UNIVERSITY OF TURKU

# ABSTRACT

| | |
|---|---|
| | Bachelor´s thesis |
| X | Master´s thesis |
| | Licentiate´s thesis |
| | Doctor´s thesis |

| | | | |
|---|---|---|---|
| Subject | Information Systems Science | Date | 20.9.2018 |
| Author(s) | Miika Rintakoski | Student number | 504758 |
| | | Number of pages | 59 + 1 |
| Title | Software as a service adoption determinants – the role of software asset characteristics | | |
| Supervisor(s) | Matti Mäntymäki | | |


Abstract

Software as a service is constantly gaining market share from traditional on-premise licensing. Despite the trend, cloud application market share is still just about 18 % of total software market. Organizations are continuously evaluating new software alternatives. The selection between SaaS and on-premise solutions is a key decision that organizations need to make when procuring new software. In order to succeed in software procurement decisions, organizations need to develop their own decision-making process and understand the potential opportunities and risks they need to consider in these decisions.

This research addresses these determinants which affect the software as a service adoption decision making. This research is built on existing literature about SaaS adoption. The adoption determinants identified in the literature were used as a basis for semi-structured interviews conducted in IT organizations. This research evaluates whether the adoption determinants found in the literature affect decision-making in the researched organizations and to what degree these adoption determinants vary depending on the procured software asset. Theoretical background combines factors from technological, organizational and environmental elements and combines the asset-specific characteristics into them.

The results of this research show that the asset-specific variance is significant in many technological, organizational and environmental adoption determinants. In addition to those, direct asset-specific determinants were identified. Determinants such as security, existing IT landscape and regulation are evaluated differently depending on the software asset. Even if there were determinants that are treated in a universal manner, each software and its applicability for SaaS deployment needs to be evaluated separately. Conclusion is that organizations need to evaluate their SaaS adoption comprehensively from technological, organizational and environmental aspects. General high-level principles can be set for the SaaS adoption as long as each asset and its characteristics are still considered individually.



| | |
|---|---|
| Key words | Software as a service, cloud software, IT adoption, determinants |
| Further information | |

TURUN YLIOPISTO

# TIIVISTELMÄ

| | |
|---|---|
| | Kandidaatintutkielma |
| X | Pro gradu -tutkielma |
| | Lisensiaatintutkielma |
| | Väitöskirja |

| | | | |
|---|---|---|---|
| Oppiaine | Tietojärjestelmätiede | Päivämäärä | 20.9.2018 |
| Tekijä(t) | Miika Rintakoski | Matrikkelinumero | 504758 |
| | | Sivumäärä | 59 + 1 |
| Otsikko | Pilviohjelmistojen käyttöönottoon vaikuttavat tekijät – ohjelmiston erityispiirteiden merkitys | | |
| Ohjaaja(t) | Matti Mäntymäki | | |


Tiivistelmä

Pilviohjelmistot valtaavat jatkuvasti markkinoita perinteisiltä paikallisesti asennettavilta ohjelmistoilta. Kasvavasta trendistä huolimatta, pilviohjelmistoihin markkinaosuus on edelleen vain noin 18 % koko ohjelmistomarkkinan koosta. Organisaatiot tekevät jatkuvasti päätöksiä uusien ohjelmistojen hankinnasta ja vaihtoehdoista. Valinta pilviratkaisun ja paikallisesti asennettavan sovelluksen välillä on oleellinen osa hankintaa ja siihen liittyvää päätöksentekoprosessia. Jotta hankintapäätökset onnistuvat, organisaatioiden tulee kehittää omaa päätöksentekoprosessiaan sekä ymmärtää mahdollisuudet ja riskit, joita näihin päätöksiin liittyy.

Tässä tutkimuksessa perehdytään pilviohjelmistojen käyttöönottoon vaikuttaviin tekijöihin. Tutkimus rakentuu aiemman, tämän tutkimusalueen kirjallisuuden varaan. Aiemmasta tieteellisestä kirjallisuudesta poimittuja käyttöönottoon vaikuttavia tekijöitä käytettiin pohjana teemahaastatteluissa, joita tehtiin yritysten IT-organisaatioissa. Tässä tutkimuksessa arvioitiin, kuinka merkittäviä kirjallisuudesta löydetyt käyttöönottoon vaikuttavat tekijät olivat tutkituissa organisaatioissa. Erityisesti huomio keskitettiin siihen, miten ohjelmistokohtaiset erityispiirteet vaikuttavat näihin tekijöihin. Teoreettinen tausta yhdistää teknologiasta, yrityksen sisältä ja toimintaympäristöstä kumpuavia tekijöitä yksittäisten ohjelmistojen erityispiirteisiin.

Tämän tutkimuksen tulokset osoittavat että ohjelmistojen erityispiirteet vaikuttavat merkittävästi niin teknologisiin kuin yrityksen sisäisiin ja toimintaympäristöstä johtuviin käyttöönottoon vaikuttaviin tekijöihin. Näiden lisäksi havaittiin myös selviä yksittäisiä ohjelmistoihin liittyviä kriteereitä. Hankintapäätökseen vaikuttavat tekijät, kuten tietoturva, aiemmin hankitut sovellukset sekä lainsäädäntö ovat esimerkkejä kriteereistä, joihin ohjelmistojen erityispiirteet vaikuttavat. Vaikka osa tekijöistä oli näistä piirteistä riippumattomia, havaittiin, että jokainen ohjelmistohankinta on yksilöllinen. Vaikka kaikkia pilviohjelmistohankintoja koskevia yleisiä tekijöitä löytyi, pitää hankintoja arvioida eri kriteerein ohjelmistosta riippuen. Yhteenvetona voidaan todeta, että organisaatioiden tulee arvioida omaa pilvisovellusten käyttöönottoa kokonaisvaltaisesti teknologisesta, organisaation sisäisestä sekä toimintaympäristön näkökulmasta. Yleisiä pääperiaatteita pilviohjelmistojen hankinnoille voidaan asettaa, kunhan jokainen hankittava ohjelmisto kuitenkin arvioidaan sen omat erityispiirteet huomioiden.



| | |
|---|---|
| Asiasanat | pilvipalvelu, pilviohjelmisto, IT käyttöönotto, päätöksenteko |
| Muita tietoja | |

Turun yliopisto
University of Turku

# SOFTWARE AS A SERVICE ADOPTION DETERMINANTS – THE ROLE OF SOFTWARE ASSET CHARACTERISTICS

Master´s Thesis
in Information Systems Science

Author:
Miika Rintakoski

Supervisor:
Matti Mäntymäki

20.9.2018
Turku

Turun kauppakorkeakoulu • Turku School of Economics

## Table of contents

## List of figures



## List of tables

# 1 INTRODUCTION

## 1.1 Research area

Cloud computing refers to a computing paradigm which makes it possible for users to access shared on-demand computing resources temporarily over the network. (Mell & Grance, 2011, 2) When the accessed resource is software, terms cloud application and software as a service (SaaS in short) are used. Cloud computing and software delivery via cloud have been hyped for around a decade. It made its first appearance in the Gartner Hype Cycle for Emerging Technologies in 2008. Since then, there has been a lot of discussion about the expected benefits, opportunities and risks that software as a service could introduce to the enterprise computing. Figure 1 displays, how the interest towards cloud computing topic has changed over the years according to Google Trends. Marketing material has focused on SaaS benefits such as scalability, reliability and cost-effectiveness. Many of the benefits seem especially attractive to small businesses which do not have the required resources to maintain comprehensive IT application landscape themselves. Investments in information technology require careful evaluation of the costs and gains. In order for cloud computing to grow, it needs to address the expectations and concerns of the enterprises.

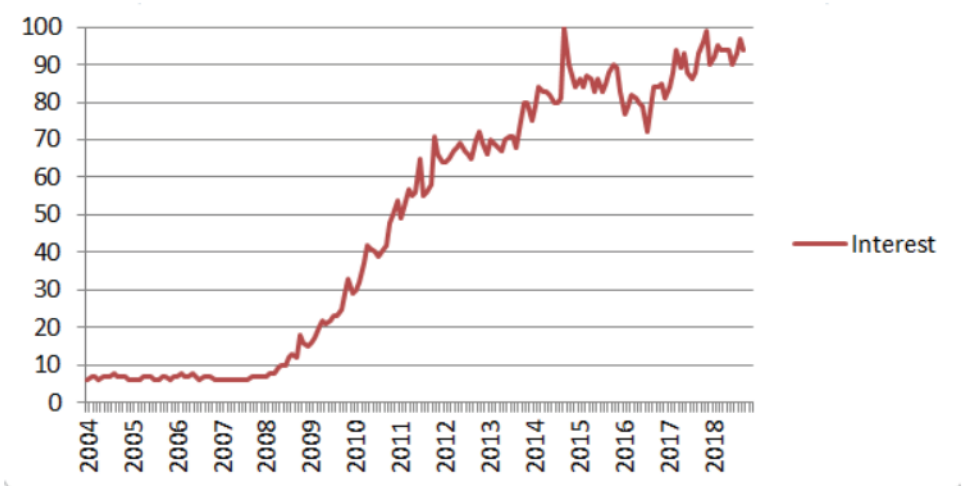


**Figure 1 - Interest towards topic Cloud Computing (Google Trends, 14.9.2018)**

The worldwide IT market size is expected to grow at around 6,2 % during the year 2018. According to Gartner, the IT market size will remain at around $3,7 trillion. Software market is expected to grow slightly. With $352 billion software spending in the 2017, the software market growth totaled 8,8 %. Software market size is expected to grow 11,1 % during the year 2018 and thus to reach the total of $391 billion. In the

meantime, cloud software market is growing faster than the overall software market. In the 2017, software as a service market size totaled $60,2 billion. With the expected yearly growth of 22,2 % in 2018, the SaaS market size would equal $73,6 billion (Moore & Meulen 2018.) Already in the 2016, the revenue generated from new on-premise licenses was declining at least within the CRM segment (Meulen & Woods 2016). In the 2019, the market size of cloud application services is expected to reach $87,2 billion (Moore & Meulen 2018). This equals a yearly growth of 15,6 %. Thus, SaaS market is growing with double rate in comparison to overall software market. (Meulen & Bamiduro 2018)

According to the statistics above, it is evident that the cloud application services are gaining market share from the more traditional on-premise licensing. Despite the trend and the significant amount of expected and perceived benefits, only 17,1 % of the software spending was used on the cloud applications during 2017. In the 2018, the same ratio is expected to be 18,8 %. Enterprises are still investing heavily on software that is not hosted in the cloud. The cloud switch is proceeding at a relatively slow pace. Nevertheless, there are many enterprises which have gone through a deployment of a cloud application. Thus, enterprises are becoming more and more aware of the actual possibilities and realized benefits as well as drawbacks related to the cloud software adoption.

The determinants affecting SaaS adoption are of interest to mainly software vendors and possible cloud software adopters (Schneider & Sunyaev 2016, 17). The use of cloud needs to be considered in the sourcing and procurement processes (Schneider & Sunyaev 2016, 1). Cloud software vendors need to be aware of the clients' concerns in order to make their software better fit for client's requirements. If the cloud application provider is able to better address customers' needs, both existing and future clients benefit. In order to succeed, the cloud software vendor should understand the determinants affecting their prospect's SaaS adoption. In the other hand, possible cloud software adopters can use the knowledge regarding other enterprises' determinants. IT sourcing decision can have significant strategic and financial impact and thus, decision makers should take into consideration several potential risks and benefits which may result from their decision (Benlian & Hess 2011 232-233; Schneider & Sunyaev 2016, 1). With proper knowledge, they can assess their cloud readiness and the suitability of available SaaS options. Decent level of knowledge cannot be acquired by a single person. The adoption decision is made jointly by several employees' collaboration. Comprehensive view of the common adoption determinants makes it easier to identify challenges related to cloud application adoption.

Finland is among the top cloud adopters in terms of percentage of enterprises using cloud services. In December 2016, 57 % of Finnish enterprises used cloud services while the overall cloud service usage in EU was 21 % (Giannakouris & Smihily 2016). These figures indicate that Finnish enterprises have been able to gather a decent amount

of experience in the field of cloud software. Thus, enterprises operating in Finland seem to be a suitable target for researching Software as a Service adoption. In the existing literature, it has been noted that client firm characteristics have an effect on the cloud adoption. Due to their special characteristics (mainly resources available for IT activities), small businesses have gained attention. In addition to size, client characteristics such as industry and internal IT capabilities affect cloud service adoption. (Schneider & Sunyaev 2016, 11-12.) The IT functions of the companies have influence on the IT investment decision-making. IT functions tend to have large variety of skills varying from procurement related capabilities to software engineering and maintenance. By definition, IT functions have sufficient IT capabilities. Their knowledge and skills would allow them to implement software and maintain their own applications on their own on-premise servers. Additionally, IT organizations should be aware of the recent trends and developments within their own industry. They should be able to make a distinction between unimportant hype and the real value of information technology trends. These characteristics make IT functions an interesting target group for cloud applications. From the resource and knowledge point of view, capable IT functions should have most (if not all) options open when it comes to information technology. Thus, the focus of this research will be on the SaaS adoption determinants in the context of IT organizations.

## 1.2 Research gap

Cloud computing overall and more specifically software as a service has been researched quite a lot during the last decade (see e.g. Wang et. al. 2016). The research ranges from highly technical details to the more business-oriented aspects. As cloud applications have gained more ground in practice, the adoption aspects of SaaS have received more attention. SaaS adoption has been studied with both quantitative and qualitative research (Schneider & Sunyaev 2016, 6). The goal has been to identify determinants affecting the SaaS adoption in various kinds of enterprises.

The benefits of cloud for small businesses have received extensive attention in marketing material. Special characteristics of small and medium sized enterprises has made them an attractive target for research as well (e.g. Gupta et. al. 2013). The relationship between cloud adoption and the size of the client enterprise has been studied frequently in academic research. However, there is considerable variance in the results. Some of the studies report significant positive relationship between cloud adoption and software firm size where as some studies indicate significant negative relationship between the two. (Schneider & Sunyaev 2016, 12)

Additionally, the research has noted that specific application types have different determinants when it comes to SaaS adoption (e.g., Benlian et. al. 2009). Industry-related aspects and internal IT-capabilities have received some attention as well. In summary, earlier research suggests that there are several determinants that affect SaaS adoption. The earlier research has focused only lightly on the asset-specific adoption determinants. The asset-specific here refers to the characteristics of each individual software. Additionally, employees in different roles view information technology and software differently. They tend to value different aspects of IT. Thus, the effect of SaaS on enterprise computing can be seen very differently in the decision-making depending on the decision maker. To form a holistic view of the IT function, this individual view needs to be considered from several different positions. The software as a service adoption research has usually focused on getting several organizations into the researches even though this usually means that there is only one participant from each organization. This approach tends to give quite a lot of importance to the opinions and experiences of this individual, and not to the organization as a whole. Thus, there is a demand for research which considers broader view of a whole IT organization on SaaS adoption. This research aims to cover that gap by broadening the view to these organizations by including employees from different roles. The emphasis will be on the asset-specific characteristics of the SaaS adoption. To address this gap, this research gathers the views from different IT roles to answer the following questions:

- *What software as a service adoption determinants are seen valuable in IT organizations?*
- *How do the characteristics of individual software assets affect these determinants?*

To answer this question, both agreements and disagreements between different individuals should be considered and the reasoning behind them should be evaluated. To understand the importance of the characteristics of individual software assets, both asset related and universal determinants need to be considered.

