Implementing Cloud Computing. A Study of the Impact on the IT Department

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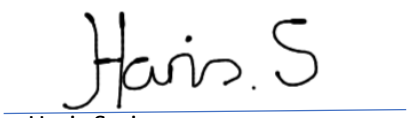
Preface

This master thesis was conducted by two students at the University of Agder (UiA) as a part of the last course of the 2-year Information System master program (2018-2020). The study was done over one semester. It was challenging work with many frustrating moments. Still, it was an enriching study that gave us great insight into how to conduct research studies, as well as we gained practical insight into how CC is used in different organizational contexts.

We want to thank our supervisors, Professor Eli Hustad and Associate Professor Ilias Pappas, for guiding us through this semester and the master thesis. We are really grateful for the time and effort they have put into helping us through comments, discussions and several meetings. We are really thankful for the time and effort they have put into helping us through comments, discussions, and several meetings.

We also want to thank our fellow students who have helped us stay grounded throughout this whole study. A special thanks to our fellow students Magnus Høvik and Mohammad Hussain, who we have studied with for the past five years throughout this entire journey. They have been part of many great discussions and has been of great help through this master thesis, both through social activities and academic advice.

Additionally, we want to thank all of our participants who were willing and took their time to sit down and have an interview with us.



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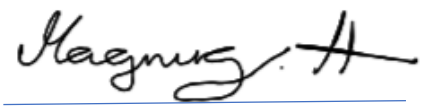

Magnus Hornnes

Abstract

Cloud Computing (CC) has become an area of interest among many organizations. Many have started to prioritize the development of both public and private Clouds for storing the increased volumes of data, and to exploit the benefits of the phenomena. With the new benefits of public Cloud, it is inevitable that some of the tasks the traditional IT departments have provisioned are being outsourced to a third party, and will be contributing to some sort of organizational and managerial change for them.

Based on this, the study has its purpose of researching how the IT department is impacted in organizations based on CC adoption. To investigate this topic, we developed the following research question; "*What impact does Cloud Computing have on the IT department and its IT governance mechanisms?".* Answering the proposed RQ will help us identify how the IT department has been impacted, as well as identifying the change in its IT governance mechanisms. To assist in answering the question above, we developed two sub-questions; *"How will the role of the IT department within an organization change after adopting CC services?"* and "*How will CC affect the managerial responsibilities within the IT department?".* These will provide further information and answer our presented RQ, as well as providing a broader specter of information.

To answer the research question, we conducted the thesis as an exploratory qualitative study where we have used an interpretivistic research approach. We have conducted a total of eleven semi-structured interviews, where we talked to different top-level managers in various organizations regarding their Cloud use, adoption, and how it impacted them. These organizations were well established, meaning they are commonly known among the population of Norway, and they covered a wide range of both public and private sectors, as well as different industries.

Through our analysis, we identified three main categories, two that are directly related to the impact on the IT department, and one that helped contextualize our findings by investigating the use of the organization's CC services. Our research suggests that there are two main directions where the IT department meets changes. These changes can be summarized in two perspectives, internal-facing towards their organization and external-facing towards the Cloud Service Provider (CSP). We have constructed a model to illustrate the impacts we have identified, and the dynamics between them. The model presented is aimed to help organizations that have started adopting CC services, or are planning to adopt CC services. This study contributes to a better understanding of how CC adoption impacts the organization and its IT department. Through the IT department's external-facing role, they will have to emphasize its responsibilities towards *Application, Resource, Security,* and *Data Management.* Through their internal-facing role, they will have to change and acquire new knowledge by cooperating cross-department and by emphasizing *Change management* and *Knowledge management.* These need to be emphasized throughout the organization so that they can become more service-oriented and align IT and business to meet the organizational goals.

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1 Introduction

The growth in Information Technology (IT) is creating an increase in productivity and economic benefits (Breaux, Gordon, Papanikolaou & Pearson, 2013), and leading the societies into an increasingly digital world (Pappas, Mikalef, Giannakos, Krogstie & Lekakos, 2018). Thus, making digital transformation a constant factor for many industries to take into consideration, which can result in changes regarding processes, infrastructure, technology, knowledge, and responsibility changes (Rockmann, Weeger & Gewald, 2015). An often seen trend is Cloud Computing (CC) as the vital pillar of the digital transformation journey in organizations (Al-Ruithe, Benkhelifa & Hameed, 2018).

CC has emerged as a disruptive technology within the IS field (Sultan & van de Bunt-Kokhuis, 2012). While CC shares some disruptive qualities, it is not inherently disruptive. For many organizations, it has enabled a lot more opportunities. CC offers countless of different solutions such as the pay-as-you-go model, making it easier for smaller companies to stay relevant in the market, as the initial threshold of investment is not as large compared to on-premise solutions (Avram, 2014).

Gartner (2019) predicts that there will be close to a 100% increase in CC revenue from 2018 to 2022. This prediction can be an indicator that CC will be adopted by more companies worldwide as they have to adapt to the new technological solutions provided so that they can stay competitive in the dynamic market. Several studies have been conducted to analyze the market of CC. Based on the 2018 IDG Cloud Computing Study, which consisted of over 550 SMEs and large enterprises, showed that over 77% had at least one application or parts of their enterprise computing infrastructure deployed in the Cloud.

Moving to a cloud environment presents a fair number of challenges, as it requires a lot of changes and restructuring. These are changes in the traditional corporate governance structure, IT architecture, business models, routines, business processes, organizational structures and that the technology will challenge an organization's established knowledge foundations (Chang, Wong, Eze & Lee, 2019). CC requires new levels of IT governance and controls, which is forcing firms to reassess their traditional IT governance practices (Becker & Bailey, 2014; Vithayathil, 2018). Additional barriers and challenges are technical, security and privacy issues, and challenges related to cost and performance (Chang et al., 2019; Phaphoom, Wang, Samuel, Helmer & Abrahamsson, 2015).

In our literature study, we discovered a notion that the IT department has to change due to the aforementioned reasons, towards a more service-oriented role to stay relevant (Becker & Bailey, 2014; Resen, Ibrahim, Shyaa & Stephan, 2020; Vithayathil, 2018). However, we identified a lack of literature regarding specific managerial responsibilities and roles within the IT department. Thus, our goal is to identify how CC impacts the IT department's role and responsibilities in terms of its function and IT governance mechanisms, as traditional ITwill be affected by CC adoption (Vithayathil, 2018). The primary focus is on the perspective of what managerial and control mechanisms organizations have to consider and prioritize to a higher degree due to CC adoption, the relational mechanisms that relate to interdepartmental collaboration and workflow, and less on the changes in authority structures in the organizations (Khan, Nicho & Takruri, 2016).

1.1 Research Question

As mentioned briefly before, the master thesis has two aspects that we will focus on in this study. To help answer the research focus, we derived at the research question below, which will provide additional knowledge and information to answer the discussion of this thesis.

> *RQ1: What impact does Cloud Computing have on the IT department and its IT governance mechanisms?*

To answer the main research question, we created two additional sub-questions. Both of them provide further information and answers RQ1.

> *SQ1: How will the role of the IT department within an organization change after adopting CC services?*
>
> *SQ2: How will CC affect the managerial responsibilities within the IT department?*

The purpose of SQ1 is to investigate how the IT department's role has changed in terms of collaboration with other departments, their workflow, and overall purpose.

SQ2 will help us answer how the IT department's managerial and control mechanisms have changed. Questions such as; *will the managerial responsibilities decrease due to shifting responsibility issues to the Cloud Service Provider (CSP), or will there still be important aspects to consider regarding them?*

We will also investigate how far into the CC adoption process the organizations are and how they use it by addressing their motivational factors, what types of deployment models they are utilizing, where the initiative comes from, and lastly, about their service models. The purpose is to get a better understanding of the contextual situation the different organizations are in, which we believe can give us a better understanding of our RQ and SQs.

1.2 Motivation

Through our studies at the University of Agder (UiA) we have developed a genuine interest in Cloud Computing. CC has been the core of many of our courses and has sparked an interest that led us to write a master thesis on the topic. Through our studies, we also discovered what areas were researched and what was missing in the literature, which motivated us to fill this research gap.

The IS field has done a lot of research on different aspects of CC, even though it is relatively new. The well-researched areas within CC are topics such as barriers, motivators, benefits, challenges (Alta van der Merve & Kotzé. 2011; Dillon, Wu & Chang, 2010), as well as a lot of studies of different adoption processes of the various CC services (Alshammari, Adamopoulos & Dick, 2018; Kaltenecker & Hess, 2014; Langhein & Thomas, 2018). We want to examine what the literature is lacking and motivate further research in these areas to get a better understanding of the Cloud phenomena. By studying these areas, we aim to present literature that can be used by firms in the process of adopting CC, to help ease their adoption process.

1.3 Thesis Disposition

The thesis uses a traditional structure for master's theses proposed by our supervisors and guidelines from the University of Agder. The structure consists of six parts (besides chapter 1 – Introduction); *Introducing the topic, Related Research, Research Approach, Results, Discussion,* and *Conclusion & Implications*. The chapters are explained in detail below.

Chapter 2 – *Introducing the topic*: Elaboration of the main concepts *Cloud Computing, IT Governance,* and *Traditional IT Department,* which are the concepts that are the focus of our research question. The purpose is to get a better perspective of the technology and our understanding of the concepts.

Chapter 3 – *Related Research*: This chapter is mainly a review of prior research on this topic to clarify applicable concepts, which the report will build upon. Parts of this systematic approach were done in regards to another subject, "*IS-420 Aktuelle tema og forskningsområder innen informasjonssystemer*" (UiA, 2019).

Chapter 4 – *Research Approach*: Contains the research approach which goes in-depth on our chosen research design, including topics such as our chosen research perspective, how we collected data, the data analysis, and how we coded and ensured validity and reliability.

Chapter 5 – *Results*: Presentation of our findings from our data analysis. The results clarify our findings regarding our research question and other important concepts that we identified through our conducted interviews.

Chapter 6 – *Discussion*: In this chapter, we'll discuss the findings from the results and what they mean, and relate them to literature to find commonalities and differences to get a better understanding of them.

Chapter 7 – *Conclusion and Implications*: We present the most important and noticeable findings and concepts, as well as implications for research and practice. We will also discuss some limitations of the study. Furthermore, we'll make suggestions for further research based on some of our limitations.

2 Introducing the topic

The purpose of this chapter is to illuminate the reader on the key concepts of this thesis. Several key concepts are mentioned throughout this thesis. Thus, we need to establish a theoretical foundation and understanding of these concepts. This chapter also aims to create consistency in the paper, as these concepts can often be interpreted in many different ways depending on the literature and the theoretical view. When discussing the various concepts in the following chapters, we will use the definitions given below.

2.1 Cloud Computing

The first definition we need to establish is Cloud Computing, as it is a term that is used a lot throughout this thesis. When referring to CC concepts, we'll be following the definition given by NIST, as other researchers often use their interpretation (Chang et al., 2019; Huntgeburth, Forderer & Veit, 2013; Rockmann et al., 2015). They define CC as;

> "*Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. This cloud model is composed of five essential characteristics, three service models, and four deployment models.*" (Mell & Grance, 2011).

CC is quite sophisticated with several service models and deployment models, and it is important to get a better understanding of the differences, as they have different impacts on the results of this thesis.

2.1.1 Cloud Deployment Models

Cloud Computing is a broad definition of different cloud infrastructures that can look very different from each other. These deployment models dictate different privacy levels, data storage, access controls, amongst many other things. The four major deployment models are *Private Cloud, Public Cloud, Hybrid Cloud,* and *Community Cloud* (Hein, 2019).

Private Cloud

The infrastructure is provisioned by a single organization and is comprising multiple consumers in the form of, e.g., business units. The infrastructure is the collection of hardware and software that enables the benefits of CC. The private Cloud can be owned, managed, and operated by the organization in question, on or off-premise, but also a professional cloud vendor, which allocate dedicated infrastructure to the organization (Mell & Grance, 2011).

