as the scalability curve cannot be estimated properly for the retail industry. If Tieto cannot provide the ability of scaling whenever the customer wants, then there is a risk that they will switch to another CSP.

The second aspect the survey resulted in is that software licenses between a customer and their vendors do not affect each other negatively or other parties. Thus, the challenge occurs only between the customer and the CSP when the application is outsourced. Even though it is the customer's responsibility to be aware of their own licensing agreement, it somehow falls on the hands of Tieto to be responsible for the licensing as well. As these customers have an inaccurate picture of the responsibility scheme, Tieto needs to tackle this challenge in order to minimize the misunderstanding.

"How could a CSP collaborate with customers without breaking any of their own software licensing agreements?"

In order to avoid breaking any third party licensing, Tieto should implement a Customer Relationship Management system which both parties can benefit from. By having a successful CRM, the customer will in a better way understand the roles and responsibilities when it comes to software licensing. Furthermore, as some industries have their core business on something other than IT, the CRM would be a good system for these customers to understand the implications of software licensing as well as about PCI DSS. Tieto on the other hand would benefit from implementing a CRM-system when communicating with the customer, and contact them as a reminder to notify their vendors when they are about to scale up a certain application. As Tieto is not responsible of notifying the vendors of the applications as many customers expects. Furthermore, if Tieto get a good customer

knowledge of the PCI DSS required customers, than there is chance that Tieto can offer SaaS applications of their own that will meet the customers' needs and demands as well as relieve them from the challenges with software licensing.

9.2 Main Research Question

To be able to answer the main research question, five sub-questions needed to be answered. The main question was following;

"How should a CSP manage the required software licenses for a cloud product when offering scalability to their customers?"

Tieto needs to learn the benefits and consequences from the product iTAP and manage the licenses in a more effective way for the product TiCC. From one side of the problem where the customers of TiCC have the possibility to outsource their applications, Tieto should implement a successful CRM with these customers. On the other side, where Tieto has obtained a more flexible payment method with one of the suppliers, Tieto should implement a successful SRM with this supplier (see figure 18).

On the supplier side, Tieto needs to lead the SRM in terms of negotiation where the supplier needs to understand the benefits of such relationship. Also, SRM can be obtained without any requiring IT-system, as Tieto already have a long history with this particular supplier. Instead they only need to strengthen their bond in form of a more involved partnership. The recommended partnership between these two parties is Japanese-Style partnership (JSP), since this kind of partnership would benefit both parties in terms of maximizing the whole value chain of the cloud offering. By focusing on the particular supplier where the challenge with licenses has been minimized, Tieto can take the opportunity to set an example for the remaining suppliers. As Tieto has a strong market position, the other suppliers would eventually reconsider their inflexible licensing agreement on the negotiation table.

On the customer side Tieto needs to listen and get deeper customer knowledge in order to minimize the misunderstandings between both parties. By implementing an IT-system, Tieto would interact with the customers on a higher level and be able to deliver more suitable solutions that could minimize the challenges with licensing. The gathered information on the system would help Tieto to know more about the customers need and benefits. With the gathered information Tieto can offer a more customized solution. Also, by improving the communication that has been lacking to this point will help Tieto to address these customers in a more effective way.

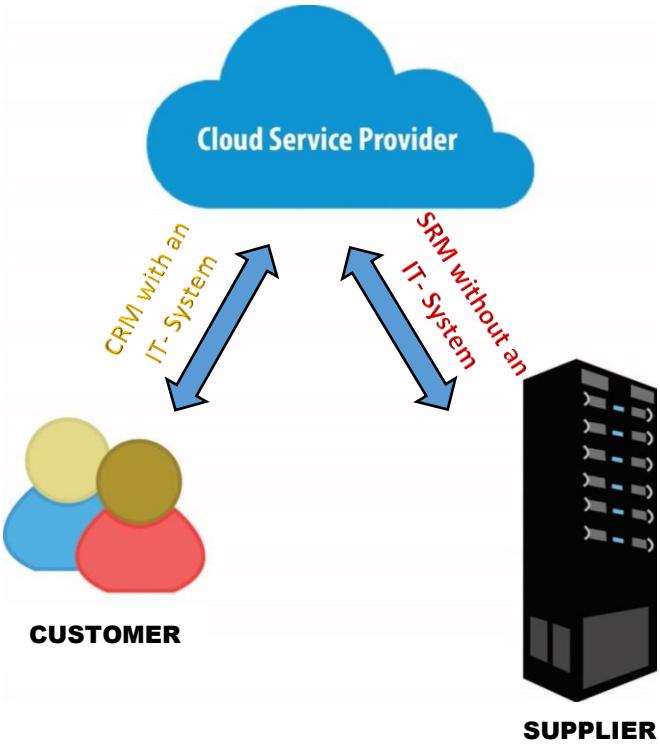

Figure 18. The recommended solution for Tieto in order to minimize the challenges with software licensing from the both sides of the chain