# 2 LITERATURE REVIEW

## 2.1 Literature review aims and methods

In research projects, a literature review is conducted to examine existing research in the field of given topic. It builds on top of past knowledge. The goal is to summarize what is already known about the topic, what concepts have been identified, what frameworks have been used, what important findings have been made and what areas of the field have not yet been studied. In literature review, key academic books and journals contributing to the domain of interest should identified. The literature review should focus on the goal of the research, thus excluding literature that does not contribute to it. (Maylor 2005, 113; Rowe 2014, 242-243)

The aim of this literature review is to systematically find and evaluate prior research regarding determinants of SaaS adoption. Comprehensive understanding of the adoption drivers makes a major contribution to the field study. Thus, identified SaaS adoption determinants are gathered from existing literature. They are then classified and described in more detail. Research question for the literature review could be formulated in following way (Fink 2005, 4). Which determinants affect organizations decisions to adopt software as a service, and why?

To assess the adoption determinants related to SaaS adoption decisions, one needs to be familiar with the concept of software as a service. Since SaaS is a part of larger concept of cloud computing, it is reasonable to cover it and related concepts briefly. Since cloud software is a form of information technology outsourcing, it is sufficient to summarize the IT outsourcing phenomena shortly if the connection to cloud computing is evident (Schneider & Sunyaev 2016, 1). Thus, some background related to the development from IT outsourcing and especially application service provisioning to cloud computing and SaaS is presented.

The source selection is one of the key phases of the literature collection (Fink 2005, 4). Searching through virtual libraries and reference databases is time-efficient and the most used method for gathering literature in nowadays (Fisher 2010, 97). To support the gathering of SaaS adoption literature, the search was started with two reference databases. The aim was to gather SaaS adoption publications comprehensively. Since software as a service has received much attention within the last ten years, the search with only the keyword “SaaS” in topic resulted in over 1800 publications in Web of Science. Large number of the results examined technical aspects of the SaaS such as multitenancy, resource allocation and technical privacy concerns. Even though they are important topics, they do not contribute to the research of SaaS adoption. Thus, only a small fraction of the results were worth concentrating on (Fisher 2010, 102). Since there were far

more publications than could be reasonably dealt with, adjustments were required to the keywords in order to identify the key publications (Fisher 2010, 100).

Selection of keywords has significant effect on the research results (Rowe 2014, 247). The reason for using “SaaS” instead of “cloud” or “cloud computing” was to limit the number of unrelated literature. Cloud as a concept has other meanings and thus, it will attract unwanted results from completely other unrelated areas of research (e.g. weather). In the other hand, “cloud computing” tends to include other areas of on-demand computing in addition to the software. Since the focus of this research is in software as a service, the use of “cloud computing” would result in too broad scope. The determinants and results of software as a service adoption vary between different forms of cloud computing, and thus they should be examined in isolation (Wang et. al. 2016, 43). The keyword “adoption” was included in the search to reduce the number of publications focusing on other aspects of cloud software.

By the end of September 2016, search in the Scopus database for “SaaS adoption” in title, abstract or keywords resulted in 226 articles and conference papers. When the Web of Science database was searched for “SaaS adoption” in topic, a total of 139 articles and conference papers were identified. When the results were combined and duplicates were removed, a total of 269 distinct publications were found. Since the access to the publication is required to properly analyze the content, full-text availability was used as a practical screening criterion (Fink 2005, 5). Topic and abstracts were also used as a filter since only part of the publications were relevant and value-adding to the research on SaaS adoption. Usually publication year is a relevant criterion in literature reviews (Rowe 2014, 247). Software as a service is quite a new concept and most of the literature has been written within the last ten years. Thus, there was no old publications to be filtered out. As a result, total of 62 papers were found with the keyword search to be applicable for the literature review about SaaS adoption determinants. The cumulative amount of SaaS adoption publication from Web of Science is presented below in figure 1. One can see from the figure that the SaaS adoption began to gain interest in academic literature from 2007 onwards. The amount of publications has increased significantly within the last few years.

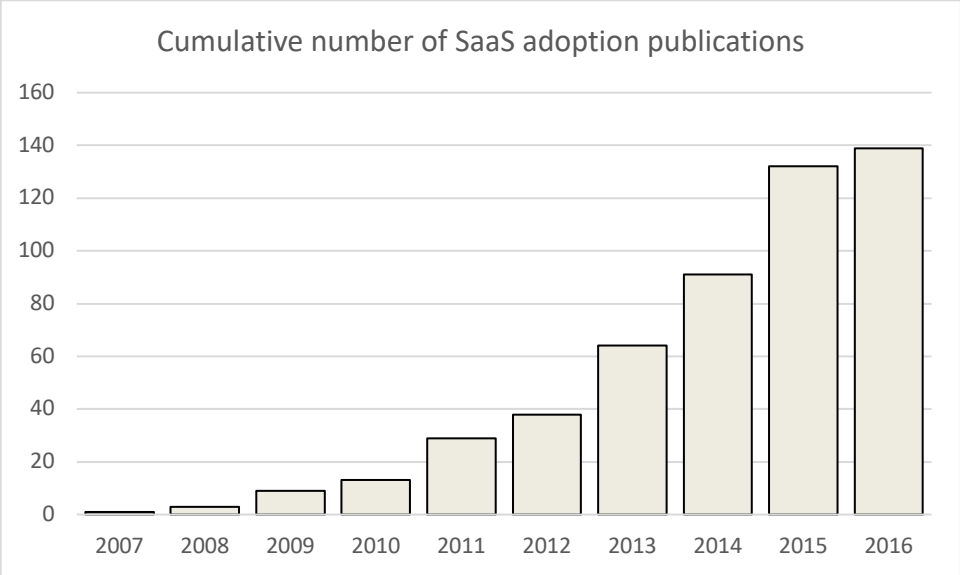


Figure 2 - Publications with SaaS adoption in topic (Web of Science 29.9.2016)

Ten out of the identified 62 publications appeared in either Senior Scholars' Basket of Journals by Association for Information Systems (Senior Scholars' Basket of Journals) or level A or level B journals of information systems journal ranking list developed by Fisher et. al. (2007). Since it is likely that the major publications lie in the top academic journals, these ten articles serve as a starting point for the literature review (Webster 2002, 16; Mäntymäki 2011, 36). Since it is possible that some key publications are missed with a keyword based search, the journals in Senior Scholars' Basket of Journals were scanned systematically for additional relevant articles (Webster & Watson 2002, 16). These included journals were (1) *European Journal of Information Systems*, (2) *Information Systems Journal*, (3) *Information Systems Research*, (4) *Journal of the Association for Information Systems*, (5) *Journal of Information Technology*, (6) *Journal of Management Information Systems*, (7) *Journal of Strategic Information Systems* and (8) *MIS Quarterly*. The articles published since 2007 were considered in the review. As a result, 5 additional relevant publications were identified.

As a last step in material gathering, an egocentric search was used to identify other key literature in the area (Maylor & Blackmon 2005, 114). The search was conducted for the 15 core publications identified in earlier stages. The goal was to identify the literature which has affected the key works on the field and thus, to provide a relatively comprehensive overview of the relevant literature. (Webster & Watson 2002, 16). Even though it is not possible to identify and cover all of the relevant literature, it is not that significant defect in this literature review (Webster & Watson 2002, 16). In the end, the aim is to provide theoretical understanding of the topic to a good extent (Rowe 2014, 251).

## 2.2 Cloud computing and software as a service

Cloud computing refers to a computing paradigm in which users can access computing resources on-demand temporarily over the network. Computing is delivered as a service rather than a product. Computing has become a ubiquitous utility which can be accessed via the Internet (Wang et. al. 2016, 35). Resources provided can be categorized into virtualized hardware infrastructure, development software environments and applications. Cloud services typically contain both physical and software resources. The resources are generally shared among all users. Service providers and consumers may be located in different countries or even continents (Gupta et. al. 2013, 861). Consumers are not aware of the exact location of the service even if they may have high-level control of the location. There can be a pay-per-use type of fee for using cloud resources. According to Mell & Grance (2011), cloud services share five essential characteristics: (1) on-demand self-service, (2) broad network access, (3) resource pooling, (4) rapid elasticity and (5) measured service. (Youseff et. al. 2008, 3-5; Mell & Grance 2011, 2; Schneider & Sunyaev 2016, 2)

The on-demand self-service characteristic means that there is typically very little service provider interaction required when the consumer wants to provision cloud computing services. Consumer can scale its capability usage or subscriptions up or down through self-service portals or APIs without the need to contact service personnel. Only a minimum management effort is required. (Mell & Grance 2011, 2)

Cloud services can be accessed from practically anywhere if the user has proper network access. Since the cloud computing capabilities are accessed via the Internet, their users are highly dependent on that network access. The term cloud has its probable origin in the illustrations and symbols of complex remote environments used in IT literature (Sultan 2010, 110). Practically any device with Internet access and suitable software (typically a web browser) can be used to access the cloud service. The devices vary from thin clients such as mobile phones to thick clients such as desktop workstations. (Mell & Grance 2011, 2)

Cloud computing resources are pooled. This means that the same resources are shared among multiple consumes in a multi-tenant model. The pooled resources include processing power, storage, memory and network. Customer demand affects the allocation of physical and virtual computing resources. Since there are no customer-dedicated resources, the resources can be reassigned elastically and rapidly. Computing power can be scaled up when the demand is higher and scaled back down when the load is lower. This can be done either automatically or by a self-service action taken by customer. To the consumer of the service, there appears to be no limits of the available resources. When the customer’s load is high, more resources are dynamically assigned for that

task. Resources are allocated to other tasks or customers, when the load gets back to steady state. (Armbrust et. al. 2010, 54; Mell & Grance 2011, 2)

To enable transparency of the cloud service usage, the service providers generally offer measurement and statistics to their consumers. Both customer and provider can monitor the service utilization. There can also be some built-in resource optimization and control which use the same metering for adjustment purposes. System type affects the suitability of different metrics. For example, number of users, storage, processing and network usage can be suitable metrics. (Mell & Grance 2011, 2)

Cloud computing is a developed way to outsource information technology. In IT outsourcing, external vendors provide IT resources to the client company's IT infrastructure. This view applies to cloud computing as well. However, the on-demand self-service nature of nature of cloud, also changes the way companies can use IT outsourcing. Some of the benefits and challenges remain the same whereas some of them have evolved. (Schneider & Sunyaev 2016, 3)

The provision of software services via Internet is not a new practice. Already in the 1990s, there were companies which provided software programs via the Internet. This application service provision (ASP) model was an alternative for the traditional on-premise application delivery. The service provider hosted the application and data in its remote data center. The client rented packaged software and accessed it with Internet connection. Few technical limitations resulted in a low popularity of the ASPs. Internet speeds were significantly lower in the 1990s. This ensured that on-premise applications were far more responsive and convenient for the users. The architecture of the ASP was also significantly different. The IT infrastructure did not support the multi-tenant model of SaaS. Instead, each customer was allocated its own hardware and software code. This reduced the feasibility of ASP from service providers' perspectives. Most of the work remained in the hands of the provider and there were very little cost advantages achieved due to the single-tenant architecture. The number of software solutions suitable for ASP was also limited. At that time, it was seldom the case that software was designed to be accessed remotely. (Sultan 2010, 109; Benlian & Hess 2011, 232-233)

Few main technological developments enabled the emergence of cloud computing: cheaper and faster Internet, improved computing power, virtualization, and service-oriented architecture. The communication network speed and bandwidth was a major limitation for ASP. When the World Wide Web started to become popular in 1993, the communication speeds were limited to 56 kbps. By the end of 2016, it was possible for regular consumers to get 1000 Mbps (or 1 000 000 kbps) connections at reasonable price in some countries (Google Fiber). This growth in Internet speed has enabled many applications. For example, social media and video streaming would not be practical applications if the internet speeds were slow. The same applies to cloud computing. High speed and reliable communications have enabled the deployment of applications and

computing resources over the internet on demand. As stated above, ASP suffered from the non-remote nature of applications. Service-oriented architecture and web services changed this. With the development of web services, the applications became exposed to other applications around them. Additionally, applications have been developed with service-orientation in mind. (Sultan 2010, 109; Böhm et. al. 2011, 33; Eha 2013)

The processing power has increased dramatically in recent decades. The 1960s and 1970s were dominated with mainframe computing in which the computing resources were centralized. The computing resources were used with terminals which were capable of basic input and output functions. The developments in information technology enabled computing power to be packed to smaller and cheaper packages. This made it possible for home computers and personal computers to gain foothold. This development has kept up, making devices smaller and more powerful. Smartphones are examples of the results of this development. Recently, the centralized computing power has again gained foothold. Data centers have been built to low-cost locations to take advantage of economies of scale. These resources are virtualized to provide scalability and create an image of infinite capacity. With high-speed networks, the computing power of centralized data centers can be made available to practically anyone and anywhere. (Armbrust et. al. 2010, 52, Böhm et. al. 2011, 33)

Software as a service addresses many concerns and limitations of ASP. The architecture has swithced from single-tenant to multi-tenant architecture. Thus, service-providers can exploit economies of scale by sharing application code and infrastructure resources with multiple customers. Shared code limits the number of customizations which can be made to the application. Unlike ASPs, cloud applications are built with remote access in mind. Many cloud applications have an API (application programming interface), which can be used to integrate into the system. SaaS has inherited many properties from application service provisioning. Basic benefits, opportunities, risks and challenges are same to a degree. However, properties like self-service nature and short-term scalability make these two application delivery models different in terms of benefits and challenges. (Sultan 2010, 110; Benlian & Hess 2011, 233; Schneider & Sunyaev 2016, 3)

In most common classifications, three type of cloud services are identified: (1) virtualized hardware infrastructure, (2) development platforms and (3) applications. Hardware infrastructure provided via cloud is usually referred to as infrastructure as a service or IaaS for short. The development platforms are called platform as a service or PaaS. Cloud applications are referred to as SaaS or software as a service. (Mell & Grance 2011, 2-3)