Public Cloud

The infrastructure is provisioned for extensive use and compared to the private Cloud; it is open use for the general public. It can be owned, managed, and operated by a business, academic, or government organization, and the infrastructure is on the premises of the cloud provider (Mell & Grance, 2011).

Hybrid Cloud

The infrastructure is a compromised version of the two aforementioned deployment models. They are unique entities but bound together with standardized technology that enables data and application portability. One example is industries that are heavily regulated due to processing sensitive data, like the health sector. They can utilize a private cloud for sensitive data and a public cloud for the more common one (Mell & Grance, 2011).

Community Cloud

The infrastructure is provisioned from a specific community of consumers from different organizations that share the same concerns. This can be regarding the same security concerns, requirements, policies, compliance considerations, etc. It can be operated by a third party, one of the organizations, or a combination of them, on or off-premise (Mell & Grance, 2011).

2.1.2 Cloud Service Models

Cloud service models, or also called delivery models, specify the capabilities offered to users and the applications supported. There are three primary cloud delivery models, *Software as a Service (SaaS)*, *Platform as a Service (PaaS)*, and *Infrastructure as a Service (IaaS)* (Paranet, 2019). Figure 1, the *shared responsibility model*, highlights the different responsibility structures between clients and CSP with the different deployment models, where, in this case, its an example with Microsoft as a CSP.

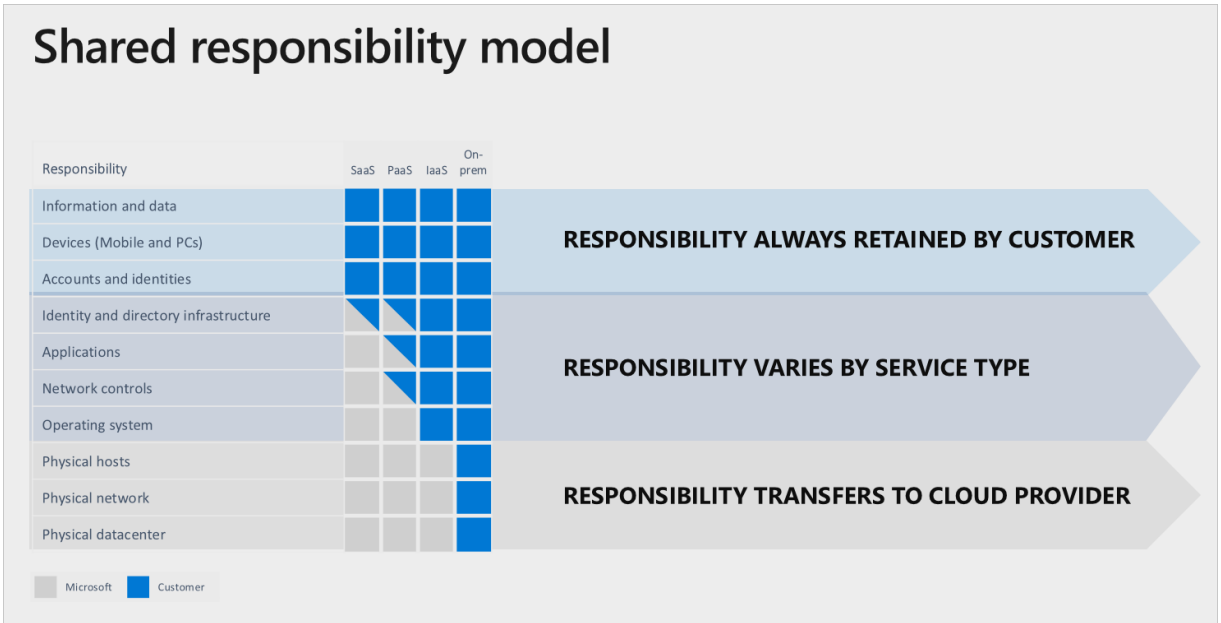

Figure 1: *"Shared responsibility model"*, 2019, by Microsoft (https://docs.microsoft.com/en-us/azure/security/fundamentals/shared-responsibility)

Software as a service (SaaS)

SaaS is the capability of leasing applications to consumers running on a provider cloud infrastructure, often done pay-per-use. These applications are highly accessible on the internet through the web-browser or program interface. The service provider will be responsible for all maintenance of the service. The consumer will not manage or control any of the underlying infrastructure, which the application is running on, such as the network, servers, etc. One exception is user and identity management (Mell & Grance, 2011).

Platform as a Service (PaaS)

PaaS is similar to SaaS. Instead of buying services, the consumer will develop their applications using platform services offered by the cloud provider. These platforms include programming languages, libraries, services, and tools supported by that specific cloud provider. This service model excludes the control over the underlying infrastructure. Unlike SaaS, where the consumers have no control over the application, the consumers will have the capability to customize the applications to their needs (Mell & Grance, 2011).

Infrastructure as a Service (IaaS)

IaaS is the service model that gives consumers the most flexibility and responsibility. They have the capability and responsibility to provision everything from a network, storage, and processing to other fundamental resources that apply to deployed software, like operating systems, etc. In other words, the consumer will have responsibility for everything, except for the underlying physical infrastructure like hardware (Mell & Grance, 2011).

2.2 IT Governance

The second term we need to establish a definition for is IT Governance (ITG). ITG is also a broad concept, so to create an unambiguous understanding of the term, we are going to follow two definitions in this paper. Weill & Ross' (2004) definition of ITG, where they state;

> "*IT governance is the process by which firms align IT actions with their performance goals and assign accountability for those actions and their outcomes.*"

De Haes & Van Grembergen (2004) have a similar explanation to the concept;

> *"IT governance is the organizational capacity exercised by the board, executive management and IT management to control the formulation and implementation of IT strategy and in this way ensure the fusion of business and IT."*

Both definitions differ, but they also focus on the same issues, how to align IT with the rest of the business to ensure organizational goals and how to delegate the primary responsibility and accountability for different actions through different controls. IT Governance Institute describes IT governance in their IT Governance Institute Board Briefing (2003, p.11) as:

Ensuring that the performance of IT meets the following objectives:

- *Aligning IT with the enterprise and realize the promised benefits*
- *Enabling the enterprise by exploiting opportunities and maximizing benefits*
- *For IT resources to be used responsibly*

- *For IT-related risks to be managed appropriately*

The concept can be connected to three different constructs, namely *structures, processes,* and *relational mechanisms*. Structures are the definition of the shape of the organizations, its key roles, power, and authority. Processes are the definition of the workflow between the roles. Lastly, relational mechanisms define the mechanisms for collaboration between different departments and, thus, how that impacts their roles and responsibility allocation (Khan et al., 2016). As a consequence of CC adoption, new requirements have emerged, and IT governance should be empowered to control and manage the different challenges and maximize an organization's return on investment in CC. Bounagui, Mezrioui & Hafiddi (2019) defines this new concept as;

> "*CC governance is a set of policies, processes, roles, responsibilities, and practices used to manage and control CC adoption and implementation in accordance with business needs."*

2.3 Traditional IT Department

The third concept we need to establish is what we mean by a traditional IT department, as this thesis looks to see the impact of CC on the traditional IT department. Therefore, we need to establish what and how IT functioned before CC adoption.

Traditionally the IT department was at the heart of the business. Fewer services and applications were available, so it was the IT department that was responsible for creating, providing, and maintaining these services internally in addition to supporting the business with technical issues. One of the main tasks is to manage technological tools internally, where hands-on experience is essential, thus, presenting *operations management* as one of the main tasks of the IT department (Shao & David, 2007; Williams, 2019).

3 Related Research

Reviewing prior literature on the topic at hand is a critical part of any academic project. The key is to find a particular problem where more research is needed and gather evidence to support the claims of newly established knowledge (Oates, 2006, p. 34).

This chapter is based on a systematic literature review conducted, that shapes the theoretical foundation based on previous literature on the concept of *Cloud Computing* in connection with *Traditional IT department* and *ITG mechanisms*. The process was done in two parts, where the first literature review was conducted in another subject, "*IS-420 – Aktuelle tema og forskningsmetoder innen informasjonssystemer*", and we extended on this literature review as a part of this thesis.

3.1 Literature Review Approach

We are following a systematic literature review approach to identify and select research to help answer our presented research questions. For our systematic literature review, we adopted some of the best practices from the literature. As a result, this literature review is highly influenced by Webster & Watson (2002), but we have also been highly inspired by others such as Danielsen & Framnes (2017) on how to approach the process of gathering and processing the literature. We explain more in-depth on how we approached this process. The concepts that we found very relevant were selected as the basis of the systematic literature review results.

3.1.1 Search Process and Criteria

Webtser and Watson (2002) mention some significant factors to consider when searching for literature. One of them is that the sources used should be determined (e.g., different journals and conferences). The search should not be confined to one research methodology or one set of journals. We decided to aim the collection of the literature review towards searching a well-known compilation of IS journals known as *basket of eight*. This compilation consists of eight acknowledged journals (Association for Information Systems, 2011), and is listed below.

- *European Journal of Information*
- *Information Systems Journal*
- *Information Systems Research*
- *Journal of AIS*
- *Journal of Information Technology*
- *Journal of MIS*
- *Journal of Strategic Information Systems*
- *MIS Quarterly*

Even though it is important to look at the leading journals primarily, as major contributions are likely to be in them, but it is also important to investigate other published articles in other journals (Webster & Watson, 2002). This is why we included more than basket of eight, but this was taken into consideration when we worked on the next step of processing them. We also had to plan out our search strategy. The search phrase must yield articles of relevance for the topic that we are studying. Based on our topic, we combined different keywords using Boolean operators like "AND" and "OR". Some criteria had to be set regarding the related research to help us accumulate results that related to our research problem to a higher degree. The main criteria were to search by using keywords relating to our research problem and look at patterns to

see what kind of synonyms that are used and variations of spelling (Oates, 2006, p.80-81; Rumsey, 2004, p. 103-109). Our chosen criteria are summarized below:

- *The articles must be posted by a trustworthy publishing journal and should be peer-reviewed*
- *The articles should not be older than ten years old*
- *The articles must be written in English or Norwegian*
- *The article must contain or address a combination of buzzwords relating to our research problem*

The literature review is also taking a similar approach to what is proposed and suggested by Webster & Watson (2002). The article goes in-depth on how to conduct and write a literature review. However, we deem some of the points they mention to be more critical than others. Listed below are the key points which we will follow, though there are other points as well, we do not follow them as blindly as the others;

- *Don't be too critical*
- *Describe key concepts and define them well*
- *Don't use models without them adding any additional information*
- *Concept-Centric*
- *Discover knowledge gaps in the literature and motivate to fill them*

The databases we chose to use were primarily Scopus and Web of Science, while Google Scholar was used to finding supplementary articles. The string below shows the first search string we developed and resulted in the first batch containing 20 articles. As each database uses a different syntax for creating search strings, we display one to show the general keywords used. The first search string was as follows:

> *«TITLE-ABS-KEY (("Cloud Computing" OR "CC") AND ("IT Department" OR "IT Structure") AND ("IT Governance" OR "IT Management") AND PUBYEAR > 2008 AND SRCTITLE ("European Journal of Information Systems " OR "Information Systems" OR "Journal Information Systems Research" OR " Journal of AIS" OR "Journal of Information" OR "Technology Journal of MIS" OR "Journal of Strategic Information Systems" OR " MIS Quarterly" OR "Communications of the Association for Information Systems (CAIS)" OR "Information and Organisation" OR "Information Technology and People" OR "International Journal of Information Management" OR "Scandinavian Journal of Information Systems" OR "MIS Quarterly Executive" OR "Computer Supported Cooperative Work") OR CONF ("ICIS " OR "ECIS" OR "AMCIS" OR "PACIS" OR "MCIS" OR "SCIS" OR "HICSS")»*

The second syntax, which acted as a supplementary addition to the first one, contained additional synonyms regarding CC, IT department and ITG, to cover a broader specter of the literature review in case we missed a significant portion. The search string was as follows:

> *"TITLE-ABS-KEY ("Cloud Computing" OR "CC" OR "Cloud") AND ("IT department" OR "IT Function") AND ("IT Governance" OR "IT controls" OR "IT administration" OR "Cloud governance" OR "IT management")…"*

This search yielded another 12 articles, giving us a total result of 32 articles.