10. Discussion

Following chapter ends this study with general discussion about the research and the sustainability aspect in terms of social, economic and environmental. Limitations and further research of this study is also discussed.

10.1 General Discussion

This research had six questions in total, one main research question and five sub-questions. It is arguable that five sub-questions might be too many for answering the main question, but these questions was needed for investing four different areas of the problem. As the research problem goes from an IT challenge to receiving a solution from the area of industrial management, the sub-questions are mainly for making it easier to the reader for following the investigation.

The problem formulation was to investigate the challenge a cloud service provider (CSP) have with software licenses with their customers and the suppliers. The gap of the problem can be interpreted differently within the company depending on the level of involvement within this particular area. Furthermore, this particular research investigates how the challenge can be minimized from a CSP's stand of point, which also depends on the size of the business and the market position the CSP has. This particular research is suitable for the CPS that have a strong market presence and that customers and suppliers are dependent on. The recommendation is to implement a Customer Relationship Management (CRM) and Supplier Relationship Management (SRM) on the both sides of the relationship chain. However, these chosen methods may not apply to every customer or supplier as some might see the problem from another perspective.

The recommendations were based on how licenses were handled with iTAP and how mistakes can be learned for the product line extension, TiCC and be handled differently. However, the study suggests creating a SRM with one particular supplier in order to be able to set an example for the rest of the suppliers. Just one supplier might not be enough to set an example for a bunch but it can be enough for creating a chain reaction. Creating a more involved partnership can take time and requires more team work. Moreover, some suppliers will need a proof of the promised benefits with a Japanese-Style partnership (JSP).

The reason why Tieto was suggested an IT-System for the CRM is because of Tieto's capability in managing such system. As Tieto operates in more than one area of IT, the company already has suitable CRM-systems that are offered to customers in other departments. By using own resources, there will be no need for investing in an expensive system. Furthermore, by using their own CRM-system, it will be a great way of showing other companies and customers, how effective their SaaS solutions are. However, a problem that might occur when Tieto wants to gather more information about the customer is that the customer might feel uncomfortable with sharing certain data that will be in the system. Furthermore, the acquiring knowledge that the employees in Tieto need about the customer might be boundary crossing for some customers as well. However, Tieto needs to make sure that these customers understand that such system will mainly benefit them as they can be in danger of paying a big fee to the vendors.

A CRM and SRM are recommended to Tieto because of how similar both methods are. As both sides of the chain are equally important, it is easier to implement methods that have similar factors and will be easier for the staff to adapt to. If Tieto succeeds to implement successful CRM and SRM for the product TiCC, the relationship can take these three parties further in terms of collaboration to a

more sustainable solution. The CRM and the SRM can be used for discovering new possibilities between the parties and can be applied to other cloud services. As TiCC is an emerging product, Tieto has the opportunity here to relate to the parties in a different manner that could increase their competitive strength.

The quantitative results of the research consist of 21 collected answers from retail companies and banks. If the quantitative part of the study would have been conducted again where 100 participated then there is a chance that the result would be different. However, as this particular study only highlights the importance of scalability and software licensing, the end result for this research would not have been different. Thus, the quantitative interviews were mainly use for enhancing the value of the statements from the qualitative interviews.

10.2 Implications on Sustainability

The result of the research should is to give suitable solutions to today's society without compromising the future generation (Brundtland, 1987). There are three sustainable implications that should be considered; social, economic and environmental. The economic aspect of sustainability is the long term relationships that Tieto will make with their suppliers and customers. These relationships will give the parties a competitive edge and be profitable on the long term as the licensing fees will be minimized. The social aspect of sustainability was to not create any ethical issues by revealing the identity of participants of the qualitative and quantitative interviews. The supplier that Tieto is recommended to create a SRM with is referred as Supplier X in the research. The environmental aspect of sustainability with TiCC is that the hardware is included when the customer decides to buy the PCI DSS solution from Tieto. The provided hardware in the infrastructure can be switched without any extra cost for Tieto. As Tieto have standardized hardware, the servers can be reused for other customers. Even though, a customer wants to replace a one year old server, Tieto can always take advantage of it in their datacenter instead of throwing it. That is a sustainable advantage with a standardized cloud service.