Infrastructure as a service typically lies at the bottom of the cloud stack. It provides essential resources to the PaaS and SaaS layer. The infrastructure provided generally refers to computational resources, data storage or communication resources physically

located in remote data center. Instead of providing dedicated hardware to consumers, IaaS providers usually use virtual machines. It is simpler from the management perspective since the provider can give their consumers full control over the virtual resources without compromising the physical resources at the data center. Full control is desirable property for the consumers since it will improve the usability of the cloud service. Client can select their operating systems, install arbitrary applications and usually even configure firewalls in their IaaS instances. Data storage is also an infrastructure service provided via cloud. Data is stored on a remote disk and can be accessed from anywhere anytime. Characteristics of cloud-based data storage include high availability, reliability through redundancy and high performance. Since the cloud infrastructure is accessed via Internet, sufficient communication resources are required to successfully operate. Examples of cloud infrastructure services include Amazon EC2 (Amazon EC2) and Rackspace cloud servers (Why Rackspace?). (Youseff et. al. 2008, 5; Mell & Grance 2011, 3; Gupta et. al. 2013, 863)

Platform as a service is typically deployed on top of IaaS but can also be managed on top of physical hardware. PaaS allows consumers to deploy custom or standard applications to cloud. Typical customers of PaaS are software developers. Cloud platform provides support for certain programming languages, databases, middleware and libraries which are utilized by the applications. The platform provides an API which the application can use to communicate with the resources such as database. The consumer is allowed to configure the application-hosting environment but has no control over the underlying infrastructure or operating systems. Generally, the benefits of PaaS include automatic scaling, load balancing and the additional services provided by the service provider. Developers can reduce time-to-market by skipping the operating system level configuration. Complexity of development and deployment is reduced (Martson et. al. 2011, 178). Examples of cloud platform services include Force.com (Build better apps with Force.com), Heroku (The Heroku Platform) and Microsoft Azure (Azure solutions). (Youseff et. al. 2008, 5; Mell & Grance 2011, 2-3; Gupta et. al. 2013, 863)

Most enterprises and consumers face the application level of the cloud, SaaS. User accesses software via a web browser or thin client software (Martson et. al. 2011, 178). Practically any applications can be deployed via cloud. For example, office suites, customer relationship management and enterprise resource planning software can be provided via cloud. The usage-based pricing model can reduce the entry barriers and allows companies with fewer resources get access to new functionality. Companies can use cloud to outsource applications which would be too costly or too time-consuming to maintain by themselves. (Goode et. al. 2015, 74). The cloud applications reduce the computation power required by the client machine. Most of the computational work is shifted from clients' devices to the data center. This enables the usage of thin clients such as mobile devices. Consumers do not need to worry about upgrading or mainte-

nance. These are responsibilities of the service provider. Service provider can deploy features and fixes to the application without any client interaction. Customer has no control over the underlying infrastructure. Client can modify application configuration in a way that is only visible for the client itself. Examples of cloud applications include GSuite office applications (GSuite) and CRM by Salesforce.com (Sales Cloud). (Youseff et. al. 2008, 3; Mell & Grance 2011, 2; Gupta et. al. 2013, 863)

Cloud services can be operated with four different deployment models: (1) public clouds, (2) private clouds, (3) community clouds and (4) hybrid cloud. The most common delivery model is the public cloud. In public clouds, the service is operated and owned by a third party and it is hosted in the premises of provider. It is available for access by anyone in the general public with internet access. The public cloud consumer has typically very little control over security or regulatory compliance, but it usually provides more benefits in terms of cost savings and scalability than other cloud delivery models. (Mell & Grance 2011, 3; Schneider & Sunyaev 2016, 3)

The private cloud is on the other extreme of cloud infrastructure delivery models. The services provided in private cloud can only one be accessed by a single organization. Thus there is no general access available. Private cloud can be operated by the consumer organization or a third party. Consumer and third party can also operate it jointly. Physically it can be located in the premises of the consumer or third party. It is more difficult to get economic benefits with private cloud due to the lack of economies of scale. In the other hand, the organization has more control over the security and regulatory compliance. (Mell & Grance 2011, 3; Schneider & Sunyaev 2016, 3)

If community of users or organizations share certain cloud services that are not available to the general public, the deployment model is called community cloud. The community shares certain interests or requirements in common. (Gupta et. al. 2013, 863) Community cloud is operated and controlled by one or multiple members of the community. A third party could also be responsible for operating it. The scalability and economic benefits increase when there are multiple users of the cloud in comparison to private cloud. Additionally, community members have control over the security and regulatory compliance of the deployment. Security requirements could be one reason for the formation of the community. Overall, the benefits and drawbacks of community cloud fall in between the public and private cloud. (Mell & Grance 2011, 3; Schneider & Sunyaev 2016, 3)

Hybrid cloud is a concept used to describe the deployment model in which organization uses distinct cloud services from two of the above three deployment options. The services are connected to transfer data and port applications. Public cloud is utilized when the financial and scalability benefits are more important than security constraints. Public clouds can be especially suitable for the cases in which information is non-

critical. When the services are business-critical, private cloud can be more suitable option to ensure proper control. (Mell & Grance 2011, 3; Schneider & Sunyaev 2016, 3)

The software as a service model has changed the landscape of enterprise computing. For example, financial requirements are indeed very different when IT investments are made to cloud instead of on-premise services. Any company can start using cloud application with little to no upfront investment. Cloud also reduces the need to evaluate usage requirements in advance. The company can add subscriptions themselves without service provider interaction. Thus, the client company can adjust their information technology infrastructure in a more agile manner. Since security concerns and uncertainty of provider's service capability might still limit the company's intention to use SaaS, the evaluation between cloud and on-premise software delivery is relevant to IT governance and decision-making in every enterprise. The determinants affecting this evaluation are discussed in detail below in subchapter 2.3.

## 2.3 Determinants of software as a service adoption

### *2.3.1 Overview*

Decision to adopt software as a service is a management decision. Business and IT executives weigh the benefits and risks of the information technology insourcing and outsourcing possibilities. The decisions are based on reasoning made by individuals in the organization. Attitudes, views and intentions within organizations' decision makers will affect the outcome. To understand the decisions, one should be able to identify the affecting determinants. Drivers for decision-making may emerge from multiple sources. They can be for example financial or environmental ones. Some determinants may be purely perceived ones, existing only in the minds of the decision maker. (Benlian & Hess 2011, 235)

As stated above, determinants affecting SaaS adoption can fall into multiple categories. For the rest of the chapter, classification adapted from the one presented by Schneider and Sunyaev (2016) will be used. According to the high-level classification, SaaS adoption determinants can be from one of the following categories: (1) technology characteristics, (2) client characteristics, (3) environmental characteristics and (4) asset characteristics. Overview of the classification is provided in Table 1. (Schneider and Sunyaev 2016, 7-8)

| Determinant category | Description |
|---|---|
| Technology | Factors that emerge from the basic characteristics of cloud technology. See 2.2 for reference. |
| Client | Internal characteristics specific to organization and its employees. |
| Environment | Characteristics of organization's operating environment which affect SaaS usage. |
| Asset | Application specific characteristics that affect its suitability for SaaS usage. Characteristics of service providers also fall to this category. |

**Table 1 - Determinant classification**

### *2.3.2 Technology characteristics*

In cloud application adoption, technology characteristics refer to those factors which are due to the nature of the cloud technology. Characteristics of cloud enable or limit some aspects of enterprise computing, and that affects the decision regarding SaaS adoption. The self-service nature or resource pooling changes the way in which companies outsource software. Those aspects need to be taken into account in the adoption decisions. (Schneider & Sunyaev 2016, 7)

Since software as a service does not require on-premise installations, it gives the client more flexibility in switching service providers. The on-demand self-service nature of application deployment reduces the risk of service provider lock-ins. Since cloud applications do not require significant upfront investments, client companies can easily explore other options and switch provider. In addition to switching flexibility, the IT infrastructure in the cloud is quicker in responding to change in workloads. Since there is no customer-dedicated resources, the resources can be reassigned elastically and rapidly (Mell & Grance 2011, 2). Client does not need to worry about the rise in system usage. The flexibility in workloads reduces the need to estimate the system usage in advance. If the system usage is higher or lower than expected, the cloud provider will handle the adjustments either manually or automatically. This can be especially attractive for customer-facing applications in which the demand can change dramatically as popularity increases (Gupta et. al. 2013, 864). (Armbrust 2010, 50; Benlian & Hess 2011, 237)

Due to the virtualization of data centers and multi-tenant architecture of cloud, service providers are able to benefit from economies of scale. The self-service aspect of cloud software also reduces the costs of service provider. This makes applications more affordable to the clients. The service providers offer latest technologies and knowledge to their clients. Access to specialized resources does not require significant upfront investments. The client can move significant part of IT costs from CAPEX to OPEX. This is especially attractive to small businesses which would not have resources to deploy, for example ERP or CRM applications, on-premises. If the company wanted to deploy such applications on-premises, great level of technical knowledge about complex IT topics would be required. With cloud applications, the requirement for this knowledge is moved from client to service provider. (Sultan 2010, 111-112; Benlian & Hess 2011, 237; Gupta et. al. 2013, 864)

Companies are more and more focusing their resources on their core competencies. Routine tasks in information management do not generally create added value to the business and thus, can be outsourced. Cloud application deployment reduces the amount of internal routine IT activities. For example, it is the responsibility of cloud service provider to update the application. This frees up resources to other more productive areas. For example, IT staff can focus on developing company IT usage. (Benlian & Hess 2011, 237; Chen & Wu 2013, 750)

The network-based access to cloud software makes it better available to client's employees. They can access the applications and data from any geographic location and any device with internet connection. Devices such as smartphones and tablets can be used for working with cloud applications. Employees can better work from home or while traveling. It provides also convenience to those who do most of their work in the field. (Gupta et. al. 2013, 864, 867, 872)

Network-based access also has its disadvantages. Employees will compare the service level to other web services (such as Google Search) and expect similar availability. This kind of availability has seldom been possible in the on-premise IT infrastructures. Thus, cloud is increasing expectations. Lost network connectivity or outage in the cloud application can result in complete unavailability of the software. This can result in significant losses in income or damage reputation. To manage risks caused by availability issues, clients can establish service level agreements with cloud service providers. (Armbrust et. al. 2010, 54; Benlian & Hess 2011, 236)

Security risks are one of the main concerns on SaaS customers in the literature (Schneider & Sunyaev 2016, 27). Since the data in public cloud resides in service providers' premises, there is a great potential for security risks (Wang et. al. 2016, 44). With SaaS, external party hosts sensitive and even business-critical information. Service provider has access to client's data and could use it to its own advantage or even sell it to competitors. Proper use of service contracts is required to limit potential opportunis-

tic behavior of vendors (Benlian & Hess 2011, 236). In addition, data corruption is potential security risk. Service providers have built data-redundancy and backup solutions to avoid corruption scenarios. (Gupta et. al. 2013, 864)

If the security is important to SaaS clients, it is just as important to the service providers. Security issues could damage the trustworthiness of service provider. Trust is important in client-vendor relationship. Overall, the service provider's security measures are not valuable on their own. The perceived value of these features is what counts in the adoption decision-making. If the possible client tends to value security high, the security features will be significant adoption determinant. Despite the prevalence of security risks, especially small businesses have been adopting public cloud applications because of the benefits they provide. Thus, some companies are willing to admit the security risks. If the client has suitable resources and security requirements are important, application can be deployed to private cloud (Mell & Grance 2011, 3). (Gupta et. al. 2013, 865; Goode et. al. 2015, 76, 80)

Organization's see security risks in SaaS mainly because they lose control of their own data (Gupta et. al. 2013, 865). When the company adopts SaaS, it transfers the data into service providers' premises. Thus, the client loses control of procedures used to secure, backup and recover the data. For example, it can be difficult for the client to restrict service providers access to their sensitive data. The service provider controls the developments made to the software and underlying technology. Thus, the client has very little influence on the update schedule, feature removals and additions, and technology decisions. In an on-premise deployment, the client has more control on these decisions. With SaaS, this control is lost. (Sultan 2010, 113, Benlian & Hess 2011, 236)

SaaS availability and reliability has direct impact on the client's business continuity. Especially large companies are vulnerable to service outages. Loss of service could result in customer dissatisfaction and financial losses. Customers may be willing to make service level agreements to reduce the impact and probability of such outages. However, the very same risk of service loss is present in on-premise deployments as well. Many in-house IT organizations may fail to achieve uptime and other service levels expected from cloud application service providers. Thus, the SaaS as such is not a risk to business continuity. It is more related to the shared responsibilities between client and provider and the client's loss of control. (Sultan 2010, 114; Martson et. al. 2011, 181; Gupta et. al. 2013, 868)

### *2.3.3 Client characteristics*

Client firm characteristic refer to the determinants that originate from certain aspects of the organization which is considering SaaS adoption. These characteristics consist of

the size, industry and employees of the company. Size has an effect on the resources the company has available for IT. Skills and attitudes of the employees also shape the decisions made. Industry is a characteristic of the client even if most of its effect comes from environmental factors. (Schneider & Sunyaev 2016, 7, 11, 30)

Client size has a two-way effect to adoption of software as a service solutions. First, more IT innovations are generally adopted by larger firms which have more resources and the ability to take risks (Low et. al. 2011, 1012). In the other hand, the cost-effectiveness of cloud applications and the pay-as-you-go subscription model attracts smaller companies with fewer resources. Software which used to require too heavy investments, is now available as SaaS with little to no upfront investments. Small companies can adopt enterprise resource planning or business intelligence solutions which were previously unreachable. Especially public cloud SaaS solutions provide feasible cost-efficiency for small and medium sized enterprises. For larger companies the cost-effectiveness may not be that significant reason for SaaS adoption. In larger companies, the IT department can already benefit high degree of economies of scale and thus, the cost difference between in-house deployment and SaaS solution may not be significant. (Martson et. al. 2011, 178, 182; Qu et. al. 2011, 115; Gupta et. al. 2013, 863)

The organizations have developed their information technology infrastructure over the years. Decisions made in the past influence how compatible the infrastructure is with SaaS adoption. Network technologies, existing systems and applications can vary in their compatibility with cloud computing. If the company has technology in place for SaaS adoption, it is more likely to adopt it. In addition to technology, the clients' human resources can vary in their suitability for SaaS adoption. Different skills and knowledge are required in SaaS system adoption and usage in contrast to on-premise deployment. (Low et. al. 2011, 1013)

Whenever organization adopts new technologies, support from top management is crucial for its success. Adoption of SaaS can influence organizations' processes, practices and resources. Thus, there is a lot of change involved. Vision and support from top management can create suitable climate for adoption. (Low et. al. 2011, 1012)

Even though organizations adopt information technology solutions, the decisions are made by the individuals within the organization. IT sourcing and adoption decisions are made by business and IT executives. They are influenced by their social environment, knowledge, attitudes and perceptions. Thus, SaaS adoption decisions cannot be evaluated without considering the determinants originating from the individuals behind these decisions. (Benlian et. al. 2009, 360-361)