3.1.2 Literature Processing

The compiled search strings were used to retrieve all search results from the specified journals. At this stage, we wanted to have a complete census of the literature relating to our topics. However, this led to a mass of gathered articles. Figure 2 illustrates how many articles we retrieved from the searches and from the following filtering process we conducted.

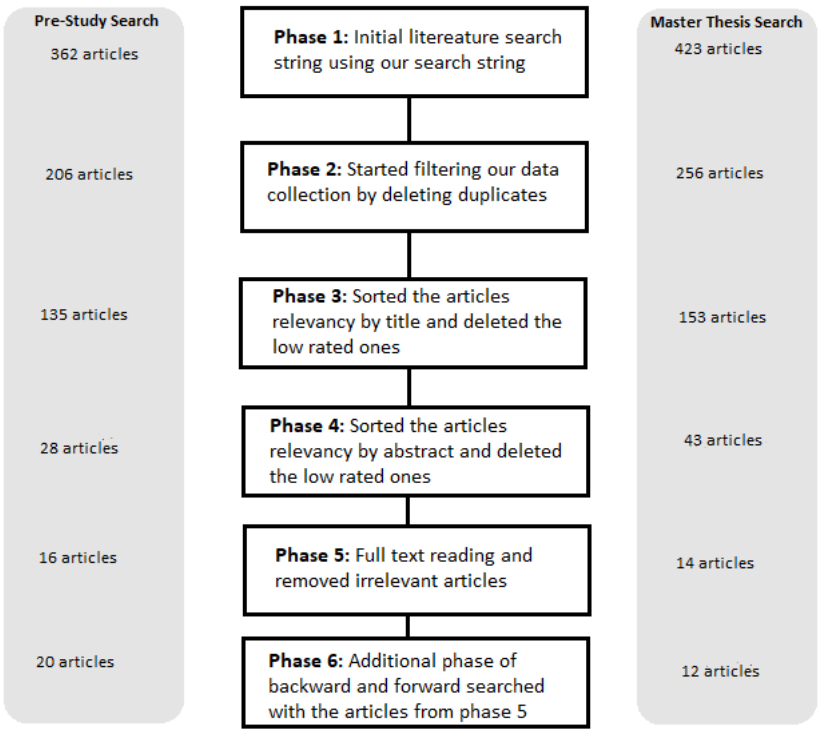

Figure 2: Literature Processing

Both sessions went through the multistep filtering process, where our goals were to lessen the articles and only collect the ones that were related to our topic as closely as possible. This was done by:

- *Deleting duplicates*
- *Evaluating the articles by topic up against our keywords*
- *Evaluating the articles by abstract*
- *Full readings of the articles that remained from the previous steps*
- *Lastly, doing forward and backward searches from the remaining articles*

The results from this process were a better understanding of concepts that are central to this topic across multiple articles, which gave us the ability to make a concept matrix and map out central themes, and what article mentions these concepts. The concept matrix can be seen in Appendix B.

3.2 Findings

During our pre-study, we constructed a concept matrix that covered the identified elements for the previous literature review. However, the pre-study was on a smaller scale, and as we expanded on the research question for this thesis, we needed to upgrade our concept matrix to cover all new aspects. The concept matrix is divided into three main categories, which we created through grouping identified concepts into higher categories.

The first category, "*Cloud impacting factors on the IT department"* is directly related to the RQ presented in this thesis. The different articles we've chosen have used a wide variety of words to describe some of the similar things. We have therefore tried to make the sub-categories general so it can capture several terms or meanings, but also specific enough to be unique and valuable as a sub-category.

Our second category, *"IT Governance"* focuses on the ITG aspect. We decided to divide the sub-categories into different management types that we identified in the literature.

The last category is "*Technologies"* which contains what kind of elements was talked about in the articles. This is primarily to see if there is any difference in our findings based on technologies such as service models and deployment models. The literature also mentions that many articles regarding CC does not differentiate between what technologies are used. Therefore we thought it would be interesting to look at that as well.

We present our findings in the sub-chapters below from the literature review, both from the pre-study and the extended review. Our results will be categorized in our two main categories to help answer our RQ, *"The impact of Cloud Computing on the IT department"* and *"Management and IT Governance"*, where we present what the current literature states about the topics.

3.2.1 The impact of Cloud Computing on the IT department

The IT department as a unit has faced various changes as a result of CC adoption, often in the form of core functions of the department (Choudhary & Vithayathil, 2013; Becker & Bailey, 2014; Vithayathil, 2018). It is suggested that the IT department and its role within the organization will be losing its relevance as a result of CC adoption, but it seems that CC enables higher IT relevance instead, when done correctly. (Heier, Borgman & Bahli, 2012; Vithayathil, 2018). The literature often mentions the transformation of the organization as a whole, which we will cover in the following chapter, but we will limit our focus to the IT department under this section. We have identified a common theme that the literature suggests. The role IT needs to undertake is towards a more service-oriented unit (Alshammari et al., 2018; Qian & Palvia, 2013). This includes roles and responsibilities such as maintaining the relationship between the CSP, evaluating, enhancing IT services, provide support to business processes & IT consulting (Vithayathil, 2018; Alshammari et al., 2018). Previously the IT department has had roles that were more focused on operational roles such as maintaining, updating, and procuring software and hardware for their internal use (Alshammari et al., 2018). By adopting CC, the relevance of the IT department actually increases as well as their horizon of responsibilities broadens (Leonhardt & Hanelt, 2018).

As mentioned, the scope of CC is quite broad, from different service models to various deployment models, and as a result, the required role of the IT department might be dependant

on the specific technology organizations choose to adopt. However, as IT is supposed to support the business side of the organization, it is not only the CC adoption that affects it but the organization's transformation in regards to new business processes. IT has the role of supporting business. Therefore, when business processes change, IT needs to change and adapt to still be able to support business (Alshammari et al., 2018). CC provides applications and infrastructure to improve internal communication, which enables them to support business easier (Palos-Sanchez, Ramirez & Velicia-Martin, 2019). As CC adoption changes the perspective of the IT department, the service-oriented perspective enables an organization to get more advice and support from the IT functions. The IT department and the role of IT, in general, has undertaken a new role in the organizations due to CC, one of their main objectives and results are often to support business which helps them align IT & business (Khan et al., 2016; Qian & Palvia, 2013).

The IT department is usually the ones responsible for developing the IT strategy within their organization. IT/IS Strategy is defined by Chen, Mocker, Preston & Teubner (2010) as *"an organizational perspective on the investment in, deployment, use, and management of information systems".* When the organizations are planning to, or have already adopted CC and are transforming, it is the IT department's role to make suitable changes to the IT strategy to secure a successful strategy and transformation. Though the main responsibility lies within the IT department, it is not all on them to do it. They need help and assistance from other departments and stakeholders such as business, top management, and consultants to be able to create a solid strategy and enable a successful transformation towards a Cloud-based organization (Kaltenecker, Hess & Huesig, 2015).

3.2.2 Management and IT Governance

There are many different types of management in an organization. Some of them might be risk management, process management, change management, service management, resource management and many more (Khan et al., 2016; Becker & Bailey, 2014; Alshammari et al., 2018; Wu, Ding, Xu, Mo & Jin, 2016). Different organizations, papers, and frameworks focus on different management types, which makes it hard to find all these perspectives in one place. This is most likely due to the different organizational contexts, like their size, people, culture, industry, and such. One thing is clear though, Cloud governance requires the definition of policies and implementation of organizational structures with defined roles and responsibilities of IT management, business process, and applications, as these are moved out to the Cloud from the traditional IT environment (Becker & Bailey, 2014). Corporate governance is supposed to help with facilitating management to provide strategic guidance, for achieving organizational objectives, managing risk, and keep track that corporal resources are used responsibly through resource management (Becker & Bailey, 2014; Kathuria, Mann, Khuntia, Saldanha & Kauffman, 2018). When the infrastructure is outsourced to a third party, it is clear that the management is changed according to the on-demand servicing, but the organization chooses what to focus on. We found that one of the most prominent management types that need attention due to CC adoption is risk management (Khan et al., 2016; Becker & Bailey, 2014). Risk management is the task of identifying critical assets that will be stored with the CSP. Examples of this is intellectual property and personal information (Khan et al., 2016). The latter is especially important now that general data protection regulation (GDPR) has been implemented in Europe since 2018 (Regjeringen, 2019). To increase the security around such risks, it is important to define a detailed Service Level Agreement (SLA) (Davidovic, Ilijevic, Luk, & Pogarcic, 2015).

Establishing a good SLA is essential to manage the relationship with the CSP and requires good contract management. Contract management is the skills of developing and managing aspects like SLAs, pricing, risk management, and data ownership, and this should be a requirement before starting to consider a CSP (Khan et al,. 2016; Qian & Palvia, 2013; Becker & Bailey, 2014). The SLA can set the standard to easier monitor and manage the services as the boundaries of the agreement between the CSP and customer are placed and to monitor the performance of the CSP in correlation with the promised benefits in the SLA (Khan et al., 2016). Another managerial aspect which is important to have in place before and during the CC adoption is change management. Change management can be seen as "*the readiness of adopting new technology and to handle challenges*" (Khan et al., 2016). As stated in the previous section, the roles and responsibilities will change, and so will the internal processes and communication flows. Good change management and process management mechanisms are essential to set in place these transformative changes smoothly. When the internal operations change, the IT department has to change accordingly (Alshammari et al., 2018).

These are some of the management types that we identified. They are explained in simple terms, but the underlying tasks of managing these different aspects are advanced. If the managerial capabilities are not in place before and during adopting CC, its doomed to make complications. The literature mentions that organizations that are not managing right will remain stagnant on governing, which leads to less growth in alignment maturity (Heier et al., 2012). IT governance is the key discipline to handle these challenges and should be empowered. The frameworks that have been identified in the literature are COBIT, COSO with their ERM framework, ITIL, ISO/IEC 27001/2 & 9000 (Becker & Bailey, 2014; Bounagui et al., 2019; Khan et al., 2016). These frameworks have many similarities, but consist of different characteristics, and can help manage the necessary governance around CC adoption.

3.3 Conceptual Framework

Based on the accumulated literature through our literature study, we developed a conceptual framework. The original figure that we base ours on is from Vithayathil (2018). He proposes an illustration of how the IT department will function, and what responsibilities they will have towards the CSP and the internal business they are part of. The following figure is his original figure presenting the transformed roles for the IT department.

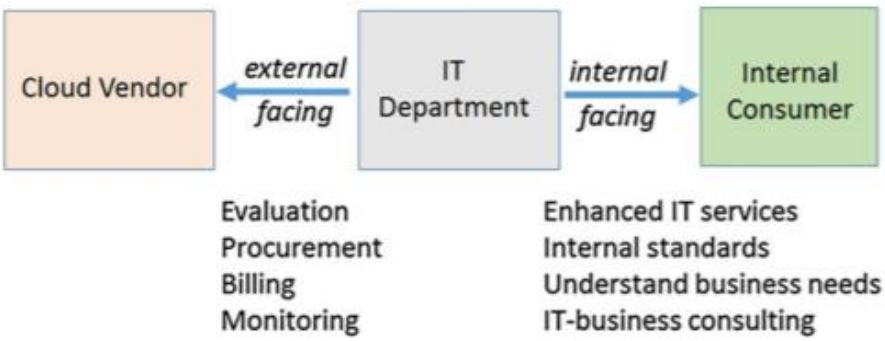

Figure 3: Transformed roles for the IT department (Vithayathil, 2018)

By evaluating the literature on this topic, we found an additional dimension, which is IT governance. We based our conceptual framework on Vithayathil's (2018) presented model in his paper and built on it with the data we acquired through our literature review. Our new model suggests that the IT department is still internal and external-facing, but includes some new managerial aspects related to IT governance that they have to consider, such as *resource management and contract management*. We also addressed *governance frameworks* that are used for controlling the IT governance aspect.