10.3 Limitations and Further Research

The case study was conducted on the financial department of Tieto on a parent brand and its line extension within PCI DSS. The findings might not be generalized with other cloud products in other departments. A future study can be conducted on generalizability for other products in other departments. Even more, a backward study would be an interesting aspect as well, that is how to apply a SRM or CRM to a cloud product. Due to the time limitation of the case study, the number of conducted interviews was limited. As this study focused on mapping a whole chain of a cloud offering where the involved parties is associated to software licenses, the research did not provide a deeper research on the specific parts of the chain. Studies where either the supplier side or the customer side is focused on would be interesting, since the interviews would only be from one side of the relationship chain and thereby provides more reliability. Furthermore, as this study is for the department of industrial management and information technology, studies on only the IT-aspect of problem would be academically interesting. Thus, software licensing and scalability still are discussable subjects within cloud computing where there are few studies on.

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Appendix 1 – The requirements of PCI DSS

The standard includes twelve requirements for businesses that stores, processes or transmits payment cardholder data. These requirements specify the framework for a secure payments environment. By fulfilling these requirements, the businesses will reach different security goals. The table also represents an example of the responsibilities a customer and CSP in a PCI DSS cloud service.

PCI DSS Requirements	Goals	Responsibility for each level		
		IaaS	PaaS	SaaS
1. Install and maintain a firewall configuration to protect cardholder data	**Build and Maintain a Secure Network**	***Both***	***Both***	***CSP***
2. Do not use vendor-supplied defaults for system passwords and other security parameters		***Both***	***Both***	***CSP***
3. Protect stored cardholder data	**Protect Cardholder Data**	***Both***	***Both***	***CSP***
4. Encrypt transmission of cardholder data across open, public networks		***Client***	***Both***	***CSP***
5. Protect all systems against malware and regularly update anti-virus software or programs	**Maintain a Vulnerability Management Program**	***Client***	***Both***	***CSP***
6. Develop and maintain secure systems and applications		***Both***	***Both***	***Both***
7. Restrict access to cardholder data by business need to know	**Implement Strong Access Control Measures**	***Both***	***Both***	***Both***
8. Identify and authenticate access to system components		***Both***	***Both***	***Both***
9. Restrict physical access to cardholder data		***CSP***	***CSP***	***CSP***
10. Track and monitor all access to network resources and cardholder data	**Regularly Monitor and Test Networks**	***Both***	***Both***	***CSP***
11. Regularly test security systems and processes		***Both***	***Both***	***CSP***
12. Maintain a policy that addresses information security for all personnel	**Maintain an Information Security Policy**	***Both***	***Both***	***Both***

Appendix 2 – Survey in Swedish

Following table represent the set of questions that was formed for the survey that was conducted through telephone. The questions were formulated for companies that handle card data. Note that the questions were formed in Swedish as the research is delimited to Swedish companies. Also, the survey was created alongside a second researcher that investigated within same field. However, only the relevant questions that were used for the analysis will be presented below.