IT executives' attitude towards outsourcing and cloud applications affects organizations SaaS adoption. This is especially prevalent if the IT executive is strong-skilled. If the IT executives are not skilled, then organization may tend to look for IT outsourcing options. Thus, the CIO's skill-level, status and attitude toward SaaS is a combination

that will influence SaaS adoption. Attitudes of the decision maker can be affected by peers and experts. (Benlian et. al. 2009, 366; Blaskovich & Mintchik 2011, 139, 147)

Decision maker's perceptions affect SaaS adoption. No matter how objective evaluation is attempted, the subjective thoughts and attitudes will have an impact. Thus, IT executives intention has an effect on SaaS adoption. If decision maker perceives risks in cloud application adoption, it will likely decrease organizations degree of SaaS adoption. Perceived risk is the feeling of potential negative consequence of adopting specific application. The organization is likely to experience loss if the risk regarding cloud application adoption comes into reality. Perceived risks are likely to fade away as the organizations become more experienced with the use of on-demand applications. (Benlian & Hess 2011, 235-236; Chen & Wu 2013, 751)

In the other hand if the executive sees a lot of benefits and opportunities in SaaS adoption, organization is likely to prefer cloud deployment over an on-premise alternative. As the technology matures, individuals gain more experience supporting or contradicting their perceptions. (Benlian & Hess 2011, 235-236; Chen & Wu 2013, 751)

Individuals' perceptions regarding the complexity of technology is likely to affect their decision. If a person thinks that the technological innovation or solution is difficult to understand and use, the perceived technology complexity is high. If the complexity is high, it takes time and effort to acquire skills and competencies required to use and benefit from the technology. Simpler and familiar concept will be adopted faster than unfamiliar ones. Perceived technology complexity is relevant for SaaS adoption. If the organization and executives perceive SaaS as complex technology, they are less likely to adopt it. As time goes on and the familiarity with SaaS increases, the perceived complexity of SaaS technology will decrease. (Chen & Wu 2013, 751; Kung et. al. 2015, 355)

The differences between industries and the IT outsourcing usage within them has been identified in the literature. Industries of organizations can be classified in many ways. Some of the classifications include the division between service and manufacturing industries or private and public sectors. Classifications based on IT intensity have also been proposed in the literature with inconsistent results. (Qu et. al. 2011, 101; Lacity et. al. 2010, 416, 424)

As the industry classifications are obscure and overlapping, it can be difficult to position certain client to an industry and assess its SaaS adoption by looking at the industry. However, certain industry characteristics have been identified as ones that affect the use of IT outsourcing and cloud. These industry characteristics are munificence, dynamism, concentration and capital intensity. (Qu et. al. 2011, 99)

Industry munificence refers to the degree of resource availability in certain industry. In non-munificent industries, many clients compete for scarce resources. This forces companies to focus on their existence instead of supporting growth. In contrast, clients

in munificent industries can focus on growth, since resources for survival can be easily obtained. Munificent and growing industry supports additional IT investments. In munificent industry, quick setup time and fast adoption support acquisition of growing market. Thus, industry munificence is positively associated with SaaS adoption in comparison to slower on-premise deployments. (Qu et. al. 2011, 109-110)

In dynamic industries, changes are more frequent and more difficult to predict than in stable industries. Information system investments are difficult to reverse. Thus, in-house software investments can become obsolete in dynamic industries. The sunk costs can be significant. It can be too risky for an organization in dynamic industry to overinvest in information technology. SaaS reduces the need from upfront investment and thus degrades the risk of expensive software solutions going obsolete. Additionally, on-demand cloud applications provide companies additional flexibility which can be beneficial in dynamic industry. Thus, industry dynamism is positively associated with software as a service adoption. (Qu et. al. 2011, 110)

Industry concentration represents the level of market concentration on few significant players within an industry. Firms in concentrated industries face less competition, are able to raise prices and benefit from monopoly-like position. If the market is not concentrated, companies face more competition. Thus, they need to focus on their cost structure in order to remain profitable. Cloud application adoption can be a way to drive down costs. Thus, low industry concentration can be a driver for SaaS adoption. (Qu et. al. 2011, 112)

Capital intensity of industry is likely to lower SaaS usage. In capital intensive industries, organizations are used to investing in fixed assets. It is difficult for new entrants to enter capital intensive industries due to the initial investments required. This reduces the need for existing organizations to prepare for unexpected changes in the industry. It requires time to build an asset infrastructure needed for successful operation. Thus, it may seem unreasonable to switch away from this heavy investing culture. They are likely to continue with their current way of operation and investments. (Qu et. al. 2011, 112-113)

### *2.3.4 Environmental characteristics*

Organizations do not operate in isolation. Instead they are constantly influenced by their environment, competitors, suppliers and customers. The actions taken by other organizations may have an effect on the SaaS adoption decisions made by one client. Companies naturally adjust their behavior to conform with the regulation. Environmental forces can be characterized as mimetic, coercive or normative forces. (Kung et. al. 2015, 352)

Coercive pressures originate from other organizations which can influence the pressured organization. The origin can be for example customers or parent company. The target company adjusts its behavior according to the demands or expectations from those which it does depend on. In cloud application usage, parent company could have a significant influence. If the parent company decides to adopt certain software solution, it might be impossible for the child company to do anything but to follow. (Kung et. al. 2015, 352)

Brand and public image are important for companies nowadays. In the era of global warming, the environmental consciousness is considered important. Cloud tends to be greener alternative when using information technology. Usage of cloud is environmentally friendly, since it is smarter usage of energy. Company with environmental goals and ideology could be attracted by this when considering their information technology usage and deployments. Thus, the coercive pressure from the society influences organization's decision-making. (Martson et. al. 2011, 182; Kung et. al. 2015, 354)

Professional communities have an effect on organizations which could impact its cloud application adoption. When cloud usage starts to develop into professional standards, the influence of the standard could work for cloud decision. Suppliers and customers are significant sources of normative pressure. (Kung et. al. 2015, 355)

When mimetic pressures exist, organizations tend to copy from other organizations. They can copy activities, processes or systems. Successful actions are more attractive for copying. If other organizations are able to gain benefits by acquiring certain software application, it becomes attractive for others to follow. With copying, companies can adopt successful practices without the need to invent and validate them by themselves. Thus, it is more efficient way to develop. This also applies to SaaS solutions. If other similar organizations are able to receive benefits from SaaS usage, one will be more interested in following. (Kung et. al. 2015, 355)

Companies need to conform to the regulation designed by both international and national institutes. Many laws governing information technology were regulated in the era before cloud computing emerged. Still many things have changed by the introduction of cloud. Physical location of data is one of them. Companies need to ensure that their data is located in a way which is required by the law. They also may have to be able to control, who has access to that data. In certain cases, cloud application may not be suitable for certain areas where sensitive data is stored. If the SaaS user cannot control the location and privacy of that data, on-premise installation may be the only option. The global distribution of cloud application data is a challenge from regulation's perspective. (Martson et. al. 2011, 182)

Organizations face pressure from their industry competitors. Companies tend to operate differently if they have strict competition for the markets and customers. This can have implications for information technology usage as well. Competition can drive or-

ganizations' adoption of on-demand software solutions. The fast setup time and financial impact of SaaS applications are favorable when competition is high or the threat of new entrants is high. Since new entrants can adopt on-demand applications quickly to gain capabilities necessary to compete in the market, why wouldn't existing players in the market do the same. (Chen & Wu 2013, 750, 765)

Organizations face a lot of uncertainties originating from their operating environment, business partners and technology. It is common for decision makers to avoid uncertainties such as unusual, unknown and unpredictable events. These uncertainties affect SaaS adoption. Uncertainty and maturity related to technology, specific product and markets are viable things to consider in decision-making. As the cloud technology and products become more mature, it can increase SaaS adoption. Cloud can be an attractive option if the demand is uncertain as it is more flexible deployment option. Uncertain demand may however result in uncertain and hidden costs. (Schneider & Sunyaev 2016, 12-13, 28)

### *2.3.5 Asset characteristics*

Asset characteristics refer to the characteristics of the cloud-sourced application. Some applications can be more attractive for SaaS deployment than others. For example, enterprise might be willing to deploy strategically more important application in-house. Some applications can provide more cost savings than others. The determinants falling into asset characteristics indicate that not all applications are equally suitable for cloud usage. The characteristics of service providers inherently fall to this category since in SaaS market, software and service provider are always packaged together. (Schneider & Sunyaev 2016, 7)

In the academic literature, cost savings have been identified as the most common determinant affecting IT outsourcing. The financial effect is even more significant with SaaS. Economic determinants have had an important effect on cloud application adoption. Cloud application provider achieves economies of scale by serving multiple clients with shared application and hardware infrastructure. Service provider's reduced costs have direct impact on the software service market prices. (Benlian & Hess 2011, 237, 243; Lee et al. 2013, 438).

In contrast to in-house production of application services, installation, development and maintenance tasks are not on customers' responsibility. Service provider takes care of them. This has an impact on the labor-related costs. When using SaaS, customers can operate with fewer employees focusing on their computing infrastructure. With less people involved in IT operations, more people can focus on other value-adding work. This has a direct impact on total cost of application ownership. Due to the self-service

nature of cloud applications, it can be expected that transaction costs such as vendor selection and contracting should be also much lower (Sultan 2010, 111; Benlian & Hess 2011, 237; Chen & Wu 2013, 751; Kung et. al. 2015, 352-353)

The introduction of on-demand applications has also changed the way in which the applications are paid for. Most SaaS are paid with a subscription model. Thus, some usage-based metric is used as a basis for service cost. In other words, the client is charged with a fixed price for each unit of service. The unit of service can be for example user or the usage of storage or computing resources. (Benlian & Hess 2011, 237; Chen & Wu 2013, 751; Gupta et. al. 2013, 864)

In the traditional IT software procurement, there is a significant sunk cost related to software and hardware involved. With pay-per-use pricing of on-demand applications, the need for upfront investments is removed. This makes it possible for even the smaller firms to utilize enterprise-grade applications. Software used in enterprise resource planning and customer relationship management are affordable in pay-per-use manner. This affordability makes SaaS especially attractive to small and medium sized enterprises. The cost-reduction may even be so significant that it compensates the common negative aspects of SaaS, such as security and privacy. As there is little to no sunk costs involved in SaaS procurement, it is cheaper to switch between application providers (Susarla et. al. 2009, 206). With pay-per-use pricing, it is easier for SaaS customers to pass some or all of the application costs to their own prices. With traditional IT investments, it is more difficult to determine the impact of fixed IT costs on customer prices. (Chen & Wu 2013, 765; Gupta et. al. 2013, 864, 870)

Software as a service has also a negative economic effect. Usage metric selection has a direct effect on the pricing. If over the years, the application usage is extended, the costs may rise in an unexpected way. There can also be hidden costs involved in the SaaS usage. These hidden costs may incur from raised service level requirements or additional feature requirements. Many cloud applications provide customization options for their customers. It is customer's responsibility to develop and maintain these customizations. The cost of these customization naturally falls to the SaaS client. As the strategic importance of the application service increases and the customer becomes more dependent on the service, it is more difficult to switch to another provider. In these situations, customer is vulnerable to the vendor's attempts to raise prices. (Benlian et. al. 2011, 236)

IT software or hardware can be valuable and inimitable resources for company. Thus, their strategic importance is high. Applications can be business-critical. The company's operations can depend heavily on the software. There is a tendency for companies to keep these strategically important applications on-premises. By operating this way, the companies minimize the risk of losing control or access to their data and the software functionality. Strategically important applications include ERP, SCM and

CRM systems. Non-critical applications are far more applicable for cloud-based deployment, since the effect of lost control is much lower. (Benlian et. al. 2009, 360, 364; Benlian & Hess 2011 236)

The specificity aspect of asset has an effect on the SaaS usage decision. The components of asset specificity consist of human asset specificity, technical specificity and site specificity. In the context of information technology, human asset specificity refers to the business knowledge required to use and develop software asset. The high degree of human asset specificity reduces the tendency to adopt SaaS solutions. However, there is limited number of empirical research focusing on this determinant. (Schneider & Sunjaev 2016, 9, 11)

Technical asset specificity refers to the number and uniqueness of special functionalities provided by software. Many SaaS solutions offer standardized set of functionalities and are limited in terms of customizability. Thus, lower technical asset specificity makes application more suitable for SaaS usage. High technical asset specificity demands more customizability from SaaS solutions in order to be applicable. The impact of technical asset specificity may vary depending on the size of the enterprise and the complexity of IT landscape. (Schneider & Sunjaev 2016, 9; Benlian et. al. 2009, 366)

The site specificity of software asset concerns the site requirements for the asset. In cloud applications, the network dependency requires specific considerations if the application needs to be accessed everyday around the clock. Since the cloud application data is stored on shared infrastructure, additional consideration is required for software processing sensitive data for example in hospitals. (Schneider & Sunjaev 2016, 9)

In the SaaS market, client is limited to the offerings available from the service providers. If certain application asset is not available as software as a service, cloud is not an option. If a cloud application exists, then certain characteristics of the service providers can also have an effect on the sourcing decisions. Service capability and quality are key determinants in selecting provider. If there is no reliable and capable service provider, it will naturally affect client's cloud adoption decision. (Gupta et. al. 2013, 870; Goode et. al. 2015, 75, 80)

Even though self-service is one key characteristic related to cloud, clients also expect support from the service provider when needed. If service provider is responsive, client's concerns and changing requirements can be addressed more effectively. This results in better value for the SaaS investment. Depending on asset criticality, the requirements for support may vary. For some assets, support availability is determinant for SaaS adoption. (Goode et. al. 2015, 76-77)

Trustworthiness of SaaS provider is important due to the common skepticism related to privacy and security of cloud. Client's processes and data is available for the provider and it requires both arrangements and trust so that the provider does not use sensitive

information for its advantage. Trust and reliability towards service provider is a SaaS adoption determinant (Gupta et. al. 2013, 872). (Goode et. al. 2015, 77)

# 3 RESEARCH APPROACH

## 3.1 Technology-organization-environment framework in SaaS context

Software as a service adoption is an instance of new technology adoption. Over the years, multiple different theories about the adoption of new technologies have been developed. These theories include but are not limited to technology-organization-environment framework (DePietro et. al. 1990), diffusion of innovation theory (Rogers 1995) and technology acceptance model (Davis et. al. 1989).