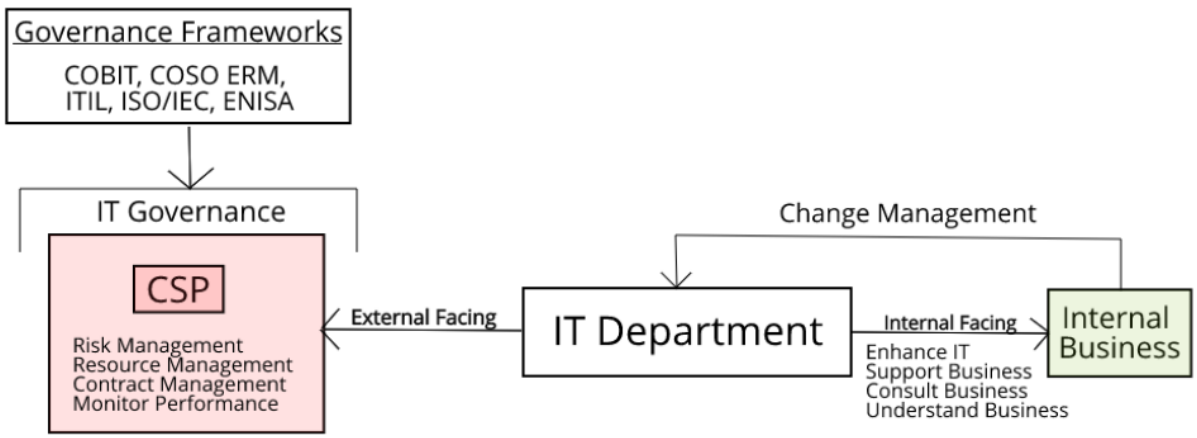

Figure 4: Proposed Conceptual Framework

4 Research approach

This chapter presents our chosen research approach, which includes our selected philosophical paradigm, and how we designed our research to address the research question: "*What impact does Cloud Computing have on the IT department and its IT governance mechanisms?"*

The design includes key information on our chosen data selection, collection, analysis, and what strategies we used to increase the validity of the results. Additionally, we will present possible ethical issues that we have taken into consideration and limitations to our research design.

4.1 Research Perspective

Myers (1997) states that qualitative and quantitative research is based on assumptions of what constitutes valid research, and different philosophical paradigms relate to the epistemology, which is the ways to acquire knowledge (Oates, 2006, p. 282) and will guide the study. A paradigm is shared assumptions about some aspect of the world, and different communities shared ways of thinking on how to approach research and gain or create knowledge. The various philosophical paradigms have different views about the nature of our world (ontology) and epistemology (Oates, 2006, p. 282). The three different perspectives are positivistic, interpretivistic, and critical thinking/research;

- The positivistic paradigm generally assumes that reality can be described by measurable properties independent by the observer or researcher, and their tools. The research is based on empirical testing of theories and hypotheses in an attempt to increase the understanding of the phenomenon. This is often done by utilizing statistical analysis and mathematical models to provide a logical, quantitative analysis of the observation and results. The end goal is to look for some kind of generalization regardless of the researcher and the occasion (Myers, 1997; Oates, 2006, p. 284-287).
- Following the definition of Oates (2006, p. 292); "*Interpretive research in IS and computing is concerned with understanding the social context of an information system: the social processes by which it is developed and construed by people and through which it influences, and is influenced by, its social setting*." When following an interpretive approach, there is no universal answer. Different groups and people perceive the world differently based on their own unique experiences resulting in several "solutions". The interpretive paradigm is often associated with qualitative data analysis, where the data is collected through words people use. Thus, it can be harder to have a neutral standpoint as assumptions, values, and actions will shape the research, affecting the situation and enabling multiple interpretations (Myers, 1997; Oates, 2006, p. 292-293).
- Critical thinking is the last paradigm and the least well known of the three. Critical research is defined by Oates (2006, p. 296) as follows; *"Critical research in IS and computing is concerned with identifying power relations, conflicts and contradictions, and empowering people to eliminate them as sources of alienation and domination."* Critical researchers do not just try to understand whatever they are researching, but they try to empower the people as well. They can be therefore seen more as activists rather than researchers. They try to resist and oppose the patterns that they find, instead of accepting them. (Oates, 2006, p. 296-297).

It can be hard to identify which research paradigm your study follows. Oates (2006) provides four key criteria to establish which paradigm to follow;

- The nature of your research question
- Your own personal beliefs and values, which shape how you perceive our world and what kind of knowledge you want to create
- Whether you want to do the kind of research that is typically done in your discipline
- Whether you are willing to take a risk and want to challenge the status quo

Based on these criteria and our philosophical background, our master thesis leans towards an interpretivistic approach, as we do not try to prove or disprove any hypothesis, but rather try to identify and explain how different factors in a particular social setting are related. We want to understand the phenomena of Cloud Computing through how people perceive it in their own organizational and personal context (Chilisa & Kawulich, 2012, p. 9-10; Myers, 2018; Oates, 2014).

4.2 Research Design

The research design is the decision of what should be investigated, with whom, and how the research should be conducted. For this thesis we defined research design as described by Yin (2003, p. 20);

"a logical plan from getting here to there, where here may be defined as the initial set of questions to be answered, and there is some set of conclusions (answers) about these questions."

Establishing a correct research design is very important for our thesis as it gives us concrete directions for procedures in our research design (Creswell, 2013, p. 19). Based on the pre-study, our philosophical views**,** and the characteristics of a qualitative study, a qualitative approach seems to be the best option for this thesis. The literature review gave us many results, but we realized that the concepts we focus on in this thesis are vaguely mentioned in the literature, but not directly answered. We had to consider what strategy to apply to our study, to cover what the literature review did not, and a qualitative study is applicable when the field is not well researched (Creswell, 2013, p . 39). Quantitative research is often generated and analyzed by positivists and uses data based on numbers and statistics to generalize results (Oates, 2006, p. 245). However, a qualitative research approach is designed to assist researchers in understanding a phenomenon and how/why it takes place from the participant's point of view from their setting (Myers, 2018). It is also closely associated with the interpretivistic perspective, which is why we believe this approach is the most suitable for our question of interest.

Two strategies were applicable in our case, surveys and case studies. Surveys focus on obtaining data of the same quality, often from a large group, in a standardized and systematic way. They are often associated with questionnaires for this reason, which is commonly used in quantitative studies. Even though questionnaires are often used, other data generation methods such as interviews, documents, and observations are also applicable. Since a case study focuses on one instance of the phenomena investigated, we found it more applicable to use an interview-based survey as our strategy and semi-structured interviews as the data generation for our qualitative approach (Oates, 2006, p. 35, 93-95). The following figure shows an illustration of the complete research design, with all the steps and methods we chose to use.

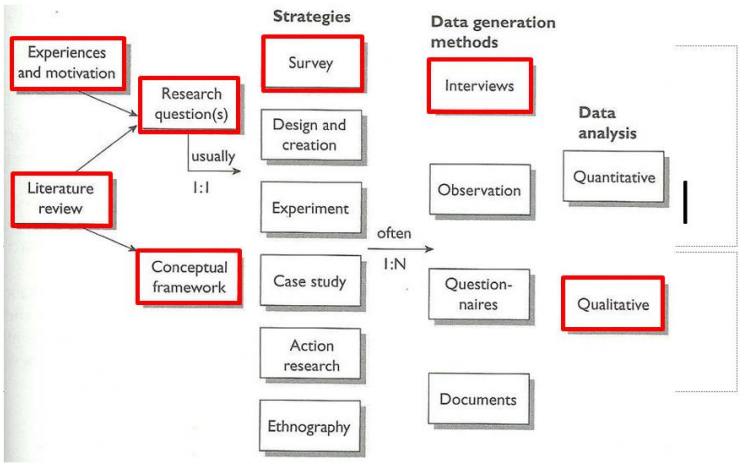

Figure 5: Research Design (Oates, 2006, p. 33)

4.3 Selection of informants

The sample was selected by doing extensive research on local companies in the Kristiansand area that had public information about their IT solutions and history. Not all companies had a significant amount of information publicly. To solve the issue, we simply sent them an email asking if their organization was applicable to the field we were researching, and if they were interested. The reason for choosing only Kristiansand based companies was simply the convenience of being able to meet them face to face. However, we ended up talking to organizations all around Norway, as it was hard to find only local organizations that were applicable. We based the selection of organizations and informants on some criteria. The organizations were required to be well established. The definition of established for us meant that they had prior "traditional" IT departmental state, and at some point, to have adopted CC technologies. Traditional meaning that they did not outsource their IT function to a cloud vendor or other third parties. The informants we contacted had to have some direct work relating to the implementation of the cloud services in the organization, or previous experience from other jobs. Restricting ourselves more then this could lead to not getting into contact with enough stakeholders, which is a scenario we tried to avoid. This is why we looked at both the public and private sectors, and everything from SMEs to large organizations. Looking at it from this perspective, we could also compare the public and private sector, and see if there are different patterns depending on organizational attributes.

This process could, at times, become very challenging as there often was limited information online. We also found ourselves redirected from the initial contact point, which delayed the data collection process. The following table shows the profiles of the contacts from the different organizations that accepted our requests, containing codes to ensure their anonymity.

Table 1: Interviewee Profile

	Interviewee profile			Organizational profile	
	Code	Position	Interview Duration	Industry	Client / Provider
1	A	IT Director	35 min	Education	Client
2	B	CTO	60 min	Energy	Client
3	C	IT Director	55 min	Ecommerce	Client
4	D	IT Advisor	55 min	Energy	Client
5	E	Head of Public Cloud	35 min	Public Company	Client
6	F	Head of Infrastructure and Operations	35 min	Ecommerce	Client
7	G	Head of Digital Management	50 min	Public Company	Client
8	H	Project Management	50 min	Public Company	Client
9	I	CTO	60 min	Consultancy	Provider
10	J	Regional Director	80 min	TeleComputing	Provider
11	K	IT Division	80 min	Public Company	Client

4.4 Data Collection

Our only source of data generation for this thesis was done by using interviews as described in our research design. For interpretative studies like this thesis, interviews are often used as a key way of accessing the different interpretations of the informants in the designated field (Walsham, 2006). Another reasoning for using interviews is that we, as researchers have an agenda, a research question, which we want to understand better. Therefore, we have a specific set of assumptions about what we want to talk about and what kind of information we want (Oates, 2006, p. 186). To be able to retrieve the necessary information, we had to construct an interview guide (Appendix A) that would help us throughout the interview process. The interview guide helped us stay on track and assist us in getting all the information we wanted in one interview as we do generally not want to talk to people a second time due to them being biased as a result of the first conversation.

The interviews were done in a semi-structured format where our interview guide was not obsolete and should be followed mindlessly, but rather just ensure that we cover the specific topics we wanted to go through. There are several benefits to this format, and we have discovered the areas and topics we want information about during our pre-study. This also enables the interviewees to talk about their own specific stories and experiences, and they might answer several of our questions in the process (Rabionet, 2011). We are also flexible during the interview as the interviewee might bring up topics that we did not have questions prepared for, and they can introduce their issues, which they think are relevant for our topic (Oates, 2006, p. 188).

In total, there are 11 separate interviews in this thesis. Qualitative studies, especially with interviews, contain large amounts of raw data. It is not recommended to try and remember the interviews by memory as you can lose key information in the process, or your memory can be biased (Oates, 2006, p. 190). Because of this, we aimed to use audiotape recording if the participants were willing to be recorded, and with the approval of *Norsk Senter for Forskningsdata* (NSD). However, their behavior might be affected due to being nervous or be more cautious about what information they give (Oates, 2006, p. 191). This did not prove to be any challenge for us as most people in the field were very comfortable talking about their experiences. Many of our interviews were done online due to COVID-19 or geographical restrictions. Most interviewees gave their consent for recording the audio of the interviews. However, there were some scenarios where the interviewees did not want to be recorded but still wanted to participate. We then had to use field notes as our method for data collection. This is the minimum requirement for data collection, but it can be hard to conduct the interview while taking notes (Oates, 2006, p. 190-191). However, this was possible while being two people during the interview, where one would lead the interview, and one would take notes.