	En enkät om molntjänster och PCI DSS	Svarsalternativ
Fråga 1	**Vilken bransch tillhör företaget du jobbar på?**	Öppen fråga
Fråga 2	**Använder ni molnlösningar?**	Ja/ Nej/ Vet inte
Fråga 3	**Vad använder nu för modell till era molnlösningar?**	Publik/ Privat/ Hybrid
Fråga 4	**Vad är det viktigaste med molntjänster för ert företag?**	Skalbarhet/ Flexibilitet/ Säker lagring/ Kostnadseffektivitet/ Tillgänglighet/ Övrigt
Fråga 5	**Hanterar ni betalningskortdata?**	Ja/ Nej
Fråga 6	**Lagrar ni känslig data som kreditinformation?**	Ja/ Nej
Fråga 7	**Följer ni PCI datasäkerhetsstandarden i dagsläget?**	Ja/ Nej/ Vet inte
Fråga 8	**Hur viktigt är skalbarheten inom korthanteringsdelen som använder molnlösningar för ert företag enligt dig?**	Skala: 1-7
Fråga 9	**Hur nöjda är ni med skalbarheten på de molnlösningar ni använder i dagsläget?**	Öppen fråga
Fråga 10	**Kan man tänka sig att betala mer för en skalbar tjänst?**	Ja/ Nej/ Vet inte
Fråga 11	**Är det viktigt med skräddarsydda lösningar framför standardlösningar vad gäller PCI DSS tjänsten?**	Ja/ Nej/ Vet inte
Fråga 12	**Hur många leverantörer har ni vad gäller PCI DSS kompatibla lösningar?**	Öppen fråga
Fråga 13	**Är ni nöjda med era nuvarande licensavtal med era applikationsförsäljare inom PCI DSS?**	Ja/ Nej
Fråga 14	**Påverkas era molnrelationer på grund av era licensavtal ni har med era applikationsförsäljare?**	Ja/ Nej

Appendix 3 – Survey translated to English

Following table represent the set of questions that was formed for the survey that was conducted through telephone. The questions were formulated for companies that handle card data. Note that the questions were formed in Swedish as the research is delimited to Swedish companies and below table is the translated version for this paper. Also, the survey was created alongside a second researcher that investigated within same field. However, only the relevant questions that were used for the analysis will be presented below.

	A survey about cloud services and PCI DSS	Answer
Question 1	**What industry is your company part of?**	Open Question
Question 2	**Does your company use cloud services?**	Yes/ Don't Know/ No
Question 3	**Which deployment model is used for the cloud services?**	Public/ Private/ Hybrid
Question 4	**What is the most important aspect with cloud services for your company?**	Scalability/ Flexibility/ Secure Storage/ Cost efficiency/ Accessibility/ Other
Question 5	**Does your company handle cardholder data?**	Yes/ No
Question 6	**Does your company store sensitive data such as credential information?**	Yes/ No
Question 7	**Does your company follow the PCI DSS today?**	Yes/ Don't Know/ No
Question 8	**How important is the scalability aspect within the card processing section when using cloud services?**	Scale: 1-7
Question 9	**How satisfied is your company with scalability in your cloud services that is used today?**	Open Question
Question 10	**Would it be considerable to pay more for a cloud service that is more scalable than the service that is used currently?**	Yes/ Don't Know/ No
Question 11	**Is it more important with customized solutions than standardized solutions when it comes to the PCI DSS compatible solutions?**	Yes/ Don't Know/ No
Question 12	**How many suppliers do you have when it comes to the PCI DSS compatible solutions?**	Open Question
Question 13	**Are you satisfied with your current licensing agreements with your vendor of application within PCI DSS?**	Yes/ No
Question 14	**Do your cloud relationships (such as your CSP) get affected because of your licensing agreement with you vendors?**	Yes/ No

Appendix 4 – SRM Questions

SRM Pathway Questions for companies to understand their current status with their suppliers.

SRM Pathway Questions	
1. What is the contribution we need from our supply base and why?	11. Do we have the right relationships with the right suppliers and are we in control of these?
2. Which suppliers are important to us and why?	12. Do we understand and are we in control of all other relationships and interfaces people have with suppliers across our business?
3. How much resource do we need and if we have only so much resource, which suppliers should we direct this at and why?	13. Do we understand our supply chains? Are we maximizing any opportunities to make them more effective?
4. How are our suppliers performing?	14. What innovation do we need from our supply base and how are we going to get it?
5. Are we getting the most from our suppliers and how can we be sure?	15. Which of our important suppliers hold the potential to make a dramatic difference to our business and why?
6. What supplier improvements would make a difference to us and how can we drive these?	16. Are we working collaboratively with those critical suppliers towards jointly agreed goals that will make a dramatic difference?
7. Do we know everything we should know about our suppliers?	17. Are all our efforts with suppliers coordinated and aligned with our corporate goals?
8. Are suppliers meeting their contractual obligations?	18. Is corporate strategy informed by supply chain possibilities?
9. What contracts are due to expire or need to be reviewed in the near term and how are we planning for this?	19. Across our organization does everyone know what is expected of them when working with suppliers?
10. What are the risks with suppliers or back up our supply chains and how is this risk being managed?	20. Do we have capability, structure and processes we need here?