The underlying questions of this research are very much the same as the ones in technology-organization-environment (TOE) framework: why does a potential user become an actual user of technological innovation? TOE represents the context of innovation adoption decision-making. This context is divided into three elements: technology, organization and environment. The four categories found in the literature review extend these three elements by introducing the asset-specific characteristics to the decision-making. The TOE framework adapted for the SaaS adoption determinants is represented in Figure 3. (DePietro et. al. 1990, 151)

The technology context consists of technologies that are present within the firm and available in the company's environment. Internal technological aspects consist of client's existing IT landscape, hardware and software in addition to current practices. The SaaS adoption determinants categorized as technology characteristics identified in chapter 2 fall into this element. More specifically in SaaS context, existing IT landscape in combination with the factors originating from the technological differences between cloud and on-premise applications form the technological context for the decision-making. (DePietro et. al. 1990 153; Schneider & Sunyaev 2016, 7)

Organizational context is the second element of TOE framework which influences the technological innovation adoption. Organizational context covers the characteristics of the client which affect the decision-making. Organizations are constantly developing and both its history and vision of the future do affect what it is currently. Organizations consist of individuals, processes and structures which have been shaped over the time of its existence. For example, firm size and the quality of human resources fall into the organizational context. The same kind of determinants have been identified also in the context of SaaS as described in 2.3.3. (DePietro et. al. 1990, 153, 155)

The third and final element of TOE framework is the environment. Organizations do not exist in a vacuum, but they are constantly being affected by other organizations and entities around them. Vendors, customers and regulation are constantly shaping the way the organization operates. For example, customers' expectations can drive the company

into adopting certain practices. The environmental context has also been identified in the SaaS adoption literature as described in chapter 2.3.4. (DePietro et. al. 1990, 153-154)

The TOE framework has been used in multiple earlier studies in the field of technology adoption for decades (e.g. Chau & Tam, 1997, Lee & Shim 2007 and Micheni 2015). This makes it a credible framework for assessing the reasoning associated with the technology adoption. The technology-organization-environment supports this research by improving the structure and classification of identified characteristics. The concepts and relationships provided by the framework will also be used to get a better structure for the empirical research phase. Consequently, using a common framework and classification for analysing the technology adoption in specific context, might help in generalizing the results and comparing them to other contexts.

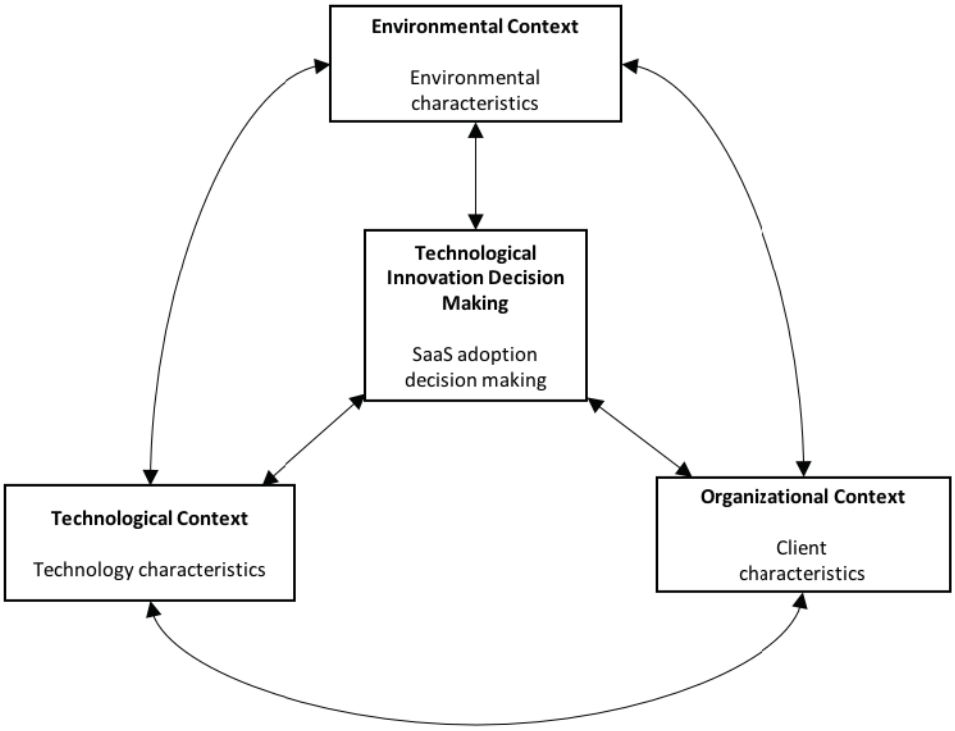


**Figure 3 – Technology-organization-environment framework in the context of SaaS adoption (adapted from DePietro et. al. 1990, 153)**

## 3.2 Asset characteristics and the TOE elements – proposed framework

According to the literature review and the technology-organization-environment framework several technological innovation (and in particular SaaS) adoption determinants have been identified and can be categorized. In particular, TOE framework uses three

categories. Even if the existence of these determinants and categories is hard to deny, their relative importance can vary significantly depending on the circumstances. As already indicated in the literature review, for example application type could be a factor that affects the valuation of different determinants.

Every software purchase decision is made individually. Each software has its own characteristics and requirements and thus, requires thorough analysis when purchasing decisions are made. Even if the same technological, organizational and environmental determinants would be present, the actual decision outcomes could still be different because of the asset specific characteristics. No matter how well the high-level principles considering SaaS adoption are formulated, there can still be asset-specific exceptions and specialties which do not comply with them.

Due to the presence of asset specific aspects that affect decision-making, the TOE framework was enhanced with the fourth element: the actual software asset and its characteristics. The expectation is that the decision makers see that the procured asset itself introduces new determinants and changes the importance of environmental, organizational and technological context and the underlying determinants. Thus, it should be considered as its own element in the SaaS adoption decision-making. The final decision-making is then made according to all these aspects. In this research, this view is evaluated with several professionals working in IT organizations.

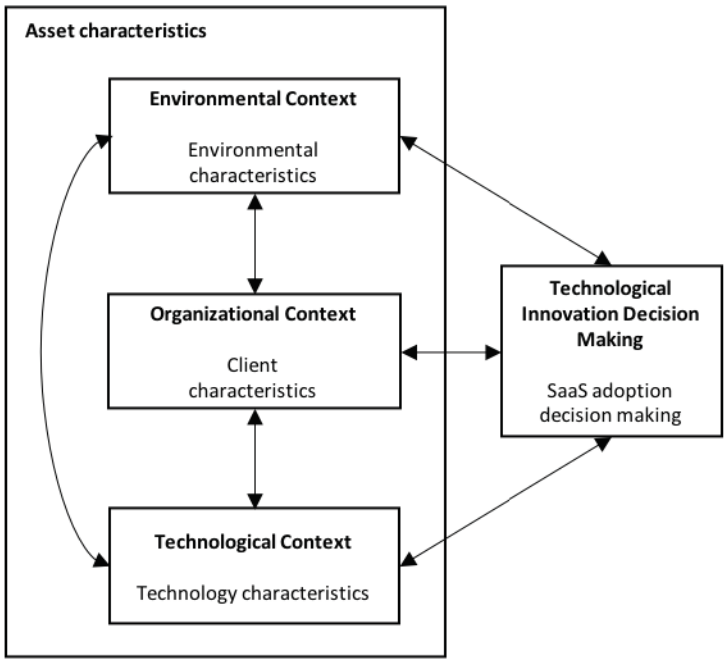


**Figure 4 - Technology-organization-environment framework with asset approach in the SaaS adoption context (adapted from DePietro el. al. 1990, 153)**

# 4 EMPIRICAL RESEARCH

## 4.1 Research methods

Selection of research method is driven by the research question. Basic distinction between quantitative and qualitative research methods is made based on whether the research question seeks to obtain broad and generalizable results or in-depth knowledge of particular circumstances. The goal of this research is to explore how employees in different positions see and evaluate the determinants of software as a service adoption. Since the aim is to identify attitudes and perceptions on individual level and especially the reasoning behind the attitudes, qualitative research methods seem to be more suitable than quantitative methods. Qualitative research aims to increase the depth of knowledge on a particular issue and dives deeper into the reasoning behind the phenomena. Quantitative research could be used to summarize the priorities and weights which are given in different positions for certain determinants, but it makes it more difficult to get more details about the reasoning behind the priorities. Thus, qualitative approach was selected. (Maylor & Blackmon 2005, 220; Fisher 2010, 69-70)

Research interview is especially suitable for conducting this research since it allows the data collection to adapt based on the circumstances, and in particular, based on the interviewee. The flow of discussion can control the direction of the interview. To understand the SaaS adoption determinants from different perspectives, it is required that the data is collected from people in different kind of positions in IT organizations. It is plausible that in different positions, the interviewees may want to focus on very different topics. Flexibility of interview gives a change to explore the role-specific differences and their causes in more detail. To answer the research questions as well as possible, it is required that the software as a service adoption determinants are approached from the interviewee's role and perspective. (Maylor & Blackmon 2005, 220)

Interviews can vary from open to structured ones depending on the level of knowledge the interviewer has about the possible answers. Depending on the research purpose, the level of openness can also vary. Semi-structured interview was selected as a research method for this study because it leaves room for in-depth analysis and coverage of predefined topics. The themes, key points and determinants identified in the SaaS adoption literature will form the basic structure of the interviews. The interview will not be structured by fixed questions, but the interviewees attitude towards the themes from literature will be evaluated during the interview. The interviewee can introduce determinants and themes themselves preferably with sample decision-making cases. Naturally, semi-structured interview makes it easier to go through the causes and attitudes in more detail. This creates an opportunity to not only explore how the attitudes differ, but

also why they differ. Open questions are used to encourage free-flowing discussion. When the interviewee is willing to focus on certain topics, semi-structured interview allows that. (Fisher 2010, 174-175; Eriksson & Kovalainen 2008, 83-85)

Interviews have their disadvantages as a research method. The interviewee should be comfortable in the situation in order to discuss the topic freely and honestly. If the correct questions are not asked, it may well be that the amount and quality of data remains low. Since the interviewing is interaction, the correct questions cannot be designed completely in advance. Semi-structured interview needs to be steered and new themes need to be introduced according to the flow of interview and schedule. This was taken into account during the interview preparation and during the interview sessions by leaving time for deviations from the structure. It was also necessary to prepare for situations that some questions are not going to generate much discussion. One testing interview was held to fine-tune the topics and test the interview structure as well as the schedule. (Fisher 2010, 102, 185)

## 4.2 Data collection and analysis

Sampling and interviewee selection are important steps in qualitative research. For practical reasons, it is easier to conduct interviews with people which can be conveniently accessed. Since the author has access to two different organizations through employment and personal relationships, the employees within these two companies were selected as primary candidates for the interview. These two companies vary in size and industry. First one of them is SME in IT consulting business and the second one a large enterprise from media industry. By limiting the number of companies to two, it is easier to keep the number of interviews reasonable while still reaching enough professionals and roles from each organization. Two companies were however considered to be required in order to reduce the factors that originate from the characteristics of one particular company. (Maylor & Blackmon 2005, 226-227)

In qualitative research, it is important to select a sample that can provide valuable insight about the subject of the study. In the case of this study, this means that the respondents should be in different roles within the IT organizations. Naturally, more experienced persons have more perspective to the software as a service adoption. When exploring the IT organizations of companies, several roles relevant for software as a service adoption and operations were identified. The persons in IT management have an effect on the IT decisions and thus were considered relevant for this research. In addition, IT architects shape the IT landscape of these companies, making their input valuable for decision-making. The employees working in IT operations have the most hands-on experience on the day-to-day work with the software solutions. In summary, the em-

ployees in these different groups are, from technology adoption perspective, in different positions. This makes it possible to use people from these groups to gather representative views from around the IT organizations. They also view software from very different point of view. Expectation is that this could introduce some valuable differences and insights in the interviewees' responses. (Maylor & Blackmon 2005, 226-227)

The interviewees were interviewed one-by-one to ensure that possibly differing and sensitive opinions were not left unsaid (Maylor & Blackmon 2005, 227). Each interview was started with an introduction to the topic and study. Instead of going straight to the SaaS adoption determinants, some general things about IT system usage and IT decision-making was discussed from the interviewee's point of view. The goal was to facilitate the interviewee's thinking so that there is more background for the discussion regarding software as a service adoption and determinants. After the introduction, the SaaS adoption and determinants were discussed. At this stage, it indicated significance if the interviewees presented the determinants themselves. If the determinants did not come up by the interviewee, the interviewer introduced the determinants and discussed their relevance with the interviewee. No pre-prioritization was given to SaaS adoption determinants, but the prioritization was made during the interview based on interviewees perceptions.

In total, seven interviews were conducted. Two of them were held with employees in IT management positions (I1 and I2). Three of the interviews were conducted with employees in IT architect-like positions (I4, I5 and I6). One of the architects also works part time in IT operations. One person, which works purely within IT operations was also interviewed (I3). In addition, one interview was held with a technology procurement specialist (I7). The interviewees are presented in table 2 below.

| **Interviewee** | **Position** | **Professional IT experience** | **Interview duration** |
|---|---|---|---|
| I1 | Partner with IT responsibilities | 29 years | 1h 5min |
| I2 | IT manager | 19 years | 1h |
| I3 | IT support specialist | 20 years | 45 min |
| I4 | IT development specialist | 16 years | 55 min |
| I5 | Enterprise architecture lead | 18 years | 40 min |
| I6 | Enterprise architect | 13 years | 1h |
| I7 | IT procurement specialist | 20 years | 40 min |

**Table 2 - Background of interviewees**

All of the interviews were recorded with the permission from the interviewees. It was naturally up to the interviewees permission whether the interview could be recorded or not. Recording is the best way to ensure that the interview is captured as well as possi-

ble. Recording allows the interviewer to reduce the amount of note-taking and focus more on the flow of conversation. Nevertheless, notes were still taken during the interviews about the key points and reactions and other things which could have been harder to recognize from the recording. Notes were also used to steer the interviews and return to important or interesting topics later on. In addition to free form notes, the basic structure in Appendix A was used to easily keep track of the topics covered since they did not occur in same order every time. It was also used to ensure that broad enough coverage of the characteristics is achieved in the interviews. Recordings were transcribed after the actual interview. Only the introduction and conclusions had fixed positions in the interviews. Other topics were covered in a free order.