Generally, we aimed to keep the interviews around one hour as we did want to spend more time than necessary on transcribing the interviews as it is a timely process. We can assume that approximately a one hour interview would result in 5 hours of transcribing depending on the quality of the audio (Oates, 2006, p. 193). As we can see in table 1, most interviews were somewhere between 60 minutes with the rare occasion of some interviews being around 30 minutes. This was generally if the interviewee seemed a bit reserved in the answers, or were usually on point with the information and did not talk about a lot of random experiences and thoughts.

The interviews were done in Norwegian, as well as transcribed in Norwegian. Therefore, our quotations will be our translation of the text, which can result in some structural differences as English sentence structure is a bit different. However, we tried to keep it as close as possible in English as to what was said in Norwegian without changing the context or meaning.

4.4.1 Pre-study

We conducted a pre-study that comprises parts of the literature review that was presented in the previous section. The pre-study was related to two courses during autumn 2019 called IS-420 "Aktuelle tema og forskningsområder innen informasjonssystemer" and IS-404 "Forskningsmetoder innen informasjonssystemer." The results from the pre-study were used as a foundation for the master thesis.

The pre-study aimed to answer the research question, "In what ways can the implementation of cloud computing initiatives in an organization affect the IT department and its IT governance mechanisms?". The data foundation for this pre-study was three semi-structured interviews with three different organizations. The participants were from different industries and gave us a small overview of how Cloud is used in different sectors. The results established the focus of our master thesis, and we then adapted our interview guide to be more fitting.

4.5 Data Analysis

The data analysis is an iterative process of understanding the research problem at hand by developing an understanding of the stakeholders being studied through context, their perspectives, and through searching for coherence and order. This iterative process can then end when an adequate coherent interpretation of the findings is reached (Kaplan & Maxwell, 2005). As mentioned, after the data collection, we ended up with high amounts of raw data. Transcription of the data was necessary for us to be able to find relations between the different interviews and answers. Based on the transcriptions and relationships, we could find common categories for the results. We followed an inductive approach for the analysis. This means when we aimed to present the results, we sought to have top-level categories as main headings and specified categories as sub-headings (Thomas, 2006).

The coding process was initially done with open coding. Open coding meaning that the labeling of data was based on the concepts and terms found in the actual transcripts of the interviews and not in the literature. When the initial round of coding was finished, and many nodes were created, we proceeded to axial coding. We looked for broader headings to incorporate the codes that had commonalities (Oates, 2006, p. 275). The process can be summarized by Thomas (2006);

- Data cleaning by formatting the raw text files to a standard format.
- Reading the texts carefully until we became more familiar with them.
- Creating the categories and individual nodes.
- Overlapping segments of text could be placed in multiple categories and nodes, and some text that was not relevant to the study was not coded.
- When all the nodes and categories were made, we ensured to refine them by evaluating the quotations inside them to convey the primary essence of the categories and sub-categories.

The following figure shows the overall process of how we processed the initial text data through multiple processing steps of coding to end up with a final result of categories and nodes and to avoid data overload (Miles & Huberman, 1994, p. 10-11)

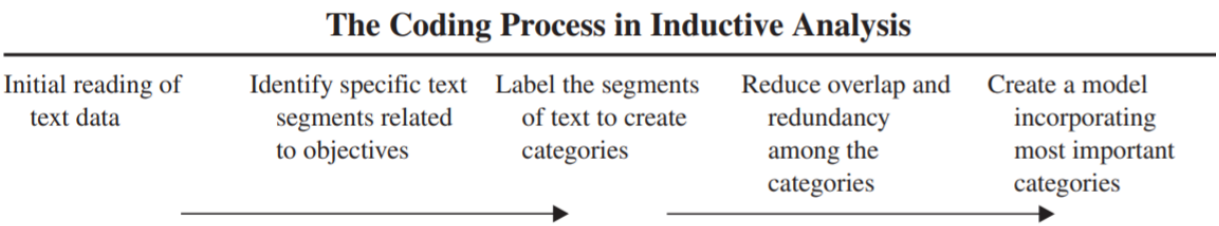

Figure 6: Coding Process (Thomas, 2006)

Figure 7 illustrates our end result of coding all our raw data. It ended up being three categories, which we organized our sub-categories in that contained several other nodes. This is the result after several iterations, where we started with roughly 110 nodes and contained it down to three categories.

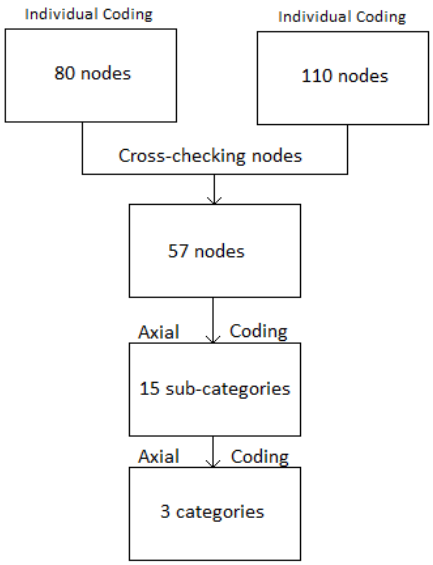

Figure 7: Open coding and data processing

Nvivo 12 was the tool utilized to help code the raw data transcriptions in a structured and more accessible way. The tool offers practical functionality to import text files easily, makes folder structure for the coding, and mark the text segments and place it in the desired nodes, which helped us immensely. Having everything structured in one place, we could easily compare our findings to find common ground for how we want to present our results.

4.5.1 Validity and Reliability

Creswell (2009, p.190) explains that validation is the process of finding the accuracy of the results by doing different procedures. One way we validated our results was to conduct a pilot interview to increase the content validity of the study (Dikko, 2016). This was in order to test the interview guide and analyze the data to see what information we got and if we asked the right questions that enable us to answer the research question. However, after conducting the pilot interview and analyzing it, we realized that our interview guide and the information we got was already on a level to answer our proposed research question. Therefore, we ended up adding the planned pilot interview to the actual study sample. We still continuously worked with data reduction and analyzing each interview to potentially find new questions and corrections that needed to be made so we could ask the "right" questions. Though this was our work process, there was no actual change made to the interview guide, but rather some small additional questions got asked during each interview to follow up on their statements or to get them to elaborate more on uncertainties.

There are some small steps we did throughout as well that possibly helped us increase some validity of the thesis. By doing some extensive research prior to the interviews, we only talked to well-established companies, meaning companies that have been around in the market for a long

time and are well known in their respective industries. This could lead to more credible results as our collected data stems from organizations that are trustworthy and might have more advanced knowledge regarding the topic we discuss. Additionally, we started this project by using an appropriate research strategy and philosophical approach that was suited for our setting. We also engaged the questionnaire by approaching it similarly to a triangulation method. Some questions about a phenomenon were not asked directly but indirectly through questions that could be thought of like a similar thing (Given, 2008, p.892). One example, if we want to learn about how the IT department has changed, we asked, "have the internal roles changed?" or "Have the IT department increased or decreased in size?". All these measures could potentially help us increase the validity of the conducted study.

One additional activity we did to help increase the validity of the findings was that we coded all the interviews individually. After this process was done, we cross-checked them. We did this to decrease the possibility of affecting each other outcomes based on bias. The two sets were merged where we saw there was a high overlap; if not, we evaluated the contents and categories and discussed them to find a common group.

We have based all our argumentation on our subjective understanding of the results we found from our respondents, and all the arguments are backed up by citations to increase the transparency and openness, but still maintain the anonymity that we have ensured.

4.5.2 Research ethics

We have obtained a lot of information for this study mainly from interviews from many informants. This means that the informants are direct participants in our research and are directly involved in our research. To respect the participant's values, it is essential that we researchers treat them fairly and with honesty (Oates, 2006, p. 54-55). Ethical behavior will protect not only the participants but also communities and environments (Israel & Hay, 2006, p.2). Violation of ethical guidelines can destroy our reputation as researchers as well as the community we are related to, the University of Agder. With this in mind, we have evaluated steps to ensure that we act trustworthy as scientists to safeguard the participant's values.

Before starting with the project, we sent in information about the project to (NSD). This mainly included the purpose of the project, information about the potential informant, data integrity, etc. Ethical clearance from NSD was a requirement to proceed with the project.

Ensuring the informed consent of all the involved participants was our main priority. By this, we mean that we secured permission from the participants only after they had been made fully aware of the nature of our research and their involvement (Oates, 2006, p. 57). An example of the document we used can be seen in Appendix C. The document was sent to the participant prior to the interview and discussed orally during the meeting to ensure that everything is understood. The key points that we ensured understanding of were:

- Informing the purpose of the project
- That all the information would be processed and presented anonymously
- All information is stored in a secured database handled by the University of Agder, and the information will be deleted at the end of the semester.
- We asked for approval to use an offline tape recorder.
- They were also fully entitled to end the interview if they wished.

4.5.3 Methodological Limitations

This thesis only used interviews as the data generation method for the findings. Therefore, we did have method triangulation which benefits of using more than one data generation method (Oates, 2006, p. 37). However, some interviews were done with multiple people from the same organization, which could help us get different views on the research problem as the people we are talking to do not necessarily represent the view of the whole organization.

A typical sample size of a qualitative study for a project like a master thesis is often seen to be around 15 participants to ensure that you reach saturation (Latham, n.d). Some studies state that saturation occurs when you have about 12 participants from a homogenous group (Guest, Bunce & Johnson, 2006), which was the case for this thesis. Mainly due to COVID-19, some interviews were canceled, and we ended up having 11 participants for this thesis.

4.5.4 Researchers Responsibility

Coming into this study, we both had our own biases based on different experiences and expectations. Our role in the interviews could be seen as an active observer, with the main focus on observing. The interview format enabled us to participate and make comments, but we were most interested in hearing their stories without influencing them.

We had no prior connection to our participants, which is a good thing for us in this situation as when research is done within your own organization or between coworkers and friends, it could influence the interpretations (Creswell, 2009, p. 215).

5 Results

In this chapter, we will present the most important findings and result from the study. We will use quotations from the interviews to help illuminate the findings. The findings will be presented in three different sub-categories, which consist of the main themes, which can be seen in table 2 and figure 8, which we discovered through our data analysis.

Our first category of findings is *"Cloud Computing Adoption".* This category has its purpose of contextualizing our results as our different participants had different levels of maturity regarding Cloud, and their Cloud usage varied.

Table 2: CC Adoption Overview

node - theme - category				
Cloud Computing Adoption				
Motivational Factors	Service Model	Deployment Model	Digitalization	
Functionality	SaaS	Public Cloud	Cloud Strategy	
Automatization	PaaS	Private Cloud	Cloud Movement	
Cost	IaaS	Hybrid Cloud	Automization	
Flexibility	Office 365	Internal Cloud		
Security	Azure	On-premise		
Infrastructure		Data Center		

The last two categories are directly related to the RQ: *"What impact does Cloud Computing have on the IT department and its IT governance mechanisms?".* The first category, *"New IT department"* answers SQ1, while the second category, *"IT Governance Mechanisms"* answers SQ2, which both are related to the main RQ.