The analysis of the research material was started by transcribing the recorded interviews. The analysis of the interviews was done by coding the material according to the determinants available in the literature. The transcriptions were read through carefully and topics from the interviews were mapped to the SaaS adoption determinants from the literature review. Additional determinants were identified and coded accordingly. In addition to the determinants, relationships between the determinants and the employees' attitudes were derived. Since the interviewee count was low, the likelihood of error in content analysis was high. Significant contributions from the content analysis could only be derived if the interviewees completely agreed. (Fisher 2010, 199-201)

## 4.3 Trustworthiness and ethical considerations

In qualitative research, it is important to ensure that the study and its findings are trustworthy. There are different criteria for evaluating the trustworthiness of qualitative research. According to Lincoln and Guba (1985), trustworthiness consists of four aspects: (1) dependability, (2) transferability, (3) credibility and (4) confirmability. (Eriksson & Kovalainen 2008, 294-295)

Dependability refers to the traceability of the research process. It also ensures that the process is logical and documented. The dependability is increased in this research by describing the interview process in detail in section 4.2 and by providing the links between interviews and results in section 5. Transferability assesses the connection between this research and earlier research. This is done, by coding the SaaS adoption determinants according to existing literature and comparing the interview results against them. Credibility of this research is ensured with proper literature review. With the literature review, it was ensured that the author had deep knowledge about the subject and thus, was able to carry out the interviews accordingly. Conformability is ensured by referring to the interviews when findings and interpretations are made. (Eriksson & Kovalainen 2008, 294-295)

It is important for any research to be aware of possible ethical problems that may be encountered while conducting it. This applies especially to qualitative research and research dealing directly with people. At the very minimum, the research should do no harm to people participating in it. Neither the information gained should be used to harm anyone. It is better to address ethical issues that may be encountered in advance. (Fisher 2010, 72-73)

The fact that the author personally knows most of the persons interviewed could be a source of ethical issues and could do harm to the validity of this study. Even if the author personally knows the interviewees, none of them will be forced to participate in the research. Anyone has the right to privacy and can exclude themselves from the research. The researched organizations and participants in particular could try to use the personal relationships to steer the results of the research. Thus, it was agreed with the participants that the researcher is allowed to make own independent conclusions. Neither the company nor the participants were thus able to steer the conclusions according to their own interests. This is important considering, that the subject of the study could have an effect on company's internal information management politics. (Fisher 2010, 73)

When researching people, it is important that every participant has agreed to participate in the study and are well aware of what their participation will involve and what the purpose of the research is. The respondents were allowed to withdraw their responses from the research up until the point when the research material had been analyzed. The results and conclusions are presented in such a way that the responses or opinions cannot be linked to the individuals. (Fisher 2010, 73)

# 5 RESULTS

## 5.1 Overview

The interviewees discussed that the attitude towards software as a service adoption has been constantly changing since cloud applications started to emerge. The experience with SaaS solutions has changed the perception towards adoption determinants, making some of them more important than what they used to be. In contrast, the priority of some determinants has also decreased. Overall, it was recognized by respondents that they have been able to adapt to the cloud way of procuring software. Certain risks have been identified over the years, but organizations have been able to find ways to reduce their likelihood and impact. At the same time, the enterprises have learned new ways to better leverage cloud applications by focusing on more value-adding tasks. But even if maturity in SaaS procurement has increased, there are still several adoption determinants which are considered when software purchasing decisions are made. The fit between the need and offering is naturally the most important factor according to the interviews but in addition to that, there are many other things to consider.

In this section, the results of the interviews are presented. First, the SaaS adoption determinants from the interviews are split into the TOE framework contexts. If some asset-specific considerations were identified, then it is discussed alongside the other determinant related topics. In the final subsection 5.5. the direct asset-specific determinants are presented.

## 5.2 Technology context

Cloud technology changes several aspects of software procurement. The key difference is that the hosting and most of the maintenance work is done by external service providers. This has potential implications on security, updates and availability. Identified determinants are listed in table 3 below.

| Technological determinant | Raised by interviewees |
|---|---|
| Security | 7/7 |
| Access to special software more easily | 4/7 |
| Reduced maintenance effort | 5/7 |
| Flexibility in system usage | 4/7 |
| Availability from anywhere | 2/7 |
| Loss of control of availability and updates | 4/7 |
| Flexibility in switching service providers | 4/7 |

**Table 3 - Technological determinants in interviews**

Security was a big theme in the interviews. All the interviewees discussed the topic, making it one of the primary determinants affecting SaaS adoption. The topic itself gained both positive and negative opinions even within individual interviews. It was clear that while cloud software introduces security risks, SaaS can be also beneficial from security point of view. Security was considered as a one theme in which the attitudes have shifted significantly during the recent year as companies have gained more experience from SaaS procurement.

According to the interviews, security risks around SaaS relate tightly to the business value of data. The data which is gathered in organizations' applications is an important asset to most businesses. It would cause severe damage to the businesses, if their data would be lost or in worst case, would be leaked to a competitor. Some applications can contain more important business data than others and thus, the risk impact can vary depending on the procured software asset. Office software and other so-called general applications are seen more feasible for SaaS adoption. Critical business data and sensitive personal data in applications would make the risk higher and thus, the decision-making process can take longer and require more careful evaluation. As the visibility to the security measures is reduced with SaaS, software with sensitive personal data might be considered only suitable for on-premise installation.

Even if the most important business applications are still seen as riskier from SaaS adoption perspective, overall it is seen that the security risk regarding SaaS adoption has decreased. For example, one interviewee highlighted that five years ago, they were certain that they did not want to take their most important business data assets to the cloud. But if the same decision would be made with current knowledge, the outcome would most probably be different. The positive experiences with SaaS providers have reduced the skepticism around the security aspects. Trust has been built between clients and SaaS providers, making it less relevant that the visibility to the security measures is reduced. Especially large service providers with several customers are seen trustworthy. Security related certificates and other proofs of security capabilities are also helpful in

establishing trust. Security-related agreements have been established between clients and SaaS providers to build trust and reduce the impact of possible security breaches. Organizations have also learned ways to deal with these risks by introducing light-weight on-premise solutions in addition to the cloud application. As one of the respondents told, a company had introduced solution to locally backup data from SaaS solution to ensure that they would not lose their data even if the SaaS provider lost their data.

Security is often seen negatively in the context of SaaS. The interviewees also saw potential security benefits in cloud software adoption. It was seen that especially larger service providers have to focus on security aspects in order to survive in the market. In addition, it was seen that the larger and more mature providers have resources to make the security things right. They have also already introduced tools to monitor application security and thus covered up some of the loss of control regarding it. Setting up the security of custom built or on-premise hosted software was not seen as a value-adding work as such. Thus, software as a service allows customers to focus on more valuable tasks in a quicker manner.

With software as a service, customer companies can be more agile in responding to the business requirements. It was evident in the interviews that the match between customer requirements and service or software offerings was seen as the most critical adoption determinant. As cloud increases the software available for low cost and with less technical expertise, it makes it easier to respond to business requirements. It was discussed in the interviews that still few years ago cloud software used to lack some features when compared to their on-premise competitors. However, currently cloud-offerings are able to match them or even bypass them with their features. Even in case the SaaS solutions miss some features, most of the important and critical ones are usually there.

Main drawback of on-premise software systems seemed to be the required maintenance effort, setup time and upgrade work. Cloud applications overall were seen as a solution to reduce maintenance work. There is no need to update servers' software or configure hardware. Even if hardware-related configuration and changes were not consuming a lot of time in the interviewed organizations, cloud applications stay operational with less effort and worries. It was overall seen that it is good that IT organizations can reduce that kind of work which can be conveniently done by software as a service vendor. However, the maintenance effort varied significantly based on the software in question. Some on-premise solutions were a lot easier to maintain than others.

Several interviewees identified that software updates are time-consuming and costly operations. Especially when the software update is needed on a business-critical application, it usually requires work at night or during the weekends to reduce the business impact. This can be both costly to the organization and dissatisfactory for the employees. Overall experience with the cloud application updates had been positive. Even if

sometimes some issues had been encountered when the service provider had done the update, the update processes had usually gone well. The zero-effort updates were seen as a major benefit of cloud application adoption.

Maintenance and update work requires detailed knowledge about the underlying systems. Especially in smaller IT organization, this was seen as a critical thing. There might be cases in which only one IT employee had the knowledge to update or troubleshoot certain software on on-premise systems. Thus, the role of that particular employee was very critical. Even if proper documentation might play its part in the knowledge transfer, it could only be done up to a certain level. Cloud software was seen as a good solution to reduce the criticality of individual employees by reducing the specificity of the knowledge required to maintain the systems. However, it was acknowledged that even if cloud applications reduce the maintenance work, it does not remove it completely. There is some configuration still to be done whether or not the application is available from the cloud. For example, users need to be created, some subscription management might be needed and certain settings should be configured in the cloud applications as well. This is of course something that can be more easily transferred over to several employees as it does not require the same depth of knowledge about the system.

As the update responsibility moves to the service provider, so does the control of the availability and update schedule. It was acknowledged that some service providers handle their part excellently and make the update experience seamless. This was seen extremely important if the nature of the service demands 24/7 uptime. Still most of the applications were such that this kind of uptime requirement is not that important. Larger partners seemed to be better at handling the updates. Some potential risks were identified with the loss of control of availability, but the likelihood of any major impact was seen low. The interviewees saw contractual things as the main method to ensure proper uptime and availability. Either the service provider itself claims certain uptime promises or they are agreed in separate contract. As more experience with cloud service providers has been gathered, the higher the trust towards the partners has become.

Interviewees also discussed the flexibility of system usage. Flexibility is mainly seen as an advantage from two perspectives: (1) it is easier to adapt system usage in terms of users, data or performance and (2) it is easier to adapt system usage in terms of features. As one of the respondents told, it is a lot easier and faster to add more data storage to a cloud application with the self-service tools than to buy and install new hard drives to an on-premise server rack. Also new features can be added to a SaaS subscription via the self-service tools, something that would require some sales negotiation and package installations in the on-premise world.

While the flexibility in system resource usage is seen beneficial, its importance was not considered that high by the interviewees. One solution used with on-premise installations, was the outsourced physical resource management. In other company, where

resource management was done by own IT organization, the system usage had remained quite stable during the recent years and thus, was not considered to be an issue.

The interviewees did not see the availability from anywhere with any device that important. Even with the on-premise software, they had already sufficient accesses from anywhere with virtual private network connectivity. Related to this, one of the interviewees highlighted that cloud software makes it easier to provide access to people external to the company in question. Thus, cloud software makes it easier for them to collaborate and share data with for example customers.

Ideally service providers can be switched more easily with cloud software since the upfront investment is lower. However, when integrations and configurations are done for the SaaS application, it ties the customer company to the service provider similarly as is with the on-premise alternative. The contractual topics raised both pros and cons regarding the flexibility. The on-premise licenses were seen difficult to get rid of once bought. However, also SaaS contracts can tie the customer to the service provider for several years.

## 5.3 Organizational context

As discussed in 2.3.3 organizational context of technology adoption refers to the determinants that originate from certain aspects of the organization itself. Overall attitude towards cloud adoption, company size and client's industry fall into this category. Existing knowledge and skills as well as current system landscape are things to consider in the SaaS adoption decision-making. (Schneider & Sunyaev 2016, 7, 11, 30)

| **Organizational determinant** | **Raised by interviewees** |
|---|---|
| Top managements attitude | 5/7 |
| Knowledge and skills | 5/7 |
| Existing IT landscape | 4/7 |
| Company size | 2/7 |
| Industry | 2/7 |

**Table 4 - Organizational determinants in interviews**

When it comes to decision-making, the attitudes of top management naturally have an impact. The top management in this context refers to both business management and IT management. The attitude towards SaaS adoption can be either positive or negative. Especially it was seen that in smaller organization, the attitude of individual decision makers can be a significant adoption determinant. Cloud skepticism or caution of a de-

cision-maker can halt SaaS adoption of the organization and easily outweigh other important factors. If for example, top-management thinks that the security risks in SaaS solutions are too high, it can easily steer the decision towards on-premise alternatives.

Top management can also steer the decisions towards cloud-based solutions. It was identified in the interviews that management individuals can even drive all-cloud approach, making new on-premise solutions unlikely. Management can also steer the architectural guidelines towards SaaS-based ecosystem. The management attitude became more evident in the buy-vs-build kind of decisions. Three interviewees highlighted that in their management, standardized products were seen as more viable alternatives in comparison to custom built software. Of course, the business requirements could override these high-level policies. If there is no suitable SaaS solution available, then on-premise is of course an alternative. If there is no product available, then custom built can be considered.

The knowledge and skills possessed by the organizations have an impact on the IT procurement decisions. The contractual negotiations and the purchasing process itself have different characteristics when SaaS solution is procured. Topics related to security need to be discussed in more detailed level, when the security related configurations are not in full control. Thus, the security negotiations need to be discussed between security experts of both client and service providers. It was also acknowledged that customers can have different kind of knowledge, experiences and processes with procurement and all of those can have an impact on the purchasing decision-making.

As discussed already in 5.2.1, the maintenance of software solutions tends to require large variety of skills. If companies do not want to invest on the low-level maintenance-related skills, SaaS alternatives can be more feasible. If the company has already earlier invested into these skills, it might not seem that important to switch to cloud. Anyway, with cloud-based solutions companies can reduce the time used for the maintenance routines. Instead, they can focus on work, which was considered to be more value-adding. This work involves challenging business about their requirements and analyzing these requirements against features of available products.

Companies have developed their IT system landscape for years. Existing systems and IT landscape overall has an effect on future software purchasing decisions. The purchased applications need to fit into the company's IT architecture. It was seen essential that the applications can be easily integrated into other key applications easily. In current SaaS solutions, it was seen that application programming interfaces (APIs) and the connectivity are in a good level, making it easy to integrate them into existing system landscape. But at the same time, it was acknowledged that especially earlier cloud solutions were not always that easily integrated. Thus, in some earlier decisions, the connectivity of the SaaS alternative was seen as a negative determinant. One interviewee also highlighted that many SaaS systems provide direct connections to other cloud applica-

tions out-of-the-box or with certain extra cost. That of course simplifies the integrations. As already discussed around the top management attitude, the architectural policies regarding the IT landscape have an effect on the decisions. When the organization tries to move their applications to cloud, it of course is seen as a positive adoption determinant for SaaS solution.

When considering new software solutions, it can be that there is already an existing solution that is to-be replaced. If the evaluations show that the current solution is cost-effective and there are no major gains from switching systems, then it may be that the existing solution remains in use.

Two interviewees in the smaller company saw benefits from SaaS usage due to their small size. They thought that with SaaS solutions they can get better tools for smaller IT innovation resources. Larger SaaS providers do much of the work. In addition, the SaaS products keep up-to-date with the latest features with minimal effort. This reduces the number of time-consuming tasks on client end. As stated in 5.2.1, with on-premise solutions, the specificity of knowledge required for system maintenance is higher. Thus, especially in smaller IT organizations, the criticality of individual employees tends to rise. With SaaS solutions, smaller companies can reduce the impact of this risk.

In the other hand, small company size can reduce SaaS adoption. One interviewee acknowledged that with smaller IT organization, it can be that there is no time for taking new innovations into use. In such situations, the current on-premise solutions are seen as good enough. With limited time and resources, companies have to live with current systems. This can delay the SaaS adoption plans for long periods.

Industry as such was not seen as a critical factor affecting SaaS adoption. It mainly related to other environmental aspects such as copying from other organizations and regulation. It was noted that if the company operated on certain tightly-regulated industry, it would bring certain regulation into the consideration. None of the interviewees raised any specific regulation that would make their own industry different from most others. One interviewee discussed that certain industries tend to adopt new technologies faster. Companies in these industries seemed to be better suitable when considering sources for benchmarking and copying.

## 5.4 Environmental context

Organizations do not exist in a vacuum. Other organizations, regulation and society are constantly influencing the decisions that organizations make. Interviewees' from different roles raised the importance of regulation, customer pressures and copying from other organizations. Competition was also considered important by some respondents while

environmental friendliness and uncertainty avoidance were not seen that critical by any of the respondents. The environmental adoption determinants are listed in table 6 below.

| **Environmental determinant** | **Raised by interviewees** |
|---|---|
| Regulation | 7/7 |
| Customer pressures | 4/7 |
| Copying from other organizations | 4/7 |
| Competition | 2/7 |
| Uncertainty avoidance | 1/7 |
| Partnerships | 2/7 |
| Environmental friendliness | 0/7 |

**Table 5 - Environmental determinants by interviews**

Regulation was discussed in all of the interviews. Especially the current General Data Protection Regulation (or GDPR for short) was raised by all of the interviewees in the early stages of the discussions. In order to comply with the GDPR, the interviewees told that they need to require certain things from their service providers. Data ownership and personal information management were considered important topics.

There was some skepticism towards cloud service providers when it comes to compliance with regulation. This was especially evident in cases where personal information was processed and stored. Even if the service providers tell their customers that they comply, it is still difficult to verify. In the end, the companies are themselves responsible for their own compliance, even if they use the software of external service providers. However, the trust towards larger service providers such as Microsoft, Amazon and Google was high. It was seen that compliance with the regulation was too critical for the business of these service providers, and thus, it should not be possible that they neglect their responsibilities. Additionally, certain contractual additions have been used to ensure that the service provider commits into doing their part of the regulations demands.

In the other hand, it was seen that usage of cloud software could help companies in complying with the regulation. Especially larger cloud software providers seemed to provide tools and mechanisms that help companies monitor and log their system usage, making it easier to verify who has accessed which data and when. This was important especially if the application contains sensitive data. Cloud application providers allowed customer companies to use these tools free-of-charge, making it a lot more cost efficient to use them, instead of building them on their own. One of the interviewees suggested that it might be beneficial to adopt software as a service because of the monitoring and logging tools it provides, even if the total cost of ownership would rise.

It was also seen by one of the interviewees that in certain industries, the regulation demands higher degree of control over the data. For example, in health care, it might be difficult to achieve this level of control with cloud applications. Thus, on-premise installation of the software may be required.

Customer pressures and the image that company represents to its customers can affect SaaS adoption. Companies inform their customers that they store and process their data properly. If they cannot ensure that their SaaS providers do so, they cannot promise it to their own customers. Especially earlier, when the cloud skepticism was more common, it might have caused damage to the company's image if their customers started to worry about company's SaaS usage. The concerns were mainly related to security and privacy.

Customer pressures were also seen as a SaaS adoption promoting determinant. It was identified that with cloud applications and services, companies could produce better user experience and better collaboration with their customers. Cloud applications are built with universal access in mind, so it makes it easier to exchange their information with customers. For example, documents could be more easily shared with customers via cloud.

It was seen by the representatives of both interviewed companies that actions and feedback received from other organizations affect the decisions made on cloud adoption. Other organizations can serve as early adopters and help stabilize and shape the service. When the service becomes more mature, and more companies start to adopt it, then it is seen as a feasible option to go to. One example was raised with certain communication software suite. Its initial cloud versions were considered instable by one of client companies. Thus, the company decided to postpone the transition from on-premise version to cloud version and waited until their client confirmed that they were confident with the cloud version. The transition with email servers was also one identified case where other organizations have been copied. Few years ago, the business emails might have been considered too risky to be held in the cloud. Nowadays, the interviewees seemed to think that these thoughts were clearly overcautious.

Two of the interviewees discussed competition related aspects to the software as a service adoption. They noted that cloud software provider can also be seen as a competitor. Thus, it would be risky to use their software and store business data on their systems. Especially the risk is higher if there is obscurity or poor terms related to data ownership. In these cases, it was seen that some other cloud service provider or an on-premise solution would be safer option. Even if the capabilities, features and pricing provided by the competitor would be superior or similar to the other options, it may still turn out that it is not even a viable alternative. This can even be seen as a strategic decision. This significance was raised by two interviews in architectural positions.

The fact that cloud software can be quickly taken into use, was not discussed in the interviews from competition perspective. It may be that since both of these companies had already been operating for more than a decade, they already have an application landscape similar to their mature competitors. Thus, there is no critical capabilities which could be caught up by adopting them from the cloud.

Uncertainty avoidance was only raised by one of the interviewees as cloud software adoption determinants. The reason why software as a service could help organizations avoid uncertainty was mainly contractual. For example, companies can reduce the uncertainty by making service-level-agreements regarding uptime. With this kind of contracts, organizations can ensure that if something goes wrong, the service provider will do their best to get the service up and running. If they fail to do that, at least the client will get some compensation. This kind of contractual agreement is also possible if hosting of on-premise software is outsourced. Thus, it is not purely a determinant to adopt cloud software, but more related to the tendency to focus on core competencies of the company. Uncertainty related to system usage was not discussed by the interviewees, even if it was noted that cloud makes it easier to try new things out. This is of course something that can be beneficial in uncertain circumstances.

Two of the interviewees discussed their IT partners as possibly affecting determinant for SaaS adoption. Existing partnerships may provide the company with an access to either on-premise or SaaS applications at lower price. This naturally makes the lower-priced option more attractive. The partnerships can also bring mandatory software to the company's environment. For example, outsourced functions may require that the company uses the partner's software system. Thus, it is impossible to select alternative software solutions.

None of the interviewees discussed environmental friendliness of the cloud software. They did not bring it up at all. Even closely related topics such as electricity costs were ignored completely. It might be that in business environment there are other aspects far more important to consider than the greenness of information technology. Environmental friendliness was not that significantly recognized in the literature either, and thus it is in line with the findings of these interviews.

## 5.5 Asset characteristics

Asset characteristics refer to the determinants originating directly from certain software solution. While some applications benefit more from transferring to the cloud, some might be more suitable for on-premise installation. Vendor availability and capabilities are also considered to be asset characteristics. For certain applications, there can be

more suitable alternatives both in cloud and for on-premise. Overview of the asset related determinants are represented in Table 4. (Schneider & Sunyaev 2016, 7)

| **Asset-related determinant** | **Raised by interviewees** |
|---|---|
| Cost effectiveness | 7/7 |
| No upfront investments | 6/7 |
| Vendor availability and competence | 5/7 |
| Business-criticality of an application | 4/7 |
| Hidden costs over time | 4/7 |
| Specialization of the software | 4/7 |

**Table 6 - Asset-related determinants in interviews**

Cost-related topics were among the most discussed ones in the interviews. The experiences of cost-effective cloud usage and reduced investment requirements make it preferable option in several cases. Different pricing models and reduced maintenance costs were identified characteristics of SaaS. Even if one interview considered that the maintenance costs of on-premise solutions are not evaluated in the similar manner as actual costs of SaaS solutions, it was still clear that the maintenance cost savings were seen as significant factors. If the maintenance has already been procured from a service provider, then it is easier to measure.

The fact that software as a service can be purchased with minimal upfront investments makes it attractive. Especially if the application does not require significant integrations or configurations before the use can start, it is simple and cost-effective to take it into use. Smaller upfront costs make it easier to experiment with applications and can also reduce the impact of bad purchasing decisions. If the company has to pay only for the usage of the application, the sunk cost won't rise high even if they later decide to abandon the software. The interviewees discussed that with on-premise software, the setup work and hardware can cause major costs already before the use of the application can even start.

One key difference between SaaS and on-premise software was the way in which the users experiment with them. Several interviewees confirmed that after the introduction of SaaS, their users have started to be more proactive in taking new software into use. After the evaluation, they usually bring these up for IT organization to discuss whether these could be taken into use officially. This reduces the visibility and control of the IT organization to the software solutions used by the business. This can even introduce additional costs if the company would already have supported software for the same purpose available, but the individual user decides to use another paid software.

In cloud, it is usually easier to scale the use of the application by adding new users to the subscription. In on-premise applications, the licenses are more often purchased beforehand and it is more difficult to adjust them. One of the interviewees highlighted that they have had cases in which they found the scalable start to application use too difficult with on-premise licensing. The on-premise licenses were usually sold with the potential maximum usage in mind making the initial license costs high. Instead they found the SaaS alternative to be more suitable for cost-efficient and scalable start.

Several interviewees highlighted the match between business requirements and available software solutions. If there is no suitable SaaS alternative available, then it is not possible to even consider cloud solutions. In these cases, on-premise products or custom-built solutions have to be considered. In addition, even if there were SaaS vendors, it might be that their capabilities are not yet good or mature enough in order to be trusted. Here it was seen that cloud offerings became available earlier for more generic software mature. Cloud anyway makes it easier to try out software solutions in order to evaluate vendor competence and software features. As the client has less control over software hosting in cloud, it puts more pressure on the cloud service provider. This makes vendor capabilities more critical

Business-criticality of an application was seen as a factor that both increases and decreases SaaS suitability. The decreasing impact was mainly related to the loss of control of security and availability. In business-critical applications the data can be extremely valuable for the company. Thus, it can be too risky to put it outside of control of your own organization. In the other hand, business-critical applications usually require certain uptime requirements. It can be difficult or costly to agree these kinds of agreements with service providers.

Business-criticality increases uptime and security requirements. Most of the interviewees agreed that if these services are provided in-house with on-premise software, it can require extensive investments on infrastructure and maintenance work. Considering for example email server, potential outage can have serious negative impact as the communication is reduced and emails might be missed. Fault-tolerant and usually costly infrastructure is a requirement with business-critical applications, and thus it was seen beneficial to move them to the cloud.

Since the cost of most SaaS applications are derived from the actual usage, hidden costs can incur over time. As two of the interviewees suggested, it can be difficult to identify the actual usage in advance. If the usage is based on users, all the required users need to be identified when costs are predicted. It might also be that it is difficult to predict the system usage in advance in terms of the pricing criterion. Some pricing criterion seemed to be easier for the prediction. One of the interviewees suggested that if applicable, the revenue-share-based pricing model was the easiest one to predict. In the other hand, transaction and system resource usage-based models were the most difficult ones

to evaluate in advance. If the pricing is based on actual system usage, proper monitoring and controlling tools and processes are needed to avoid unexpected extra costs. It is common in SaaS applications that only certain features are included in each subscription level. Extra features will be purchased as add-ons and can also cause extra costs, if their need and capabilities are not evaluated or understood in advance. It was also discussed that since the SaaS costs are usually recurring from month to another, it might require specific justification for them to be included in the budget.

In the literature, it was identified that specialization of the software reduces SaaS adoption. This was also confirmed by three interviewees. As per their experience, general software was first deployed via cloud. As the specificity increases, it takes longer for the software to become available in the SaaS market. The interviewees had also encountered beliefs that the cloud versions usually lacked certain features which are included in their on-premise competitors. After more thorough evaluation however, it was found that either there is no difference in the functionalities offered, or that the differences are so minor that it has no impact on the customer company. One interview also highlighted a case in which the functionalities in the cloud version were superior in comparison to the on-premise alternative.

Below is a figure that summarizes the main findings of this research. It was identified that there are three levels of asset specific characteristics that affect the SaaS decision-making. There are universal adoption determinants that do not depend on the asset-specific factors. These are located in one of the three elements of TOE framework. For example, company size falls into this category. Then there are determinants that are directly related to the procured software asset. These do not naturally fall into any of the TOE framework elements. For example, business-criticality of an application is a part of this category. Then finally, there are determinants that fall into one of the three elements of TOE framework but have certain asset-specific variances. For example, the security falls into this category. Figure 5 below is adapted from Figure 4 based on the research results. Direct relation from asset characteristics has been added. In addition, universality of certain technological, environmental and organizational aspects has been highlighted by extending these contexts outside the asset characteristics.

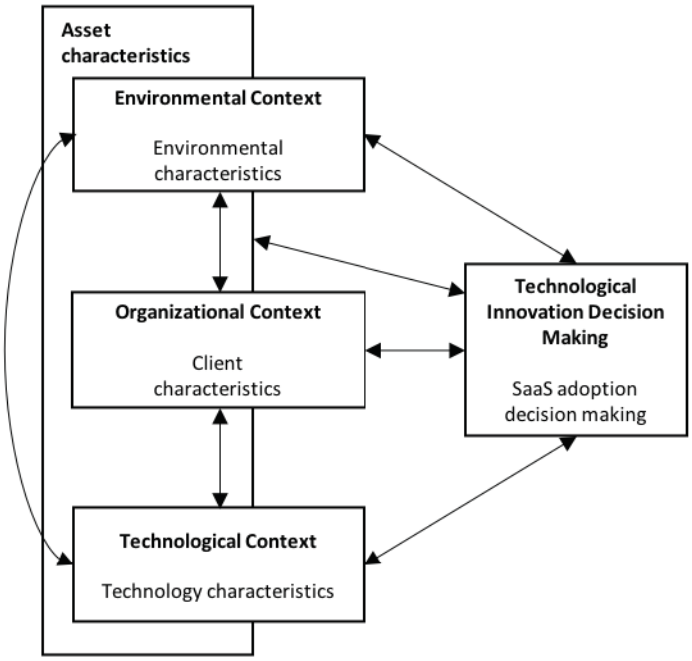


**Figure 5 - Research framework adapted with the research findings**

# 6 DISCUSSION

## 6.1 Key findings

The goal of this research was to assess the software as a service adoption determinants and their relation with asset- and software-specific characteristics. The focus has been in information technology organizations. This research covered the technological, organizational and environmental characteristics that affect SaaS decision-making. In addition, the asset related variances in these characteristics were clarified and direct asset-related determinants were identified. The research questions were:

- *What software as a service adoption determinants are seen valuable in IT organizations?*
- *How do the characteristics of individual software affect these determinants?*

This research categorized potential SaaS adoption determinants into four categories: (1) technology context, (2) organizational context, (3) environmental context and (4) asset-specific determinants. The categorization was derived from the results of the literature review. In addition, it was identified that asset-specific determinants also introduce variance in the first three categories. Overall as summarized in the next few paragraphs, this researched was able to answer the research questions and thus, successfully fulfills its purpose. SaaS adoption determinants were identified successfully and the reasoning behind them was clarified. In addition, relationships between procured asset and the adoption process were identified.

In this research, the technology context referred to the way cloud technology enables or limits the enterprise computing in contrast to on-premise hosting. When software is procured from cloud, certain degree of control is lost. Security, update schedule and availability are in control of the service provider. However at the same time, the maintenance effort is reduced. Different software assets behave differently in the SaaS technology context. The security aspect was seen very differently depending on the application. If business critical and sensitive personal information is processed with the software, then the security is a more important theme. If the application data is not so critical, then the security of SaaS adoption can be seen as beneficial. If the specific application does not seem to be that critical from security point of view, it is more cost-effective and reduces adoption time, if the service provider takes care of all the security things. When service provider takes care of all the security and maintenance work, it frees up resources for other tasks within the client organization. Certain applications can be time-consuming and troublesome to maintain in on-premise setup. Thus, SaaS adop-

tion may provide more benefits in these cases. In contrast, some applications can be quite effortless to maintain, and in that sense, would not benefit that much from switching to SaaS. The asset-specific factor was also present in the availability topic. Certain applications had clearly tighter requirements for availability than others.