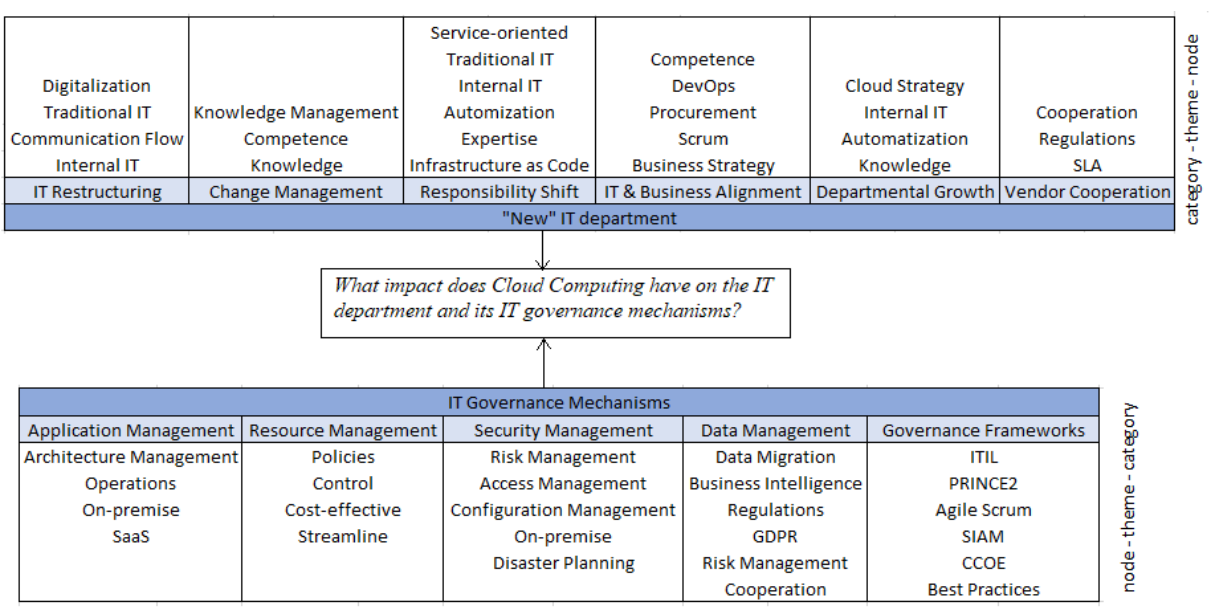

Figure 8: Category Overview

5.1 Cloud Computing Adoption

The literature states that there are many benefits to adopting CC such as better use of resources, the increased value of IT services and enables IT to support the core functions of the business and provide IT and business alignment (Khan et al., 2016; Mell & Grance, 2011; Qian & Palvia, 2013; Vithayathil, 2018). The results show, however, that there are several other reasons for adopting CC, not only those present in the literature.

5.1.1 Motivational Factors

One common theme throughout our findings was that many organizations started using CC so they could be a part of a more extensive infrastructure, as there is no way to keep up with the innovation pace of larger CSPs.

> *"It is clear that the main benefit of adopting cloud solutions is that you get the innovation pace of another and a much larger company. We would never be able to build a platform like Azure, Google, Amazon, or others."* (Interviewee B)

> *"You get access to a much larger "toolbox" than what you have internally in your own organization"* (Interviewee K)

> *"The functionality that I get from Cloud like the classification of data, the structure, and the portfolio of applications. It is so big that I would never be able to build something like that myself."* (Interviewee A)

This viewpoint is supported by a lot of the other interviewees. The idea and benefits of being part of something bigger than yourself was a huge factor, if not the biggest. That does not mean there were no other prevalent factors for adopting Cloud. For many of the interviewees, there were several factors that played a role in the adoption. These were generally the more "traditional" benefits, as seen in the literature, such as security, cost, and flexibility.

> *"Let's say there are some things, like Office 365. Office delivers a lot more safety and stability than what we would have been able to provide ourselves."* (Interviewee C)

> *"I think that the technical security mechanisms are just that good in the Cloud, that if you use them, you can be more secure, and able to process data a lot more secure than what you could in the existing data centers."* (Interviewee I)

> *"The initial investment cost is much lower in advance because we don't have to build a rack and storage for millions of NOK and use 5-7 years to writedown inventory. We can directly enter the Cloud with a low cost over the same time period. It doesn't necessarily become cheaper, but it is a more controlled cost."*(Interviewee A)

The thoughts expressed by interviewee A regarding cost is generally reflected throughout all the interviews. Cost is not something that is necessarily considered a motivational benefit for adopting Cloud, but rather a bonus that comes with CC adoption. The experiences presented in the interviews were that cost is not a benefit that makes operations less costly, but it can be easier to maintain a view of your expenses instead of a decrease in operating costs.

The table below shows the summary of motivation for each company for adopting CC in their organization.

Table 3: Motivation Overview

	COMPANY										
	A	B	C	D	E	F	G	H	I	J	K
Motivation	Functionality	Innovation	Stability	Infrastructure	Security	SaaS Solutions	Flexibility	Uptime	Interaction	Security	Operations
	Cost	Security	Security	Flexibility	Cost	Infrastructure	Functionality	Resource Use	Productivity	Innovation	Development
	Security	Cost	Flexibility	Cost	Innovation		Automatization	Infrastructure		Flexibility	Flexibility
	Flexibility			Cleaning	Effectiveness						Infrastruture

5.1.2 Service Model

As described earlier in our selection of informants, there was no requirement to how mature, or how far along the organizations have come in their CC adoption. As we talked to 11 different people, our findings showed that the various organizations were generally in different stages in the implementation. Some of them were just barely starting and had some SaaS solutions, but there were some organizations that were more mature in the sense of adopting CC to a high degree and use IaaS solutions.

> *"We also have a lot of service-oriented services in the Cloud (SaaS)"* (Interviewee B)

> "*It has been very easy for us to take use of SaaS solutions in the Cloud. That is what has been mostly the biggest motivation for us in the Cloud"* (Interviewee F)

These sentiments are supported by a lot of the other interviewees as the usage of SaaS services like Office 365 is widely used in organizations that have Cloud services to various degrees. It was ubiquitous for our interviewees to use Office 365 as it is highly customizable and offers a lot more functionality based on how you configure it. Therefore, it fits for smaller companies that just want a few functions or larger enterprises that want to take advantage of all the different functionalities. However, we see that the more mature organizations try to take advantage of more "advanced" solutions.

> *"If we were to move a data center and move the data and servers to establish a new one, it would take months. However, it is now code based and we just roll it out. So far the experiences are good, but there are challenges aswell."* (Interviewee B)

> *"The Cloud solutions will end up being what we call "Server Less". You just write code snippets that you run in the Cloud."* (Interviewee G)

Table 4 shows the overall usage of different service models. There may be some organizations that use more service models than what they told us, as we did not explicitly ask what kind of service models they used. However, all participants generally talked about their usage of Cloud, including the systems they used.

Table 4: Service Model Overview

Service Model	Interviewee
Software as a Service (SaaS)	A, B, C, D, E, F, G, H, I, J, & K
Platform as a Service (PaaS)	B, D, E, H, & K
Infrastructure as a Service (IaaS)	A, B, D, E, G, H, I & K

5.1.3 Deployment Model

Something that was brought up a lot during our interviews was that many organizations had been using "Cloud" way before they went on a Cloud journey. Many organizations have been operating an internal Cloud or data center which resembles a private cloud. For many, the term Cloud could sometimes be a bit ambiguous

> *"Our use of public cloud solutions are low, but we have an internal cloud that has been established. So our internal Cloud covers mostly all of what we have. Everything we have in our data centers runs on an internal cloud. So even if we have used little public Cloud, we still have used a lot of Cloud as we run containers and virtual machines and all that."* (Interviewee H)

> *"We have a big datacenter in Oslo which isn't a lot different from Microsofts. Maybe it isn't as standardized meaning its not as easy as replacing containers, but it works the same way. […] what is Cloud? Is it Microsoft and Azure or is it using the internet to access datacenters?"* (Interviewee J)

As we can see from the quotations some organizations have used, and are using private clouds. The usage of internal cloud systems was quite widespread, but they would not always call it Cloud during the interviews. When they referred to the Cloud, and Cloud usage it was usually when they had started the process with either of the big three CSPs, Microsoft, Amazon or Google and started using their services. Normally a combination between private and public was desirable. So they hybrid Cloud solution was seen as optimal.

> *"I don't think it's ideal to be a 100% in the Cloud, I think hybrid is the ideal. Some things just works best on-prem while other things work best in the Cloud."* (Interviewee C)

There are some other factors that were dominant in our results regarding the hesitation of public cloud. One significant factor was latency. Latency was one of the bigger challenges of using a public cloud. Your data could be fragmented and split up into different data centers around the world. This poses a huge latency problem if the systems need to communicate with each other back and forth. Another issue regarding public cloud was laws and regulations, especially with GDPR. This was mostly an issue and problem for organizations in the public sector, as private sector organizations could generally rely on the CSP to be up to standard regarding laws as the SLAs hold them responsible.

> *"The biggest challenge is actually latency or lag. When your data is one place and your prossesing is another place, and some of it might be in Oslo while other parts are in Amsterdam. Your solutions needs to talk to each other 100 times to be able to draw an image and it takes 25 miliseconds for each time, then it would take an awful amount of time."* (Interviewee B)

5.1.4 Digitalization

Digitalization is a common theme for all these Cloud adoption journeys. For many, the decision to use Cloud was not necessarily the original strategy. As a part of their digitalization strategy, they had to make different assessments to see what was most fitting for their organization, and for many that happened to be Cloud. So a sentiment that is shared by a lot of our interviewees is that the goal is not necessarily Cloud, but Cloud is part of the journey.

> "*Instead of building up even more traditional IT, meaning, going back to our own data center or build up our own management rig, we are going to move towards Cloud solutions. Then we are going to try and automize whatever can be automized and gain more value. So I'm not sure if it is because of Cloud, but Cloud is part of the answer."* (Interviewee B)

However, we see that there are organizations that have a strategy for Cloud, and that the full purpose of the digitalization journey is to put as much as possible in the Cloud, and use Cloud.

> *"A clear strategy for our organization is to "Cloud First". That is because our customers are created in Azure, that is where the users operate, that is where you get your mail and possible connection to other solutions."* (Interviewee J)

5.2 IT Governance Mechanisms

Ensuring that we, as researchers and our interviewees, had a common understanding of the term "IT governance" was very important. We asked all the interviewees what IT governance meant to them, before giving our opinion, to eliminate the possibility of bias.

> "*We have an IT operating model, which I believe is the IT governance part. This model includes a lot and spans everything from processes to technology, roles, functionality, and humans." (Interviewee F)*

> *"I think the term IT governance can be consolidated into two concepts; The first one focuses on how to "run the business", how to operate as effectively as possible with the lowest cost. The second concept is how to "change the business". How to support change and develop IT services that help with it."* (Interviewee I)

> *"IT governance reflects the whole package. If you want a happy customer, we must help manage all parts of their business."* (Interviewee J)

We believe that these quotes all have a similar essence of what IT governance means. Not only does it cover the typical technical aspects often associated with an IT department, but also change management, people, and how to increase the alignment between IT and business. The essence is very similar to the clarifications given by Weill and Ross (2004) and De Haes & Van Grembergen (2004).

Through the interviews, it was apparent that ITG is an essential task delegated primarily to the IT department and will require new considerations of governing after adopting CC services. Controlling the different aspects of CC is one of the most crucial factors after CC adoption. When asking what roles will stand out compared to others in the future, interviewee E stated that ITG would be critical. The reason why ITG will become more important is that the process will become more comprehensive compared to when everything was on-premise. All the different component of CC makes it much more distributed. Having control over the various distributed components will require more work and mechanisms to control in a secure matter. When asking if governing will become easier after CC adoption compared to on-prem solutions, it was clear that this was not the case.

> "*No it will become harder. Always when having a distributed solution, it'll become more difficult to control because the control span is much wider. While before, you could have everything unified and, all went through the same pipe. Now you have 20 teams that operate on their own, so governance is much harder".* (Interviewee G)

> *"I think it will become much harder in a way. Everything is distributed, and it's not only one Cloud. Before, when everything was in the same datacenter and drifted by the guys down the hallway, then governance and requirements for formalism and things were much easier".* (Interviewee F)

ITG will not only become more comprehensive from the cloud perspective but for the overall process. To elaborate on this, some of the organizations could not migrate some of the systems to the Cloud. This is for different reasons like regulatory or that they do not find it profitable to migrate more significant core systems to the Cloud. This can be seen in the public sector, which can be more affected by regulations or by organizations that have comprehensive data systems that are not Cloud-native, meaning that they need restructuring to be compatible with providers like MS Azure.