Organizational context is formed by the characteristics of the client. It contains the individuals of the organization, their relationships, skills and internal processes. It is formed over the years. One important aspect in software procurement, the existing IT landscape, is part of organizational context. Top managements attitudes were seen as one of the most important organizational determinants affecting SaaS adoption. However, there seemed to be little asset-specific variance in it. Only specific business requirements could override high-level guidelines. The existing IT landscape was the most critical one with significant asset-specific characteristics. The application in consideration needs to fit the existing landscape. The integration requirements depend highly on the nature of the procured software and thus, different assets should be evaluated differently. If the software is procured to replace another one, then the characteristics of the original one need to be taken into consideration. Some organizational determinants, such as company size and industry seemed to have no asset-specific relations.

Environmental characteristics did not receive as much attention as the technical and organizational ones. Regulation was the most significant determinant there. It had also notable relation to specific software. Software which is used to store and process personal information tends to be more risky for cloud deployment. More general-purpose applications did not have this kind of risk. Otherwise environmental factors did not seem to have this kind of relationship with specific applications. Partnerships with software vendors were completely new determinant as it was not identified in the existing literature.

In addition to technological, organizational and environmental contexts, direct asset characteristics were identified. The cost effectiveness and the overall cost formation of each individual software products differ and thus, each of them needs to be evaluated differently. Each software is provided by different vendors, making the vendor availability and competency a significant determinant for each application.

## 6.2 Research implications

This research falls into the area of technology adoption related literature. It builds on top of existing cloud and SaaS adoption literature. The main contributions which this research introduces to this field are (1) comprehensive evaluation of SaaS adoption determinants and (2) linking the asset-specific variances to these determinants. This research is thus far one of the first studies assessing software as a service adoption deter-

minants by interviewing several individuals within same organizations. Thus, it evaluates the SaaS adoption from broader perspective than the previous research which has mainly focused on specific roles only. In the earlier research, mostly application type has been used as an asset-specific determinant. This research combined all the SaaS adoption determinants under one study and evaluated their relationships with the asset in question. This provides more insights to the software as a service procurement decision-making. In the future research, asset-specific factors need to be considered before drawing generalizable results.

## 6.3 Managerial implications

Software procurement decisions are made by organizations constantly. New business requirements emerge continuously, and technology is taken into use to respond to them. Poor purchasing decisions can be costly and result in a wasted time and effort. SaaS is becoming more and more noteworthy option for every use case. Proper assessment of the alternatives is required if the organization wants to be successful in its software purchases. This research provides insights and details about different aspects and determinants which need to be taken into consideration during the evaluation. Thus, the results of this research will help companies and other organization to make better informed software procurement decisions.

At the same time, there are several software vendors that try to address their customers concerns as well as possible. To better address client requirements, the service providers need to understand the decision-making process and evaluation criterion on the potential client side. If the client requirements are understood properly, service providers are able to create products and services that benefit their clients even more. That will naturally increase the changes of drawing new additional customers.

## 6.4 Limitations and future research

Interview as a research method is vulnerable to subjective interpretations. Even if the author has put a lot of effort in ensuring objective treatment in the material collection, one cannot guarantee that data interpretation is fully objective. It is thus possible that also conclusions drawn from the interpretation are subjective. The interviewee selection was also made with easy accessibility in mind. Thus, only two companies were included in the sample. This reduces the generalizability of the results. However, the fact that this approach allowed interviewing of several individuals within single organization is also seen as one of the strengths of this study.

The results of this research showed that decision-making in software as a service adoption is a complex topic with several aspects to consider. Some of these aspects have universal characteristics, meaning that their impact is similar regardless of the procured application. Other characteristics and their relative importance can vary depending on the software in question. In future research there would be potential for research which tries to gather broader view to this topic by quantitatively testing the results of this research in more organizations and with more respondents. It would also be interesting if more employee role -related differences would be evaluated. This study focused on information technology organizations, but as the IT-savviness of business is growing, the business decision-makers attitudes towards SaaS adoption might be of interest as well.

All in all, organizations are becoming more and more experienced with SaaS solutions. As experience is gained, the attitudes towards certain adoption determinants is changing. Thus, there is a room for research that would compare the adoption determinants in different points of time. In addition, as it most likely will be that the attitudes keep changing as time goes by, there is a room for SaaS adoption research in the future as well. As one of the interviewees commented the topic of this research: the topic is very current at the moment, but it also has been it for a decade. One could expect that it will remain current for at least another decade.

# REFERENCES

Amazon EC2. Amazon. <https://aws.amazon.com/ec2/>, retrieved 8.2.2017.

Armbrust, M. – Fox, A. – Griffith, R. – Joseph, A. D. – Katz, R. – Konwinski, A. – Lee, G. – Patterson, D. – Rabkin, A. – Stoica, I. – Zaharia, M. (2010), A view of cloud computing. *Communications of the ACM*. Vol. 53(4), 50-58.

Azure solutions. Microsoft. <https://azure.microsoft.com/fi-fi/solutions/>, retrieved 8.2.2017.

Benlian, A. – Hess, T. – Buxmann, A. (2009) Drivers of SaaS-Adoption – An Emprical Study of Different Application Types. *Business & Information Systems Engineering*. Vol. 1(5), 357-369.

Benlian, A. – Hess, T. (2011) Opportunities and risks of software as a service: Findings from a survey of IT executives. *Decision Support Systems*. Vol. 52, 232-246.

Blaskovich, J. – Mintchik, N. (2011) Accounting executives and IT outsourcing recommendations: an experimental study of the effect of CIO skills and institutional isomorphism. *Journal of Information Technology*. Vol. 26, 139-152.

Build better apps with Force.com. Salesforce.com. <https://www.salesforce.com/products/platform/products/force/?d=70130000000f27V&internal=true>, retrieved 8.2.2017.

Böhm, M. – Leimeister, S. – Riedl, C. – Krcmar, H. (2011) Cloud Computing – Outsourcing 2.0 or a new Business Model for IT Provisioning? in: *Application Management*, eds. Keuper, F. – Oecking, C. – Degenhardt, A., 31-56. Gabler Verlag, Wiesbaden

Chau, P. Y. K. – Tam, K. Y. (1997) Factors Affecting the Adoption of Open Systems: An Exploratory Study. *MIS Quarterly*, Vol. 21(1), 1-24.

Chen, P. – Wu, S. (2013) The Impact and Implications of On-Demand Services on Market Structures. *Information Systems Research*. Vol. 24(3) 750-767.

Davis, F. D. (1989) Perceived usefulness, perceived ease of use, and user acceptance of information technology, *MIS Quarterly*, Vol. 13(3), 319-340.

DePietro, R. – Wiarda, E. – Fleischer, M. (1990) The Context for Change: Organization, Technology, and Environment in: *The Process of Technological Innovation*, eds. Tornatzky, L. G. – Fleischer, M., 151-175. Lexington Books, Toronto

Eha, B. P. (2013) An Accelerated History of Internet Speed (Infographic). *Entrepreneur*. <https://www.entrepreneur.com/article/228489>, retrieved 7.2.2017.

Eriksson P. – Kovalainen A. (2008) *Qualitative Methods in Business Research*. 1st ed. Sage Publications, Thousand Oaks

Fink, A. (2005) *Conducting research literature reviews: From the Internet to paper*. 2nd ed. Sage Publications, Thousand Oaks

Fisher, C. M. (2010) *Researching and writing a dissertation : an essential guide for business students*. 3rd ed. Pearson Education Limited, Harlow

Fisher, J. – Shanks, G. – Lamp, J. (2007) A ranking list for information systems journals. *Australasian Journal of Information Systems*. Vol. 14(2), 5-18

Giannakouris K. – Smihily M. (2016) Cloud computing – statistics on the use by enterprises. Eurostat. <https://ec.europa.eu/eurostat/statistics-explained/index.php/Cloud_computing_-_statistics_on_the_use_by_enterprises>, retrieved 15.9.2018.

Goode, S. – Chinho, L. – Tsai, J. C. – Jiang, J. J. (2015) Rethinking the role of security in client satisfaction with Software as a service (SaaS) providers. *Decision Support Systems*. Vol. 70, 73-85

Google Fiber. Google. <https://fiber.google.com/about/>, retrieved 8.2.2017.

GSuite. Google. <https://gsuite.google.com/>, retrieved 9.2.2017.

Gupta, P. – Seetharaman, A. – Raj, J. R. (2013) The usage and adoption of cloud computing by small and medium businesses. *International Journal of Information Management*. Vol. 33, 861-874.

Heroku Platform. Salesforce.com. <https://www.heroku.com/platform>, retrieved 8.2.2017

Kung, L. – Cegielski, C. G. Kung H-J. (2015) An integrated environmental perspective on software as a service adoption in manufacturing and retail firms. *Journal of Information Technology*. Vol. 30, 352-363.

Lacity, M. C. – Khan, S. – Yan, A. – Willcocks, L. P. (2010) A review of the IT outsourcing empirical literature and future research directions. *Journal of Information Technology*. Vol. 25, 395-433.

Lee, C.-P. – Shim, J. P. (2007) An Exploratory Study of Radio Frequency Identification (RFID) Adoption in the Healthcare Industry. *European Journal of Information Systems.* Vol 16(6), 712-724.

Lee, S.-G. – Chae, S. H. – Cho, K. M. (2013) Drivers and inhibitors of SaaS adoption in Korea. *International Journal of Information Management*. Vol. 33, 429-440.

Lincoln, Y. S. – Guba, E. G. (1985) *Naturalistic Inquiry.* 3rd ed. Sage Publications, Thousand Oaks

Low, C. – Chen, Y. – Wu, M. (2011) Understanding the determinants of cloud computing adoption. *Industrial Management & Data Systems*. Vol. 111(7), 1006-1023.

Martson, S. – Li, Z. – Bandyopadhyay, S. – Zhang, J. – Ghalsasi, A. (2011) Cloud computing – The business perspective. *Decision Support Systems*. Vol. 51, 176-189.

Maylor, H. – Blackmon, K. (2005) *Researching Business and Management*. Palgrave Macmillan, New York

Mell, P. – Grance, T. (2011) The NIST Definition of Cloud Computing. National Institute of Standards and Technology. <http://nvlpubs.nist.gov/nistpubs/Legacy/SP/nistspecialpublication800-145.pdf>, retrieved 9.2.2017.

Meulen, R. – Woods, V. (2016) Gartner Says Customer Relationship Management Software Market Grew 12.3 Percent. Gartner. <https://www.gartner.com/newsroom/id/3329317>, retrieved 14.9.2018.

Meulen, R. – Bamiduro, W. (2018) Gartner Says Global IT Spending to Grow 6.2 Percent in 2018. Gartner. <https://www.gartner.com/newsroom/id/3871063>, retrieved 14.9.2018.

Micheni, E. M. (2015) Using the Technology Organization Environment Framework for Adoption and Implementation of Cloud Computing in Institutions of Higher Learning in Kenya.

Moore, S. – Meulen, R. (2018) Gartner Forecasts Worldwide Public Cloud Revenue to Grow 21.4 Percent in 2018. Gartner. <https://www.gartner.com/newsroom/id/3871416>, retrieved 14.9.2018.

Mäntymäki, M. (2011) Continuous Use and Purchasing Behaviour in Social Virtual Worlds, Doctoral Dissertation in Information Systems Science, Turku School of Economics, Series A, Turku

Qu, W. G. – Pinsoneault, A. – Oh, W. (2011) Influence of Industry Characteristics on Information Technology Outsourcing. Journal of Management Information Systems Vol. 27(4), 99-127.

Rogers, E. M. – (1995) *Diffusion of Innovations.* The Free Press, New York

Rowe, F. (2014) What literature review is not: diversity, boundaries and recommendations. *European Journal of Information Systems*, Vol. 23(3), 241-255.

Sales Cloud. Salesforce.com. <https://www.salesforce.com/products/sales-cloud/overview/>, retrieved 8.2.2017.

Schneider, S. – Sunyaev A. (2016) Determinant factors of cloud-sourcing decisions: reflecting on the IT outsourcing literature in the era of cloud computing. *Journal of Information Technology,* Vol. 31, 1-31.

Senior Scholars' Basket of Journals. Association for Information Systems <http://www.aisnet.org/?SeniorScholarBasket>, retrieved 8.1.2017.

Sultan, N. (2010) Cloud computing for education: A new dawn? *International Journal of Information Management*. Vol. 30, 109-116

Susalra, A. – Barua A. – Whinston A. B. (2009) A Transaction Cost Perspective of the "Software as a Service" Business Model, *Journal of Management Information Systems*. Vol. 26(2), 205-240.

Wang, N. – Liang, H. – Jia, Y. – Ge, S. – Xue, Y. – Wang, Z. (2016) Cloud computing research in the IS discipline: A citation/co-citation analysis. *Decision Support Systems* Vol. 86, 35-47.

Webster, J. – Watson, R. T. (2002) Analyzing the Past to Prepare for the Future: Writing a Literature Review. *MIS Quarterly*, Vol. 26(2), 13-23.

Why Rackspace? Rackspace. <https://www.rackspace.com/why-rackspace>, retrieved 8.2.2017.

Youseff, L. – Butrico, M. – Da Silva, D. (2008) Towards a Unified Ontology of Cloud Computing. Grid Computing Workshop (GCE '08), 1-10.

# A BASIC STRUCTURE FOR THE INTERVIEWS

Interviewee: Date:

Role:

| |
|---|
| **Introduction** |
| Practicalities (informed consent, recording) |
| Scope of the study |
| Interviewees role and background |
| Company's IT landscape and cloud usage |
| **Technology characteristics** |
| Flexibility in switching service providers (e.g. no upfront investments) |
| Flexibility in system usage |
| Access to special software with low cost and little technical expertise |
| Reduced number of routine maintenance tasks |
| Availability from anywhere with any device |
| Loss of control of the availability |
| Loss of control of the security |
| Loss of control of the updates |
| Security risks |
| Security gains |
| **Client characteristics** |
| Small company, smaller resources for IT, cost effectiveness |
| Small company, no resources for IT innovations |
| Knowledge and skills |
| Legacy systems |
| Top managements positive attitude |
| Top managements negative attitude |
| Industry |
| **Asset characteristics** |
| Cost effectiveness |
| No upfront investments (pay-per-use) |
| Hidden costs (over time) |
| Business-criticality of an application |
| Specialization of the software |
| Vendor availability and competence |
| **Environmental characteristics** |
| Customer pressures |
| Environmental friendliness |
| Copying from other organizations |
| Regulation |
| Competition |
| Uncertainty avoidance |
| **Conclusions** |