> "*I can see many benefits, but as of now, I don't think it is economically the right choice… We started developing our platform when Cloud wasn't mature enough for our size. If we were to start building it today, the decision would have been different".* (Interviewee C)

> *"… It's been easy to go towards SaaS solutions in the Cloud. That's the main driver for Cloud implementation for us, while the other heavier systems which we have stronger ownership to, is much more customized, contains more volume and is central for our drift have remained on-prem".* (Interviewee F)

Most of the interviewees are aiming to migrate most of their infrastructure and systems to the Cloud. The problem is that this will usually not be possible as some systems will either not be compatible, or because of regulatory issues, or just would not be worth it because of factors such as latency. This means that most organizations we talked to have a hybrid cloud and that this is the most preferred cloud type, even though it requires governance both externally towards the cloud vendor and towards internal infrastructure.

> *"We seek to move stuff to the Cloud because it's not cost-effective to buy your infrastructure with cooling, UPS, etc. but there are still a lot of applications we can't move out yet, and that is a challenge".* (Interviewee A)

Now that we have established that ITG is essential and can be more comprehensive after CC adoption, we want to explain what managerial aspects the IT department has to take into consideration with this evolving technology. When asking the interviewees what controls were essential when adopting cloud services, many answered the same. The concepts, *Application management, Resource management, Configuration management, Architectural management, Access management, Security management, Risk management, Data management, Change management,* and *Knowledge management* were the ones that were redundant in their answers. The following table gives an overview of the concepts mentioned and by whom;

Table 5: Identified Management Types

Technical Concepts	Interviewee
Application Management	A, B, C, D, G, K, & J
Resource Management	A, B, F, G, H, K
Configuration Management	C, H, K, I, J
Architectural Management	B, C, G, K, H, I, J
Access Management	B, D, F, H, K, I
Security Management	A, B, C, D, E, F, G, H, I, J, K
Risk Management	A, C, D, G, I, K
Data Management	A, B, D, E, F, G, K
Business Concepts	
Change Management	B, C, D, I, H, G
Knowledge Management	A, B, C, D, E, F, G, H, I, J, K

We have decided to group them into two; technical concepts, which are mainly operated by the IT department and business concepts, which is organization-wide, but which the IT department has to support. This section will cover the technical concepts. Separating the different management types as in the table does not mean that they are independent of each other. They impact each other in one way or another, and it has to be looked at as a whole.

5.2.1 Application Management

The interviewees highly emphasized application management when talking about what managerial aspects of CC were essential to them. On-premise running applications need provisioning, while when adopting SaaS, the tasks are plainly given to the CSP. If a Cloud service or application goes down, it is up to the CSP to make it work again.

> "*Let's use SaaS as an example. It should have so many other customers that I feel that I do not need to notify that something has gone down. There are a thousand different customers who are bigger and more important than me who inform and get the criticality of that service back up. If I'm the only one taken out of a SaaS then I'm skeptical. That's not why I want it. So our operations are a bit different, because now we have something we are responsible for, and something else that we have totally given to Microsoft or other CSPs"* (Interviewee B)

Even though this task diminishes for the IT department, new challenges appear. The challenge is that the specter of applications has increased significantly. Even Office365 has a lot of apps that organizations have to consider if they need it related to the realization of the organization's goals. Being responsible for the offers that are out in the market and then evaluate if they are required or not and learning how to incorporate them is one of the challenges. Also, having routines for training and learning how to utilize the applications that are incorporated into the service portfolio and having someone who is responsible for this process. When asking if Office365 has changed any internal routines in their organization, it was apparent that this was one of the main issues.

> *"...choice of solutions and then think of the whole, not just cost... Which solutions should you use, why should you use them, what do they mean for tasks you have to do yourself, configuration, how to operate, cost perspective, etc."* (Interviewee H)

> *"... how to prioritize competence and resources, we have long handled the portfolio management of projects, but also portfolio management of the services you utilize. What services do we need to focus more on, and which ones do we need to replace?"* (Interviewee I)

Interviewee G was also concerned with the ability to operate the application because one must know what works as intended and what does not. This can be hard in a setting where it can easily become many thousand components to evaluate from different microservices that are offered. This is, of course, for the vast possibilities and offers that are out in the market, SaaS solutions.

Architecture management from the perspective of application management is also essential. When developing applications through PaaS or just pre-developed applications that are migrated into the Cloud means that they are always connected to the internet, which makes developing applications with security embedded very important. The importance of a good architecture for the applications is for both cloud applications and on-prem solutions. Even though an application is not in the Cloud and offline, it must be developed with good architecture to deal with problems such as latency and responsiveness, and this also counts for applications in the Cloud.

> *"You can't just buy the ocean to solve it. You have to take into account the coding and the way you create the architecture of your system, which applies whether you are in the Cloud or if you are on-prem. It's not that scaling is not a problem since it's in the Cloud, but it will be able to handle it in a much better way than when the servers are running 100% CPU on-prem"* (Interviewee C)

5.2.2 Resource Management

Resource management, also referred to as *cost management*, is for many reasons tough to control, and one of the reasons is correlating to application management; it can be hard to govern a distributed infrastructure. The cost model is often different in a Cloud environment compared to on-premise solutions. In a Cloud environment, its usually a subscription-based payment system, where the consumer pays per user using the applications. In a serverless context, the consumer pays for the amount of computing that is utilized, meaning the time that the code is being executed, where the CSP takes responsibility for the server part in a client-server application (Microsoft, n.d). The on-premise solution, however, will require an initial investment in infrastructure, and that will be the cost model. The cost is independent of how many people use the system, except for the fact that data will be accumulated faster, which leads to faster increased storage.

> *"The cost picture can become complicated. You see a cost, 1.50 per hour, what does that mean? Does it mean 1.50 per hour? No, it's 1.50 for that one and 50 cents for that and 2 kroner for that. How does it look overall? We calculate it after a week, "oh shit, its suddenly 7k kroner per day, should we turn off something?"* (Interviewee B)

> *"… at Microsoft you pay subscription per head. You also pay for some storage, which is insignificant… Its a lot of different licenses that give different solutions, and the more you pay, it will often become more advanced and secure."* (Interviewee F)

Interviewee D also states that resource management is one crucial factor to consider, but its easier to have an insight into the cost for the Cloud solution that is used with servers you pay for, etc. But this requires lifting their eyes from old ways of managing where cost could be hidden, and the investment and cost evaluations were done only once. Now it is more dynamic, and you can see how much you pay each day.

The IT department will have the main task of controlling the resources and cost, and that it is cost-effective through optimization of processes and other mechanisms. IT departments have to consider different aspects, such as run-time environments. The different virtual machines and other development environments that are not being used have to be actively turned off to streamline resource management. Having policies enforced around the usage and when to open new environments is key to control this cost. It is also crucial to consider who can have these privileges, and who can connect and use resources or deal with upscaling and downscaling of the given services and platforms.

> *"The IT department will get the main task of managing the cost-related stuff related to how we operate in the cloud."* (Interviewee A)

> *"One is that of uncontrolled cost overruns. It means that if you just let everyone connect to Amazon and do what they want, it will be expensive. Much of what we do is create leads and manage money and return costs so that people know what It means if you turn on a server that costs 100 thousand NOK"* (Interviewee G)

Interviewee K states that they have to make considerations when opening a virtual machine in the Cloud. If it is only used for 8 hours, and they forget to turn it off, they'll end up being charged, e.g., 24 hours. There are different tools that can be utilized to enhance this process. In addition to having policies to help control cost, automation can also be used to streamline cost.

> *"How should things be scaled up and down, what rules should we have around finances etc. Because here, if you do not remember them, then it will be terribly expensive."* (Interviewee K)

5.2.3 Security Management

It is prominent that security was the most important aspect of governance when talking to the interviewees. All the interviewees mentioned or talked about security to some degree. Security is one of many reasons why people adopt CC (Chang et al., 2019). Even though CC can be associated with increased security, it does not mean that the consumers of the technology can stop focusing on security aspects. Having a secure environment and migration of systems requires the consumers to have security in mind and knowledge around it. Interviewee F states that it is important to not be naïve by just migrating it into the Cloud and thinking everything is fine. The process requires a lot around the agreement between CSP and consumers and the technical aspects.

"Security is definitely the area that needs a new type of competence, knowledge, capacity, and solutions. When you go to a Cloud, or not only that, when you move out of areas where you have dealt with perimeter protection, you build a fort and protect everything from reaching inside. That is the old way of thinking. With Cloud solutions, sharing with partners, API based services, etc. we have to build security embedded in the solutions." (Interviewee B)

"One of the big changes is that the people sitting close to the solutions will be independent for their parts, instead of having a big centralized perimeter around everything when talking about today's on-prem solutions versus. the Cloud." (Interviewee D)

"… Yes it is in the Cloud, but it does not mean that it is secure. We are using it, and either way, if it's stored in our database or in a Cloud database, then you have to think about security anyways" (Interviewee C)

"In practice, there are impressive security environments, and we are nowhere near that capacity, but it doesn't become any more secure then what we do ourselves, so you have to know better." (Interviewee E)

Interviewee F also supports these claims that security was easier when everything was protected locally inside a data center, where you trust everything inside, and not the "outside", but when you migrate to the Cloud, everything is "outside". This means that Cloud can provide a more secure environment, as they have the capability of securing their solutions to a much higher degree, as they have the resources to do so. But this also exposes everyone, as the solutions are accessible through the internet, which means that they have to secure their services through tools that are provided to the clients. The concern is not that the infrastructure security is vulnerable but more that the clients can make errors and, through *access management* and *configuration management*, decrease the possibility of these errors. When buying a SaaS, it wont be optimized, and people will have the responsibility to optimize them through configurations that are available to that particular service.

"If you look at some of the CSPs, you can see that they have SLAs that state a service will have 99.95 or 99.99% availability, but this is assuming it is configured correctly" (Interviewee K)

"… You also have to utilize the security mechanisms that is in the cloud platforms that are about securing identity with two-factor, conditional access. If you are here, you'll have access and if you there, you will not have access." (Interviewee I)

It is already addressed that CC leads to a more distributed overview of the whole picture. The interviewees also address that the work structure is changed, and instead of having silos with different knowledge, its team based around the various solutions they have. This requires a bigger specter of security knowledge, where the people working with one particular solution, have responsibility for that one, including the security aspect. A competence that is already limited is needed to a higher degree, and that is a challenge for many organizations.

"*There is not much available competence, and that is probably the most challenging, the fact that there is so little of it"* (Interviewee B)

> *"When it comes to security management, it is to get the security focus around those who actually see the contexts, instead of having a security manager who has control over everything.* (Interviewee D)

> *"Before, you had a security manager who fixed everything and acted as a gate for permission, but that's not how it is today. We use distributed mechanisms, where we have a security champion that we work with, and which we work on to develop in each team, and this person will take responsibility for information security in the team"* (Interviewee G)

Risk management is another important perspective that has to be considered. Clients have to ask themselves, what can go wrong in a CC adoption process, and how will this affect their operations. This process can change the internal structures and interviewee I mention that it is important to look at the whole supply chain and find the risks and vulnerabilities by this approach. Disaster planning is a concept that many of the interviewees find much easier to handle with Cloud adoption.

> *"… It is much easier to set up disaster recovery sites and similar things, which is more tangible. You get more functionality from an initially smaller scale"* (Interviewee C)

> *"… We also look at other things like disaster planning setup and stuff like that, in a Cloud setting. It enables us to become more robust.*" (Interviewee F)

5.2.4 Data Management

Data management has dramatically increased in importance due to CC solutions. This is not something that is unique to the Cloud, but rather in an increasingly digitalizing world. More and more data and types of data are available for processing, and organizations try to utilize this. Some SaaS help collect this data, and some help process it through *Business Intelligence* (BI) systems like Power BI. This increased amount of data collection presents new challenges for organizations that migrate to the Cloud. Business data, customer data, sensory data, sensitive data, etc. All have to be evaluated if they can be stored in a Cloud.

> *"Drifting servers will disappear, and the basic assignments around that. Database expert, that provisions the underlying database? No, but rather controlling the data."* (Interviewee E)

This means that the first step that needs evaluation is, "can we migrate this type of data to the cloud?". This is due to regulatory requirements, such as following the requirements for the General Data Protection Regulation (GDPR). The interviewees from the public sector also mentioned that they had to be compliant with different acts, such as the Norwegian Administration act, the Security act, the Archive act, etc. Risk management in the process of data migration is, therefore, crucial. Many regulatory factors can make this process more complicated and has to be done thoroughly to eliminate the risks that come with this. What data can we share with the CSP, and what information should we keep on-premise? These types of questions are essential, and we see through the interviews that this challenge is more visible in the public sector. Since GDPR is a somewhat new concept, we made sure to ask if it acted as an inhibitor for CC adoption. This was not the case. Good communication and cooperation with the CSP could smoothen this process and make the consumers compliant for these acts at a faster rate, but it is still the consumer's responsibility to make sure it is GDPR compliant.

> *"They can help us classify the data by saying this data is not GDPR compliant and give us notifications around that. But there is nothing with a cloud provider that prevents me from storing your email address even if you have not accepted it"* (Interviewee C)

> *"… Maybe it has affected us to a minor degree, but nothing special. I feel like the CSPs, and we have worked a lot with deals and stuff to get the requirements for GDPR in place, and the big CSPs are good at this."* (Interviewee F)

The second important aspect to consider is how to share data. This is both from the perspective of the whole supply chain and organization. From having independent systems to incorporating microservices, that have to be interoperable, means that data is shared between the different systems. Different people can operate these different systems, and organizations have to have in place mechanisms to secure this data, so only authorized and people who are supposed to see the data, are the ones who have access to it. This is another reason why access management is essential.

> *"Data management focused on the different silos where the data existed. Now when we talk about data management, it's on a corporate level, which means across the whole enterprise".* (Interviewee D)

Lastly, utilizing the collected data is vital for organizations. This is very organization and data-dependent and is done depending on the objective of the organization. Interviewee G states that the bridge between IT and business needs is more clear, and the enabler for this is data science, as the organization needs insights.

5.2.5 Governance Frameworks

When asking the interviewees about if they use any formal standardized frameworks or if they had any customized frameworks for governance, there were multiple answers without a precise solution. Most of the responses stated that they tried to apply best practices across various frameworks, but did not specify which ones. This means that most interviewees referred to customized governing documents, which is put together by multiple other best practices to suit their context and way of work.

> "*We have some management documents that have been continuously updated to take into account the changes that have been made…*" (Interviewee D)

> "*We don't use any specific framework, but rather recommended practice. We follow the aspects that we think is important, best practices taken from multiple sources. We have spent some time getting started"* (Interviewee E)

Information Technology Infrastructure Library (ITIL) is the main standardized framework that was apparent and brought up. Both interviewee F and I mentioned that ITIL had been a framework that has stood firm in their organizations for many years. Interviewee I also mentioned the Service Integration and Management (SIAM) framework.

> *"The ITIL approach so far has been very process-oriented, whereas in the future, we have to center the frameworks to a higher degree, and for this ITIL version 4 has risen. Freeing up a bit from processes and switching to more focus on user and effect, so we can say ITIL is a strong framework, as is the SIAM framework."* (Interviewee I)

Other frameworks that were mentioned In correlation with governance mechanisms were agile approach, such as Scrum as a framework, Prince2, and Cloud Center of Excellence (CCoE), which is a framework containing a collection of documentation, implementation guidance, best practices and tools provided by Microsoft for Cloud adoption.

"You have scrum teams as you call it, and with Cloud, you can get, uhm, we have 20 teams. This is not a problem, you can just spin up some servers in the Cloud so have 20 teams that can work at the same time. But then you get the coordination, so we have Scrum as a framework and such to gather the teams and work together to agree on different things, and we have seen that this is a necessity" (Interviewee G)

5.3 "New" IT Department

One of the main focuses of this thesis is to discover the shift of focus and responsibility that IT department experiences as a result of CC adoption. Our findings show a lot of different changes in different areas such as internal restructuring, digitalization, responsibility shift, and IT & business alignment.

5.3.1 IT restructuring

As mentioned earlier, Cloud is often a part of the organization's digitalization process, and as a result, a lot of changes are being made. One big difference is the internal restructuring of the organization, how the workflow is across different departments, and how they manage IT.

> *"We have had a change of the organization, the way we work, and went over to the Cloud, and that is because there are multiple things that have to happen simultaneously to get the effect of the digitalization. Cloud is only the tool, so it depends on how you use it."* (Interviewee G)

> *"I think in most cases, the IT department will increase, but it might diminish the divide between what is IT and what is business."* (Interviewee I)

Through the dialogue with our participants, we realized that instead of IT being one huge traditional IT department, they are being divided into smaller divisions with their own focus areas. Even though IT has taken on this new perspective, there are still some organizations that still have the traditional internal IT department, which even the newer IT sub-departments look to for assistance.

We also experienced that some organizations started to tear down the silos and incorporate teams cross-functions, to have teams containing multiple disciplines.

> *"Today we're centered around the classic IT operating model we have, which is many specialized teams that can say the specific subject areas, we have our own departments for networks, our own departments for security, our own departments for database and backup. They are extremely highly specialized for the specific tasks, while what we are trying to do now is to get more DevOps oriented teams where they can take the entire lifecycle responsibility for the solutions they create, the ones that are closest."* (Interviewee D)

5.3.2 IT & Business Alignment

A common change is that IT, even more so than before, works to support the business side of the organization. When working with IT, you do not only work with IT. You need to have an understanding of business. You need knowledge about the other departments that you are going to communicate with so that IT can support the business in the best way possible.

> *"When hiring people for IT, I am looking for people with business understanding and can communicate with other departments, but they are still technical and need to be able to develop, but they have the ability to cooperate with other departments and learn core areas from those departments."* (Interviewee C)

> *"We see that IT takes a step closer to business and is basically more of a adviser for how IT should work. IT is then able to be more of a bridge builder of how IT should help business instead of just being the unit that has the responsibility for producing IT services."* (Interviewee I)

It is clear from the interviews that this view is supported by most of the interviewees and their organizations. Some organizations had already reached a high state of interoperability, and some were in the process of becoming more service-oriented. When using simple services such as SaaS, the business side of the organization can procure the services themselves without advising IT. However, they can still advise IT when needed for more complex systems, and IT knows the business needs so they can better support and advise the business.

This alignment between business and IT goes both ways. It is not only IT that experiences increased workload and responsibility. The business department also has to be able to work interdisciplinary and have some level of IT competence.

> *"That is also one of the challenges, we demand a lot more from business, and they are used to just managing and order things from IT. Then it is up to IT to fix it and pay for it. That is how it has been in the old days. Now they own it themselves, and need to take responsiblitly and it has often been like "Can't just someone from IT come and fix it?" Then you have to tell them no, because they are supposed to do the work themselves."* (Interviewee G)

Many organizations have adopted some ownership mentality of their produced products, where there are teams that own the products that are being made or managed. This requires interdisciplinary work between all the departments and changes the communication flow in the organizations. This makes it easier to communicate between the different departments but places some pressure on the employees to learn new knowledge areas.

> *"We often use the word interdisciplinary here in our organization which means that you work together. It is not only the different teams that work isolated in different siloes. In practice when working interdisciplinary you are able to get aid and competence from other actors in the DevOps cloud. So there are a lot of different teams with a lot of different competence."* (Interviewee G)

This statement was supported by a few other organizations that also use DevOps. However, not everyone uses the same methodologies, and some organizations used more "mainstream" methods like Scrum.

> *"We do not use any standardized processes on my core team, but we are trying to get scrum so that we are able to see what people are actually doing, prioritize and get others up so that they can see what you are doing and distribute tasks and then prioritize those."* (Interviewee D)

5.3.3 Responsibility Shift

As presented earlier, the IT department has faced some restructuring within the organization and that they are more close-knit to the business department than before. Additionally, they got a lot more areas to focus on as a result of CC adoption and the new knowledge areas it brings. One of the more noticeable changes from a traditional IT department is the shift away from the more hands-on technical hardware part of IT. When adopting Cloud services, you no longer have to maintain servers and racks on your own premises as it is outsourced to the Cloud, at least when using a public cloud. The responsibility goes over to the CSP that you buy your services from, and IT has to take on a more monitoring role.

> *"When a service goes from running on our on-prem to now being a SaaS, there is a whole other category of deals and needs. We don't have to relate to patching, routines and downtime. That is regulated a whole other way. We still need to know that it happens, but it is no longer us that coordinates it."* (Interviewee B)

> *«It has been a big change in how we operate. Those employees who have earlier been running around operating the servers and mounting racks and stuff like that, there is a lot less of those because we are in the Cloud and can deploy servers and services super easy with control on cost."* (Interviewee A)

Most interviews heavily supported this, as the responsibility falls on the CSPs. However, some organizations have substantial on-premise solutions, which makes it harder for them economically to move up in the Cloud. Therefore, they are still dependent on maintaining some of the technical hardware knowledge as they are, to some degree, keeping their on-premise solutions.

Additionally, we saw that there was an increased focus on development and operations. There was a general consensus that the goal was to automate anything that you have to do more than two times. If it can be automated, it should be. The IT department is becoming a lot more software heavy when they do not have to prioritize hardware and traditional roles and tasks. Cloud enables more innovative environments for developers with a lot of different options. The "new" IT department needs to acquire the new knowledge that comes with Cloud and can then themselves roll out code, define and deploy servers as they wish without having the hands-on technical experience of the hardware.

> *"This is not only personal, but based on the job I've done that it is not only Cloud, but Cloud is a part of it, but a lot more of the traditional IT jobs will disappear and become a lot more software-defined. It will be a lot more scripting, a lot more technical stuff. So the IT-operations staff that run around and checks on the servers, changes discs and stuff like that will disappear completely. Things will become software, code, and everything will be programmed. Even how a server is going to look."* (Interviewee F)

The goal for many of the organizations is to convert all operations to code instead of manually having to do the job. The concept that we found was that Infrastructure as Code (IaC) is a goal

that they try to achieve. This implies that all the infrastructure will be built on code so that more and more of the operational processes can be automated through scripting.

> *"I have a goal that all the infrastructure, and by that, I mean servers, storage, network, access management, and everything else is done through code. That means if something is wrong, instead of spending hours and days troubleshooting it, we can wipe the faulty server and re-deploy it."* (Interviewee B)

Interviewee D, E, F, H, I and J also share this view, but state that this is a challenging task that requires time and effort to do.

> *"When you have many employees that know the old stuff and little about the new, how can we achieve this goal."* (Interviewee F)

Having infrastructure optimization as a goal implies that the newly developed applications have to be Cloud-native.

> *"... if there is something important vi need to make for ourselves, then we'll make it. We will develop it directly operable with Azure or other Cloud services. It wont go via our local server and PCs, then migrated."* (Interviewee B)

5.3.4 Change Management

As we presented earlier in this chapter, there are a lot of changes within the organization and the IT department when adopting CC. As a result, there is a lot of restructuring of the jobs and tasks the employees were doing contra what they are doing now due to CC. We found that as CC is relatively new, there is rarely anyone on the market with the proper knowledge and experience. Therefore, they have to train and educate their personnel that will now have new tasks and responsibilities as the expertise can not be found on the market. Through our conversations, it was clear that they wanted to retain their employees, but if people are not willing to adapt, there is no longer any need for those employees.

> *"In the journey from producing IT yourself, to have more governance and management, there is a lot of change management. People need to change jobs, people need to change how they work, you get a whole new set of processes and you new other and new competences and tools. It is a big change. It is a change that takes time. It can take several years."* (Interviewee I)

> *"If I can say something about change management, it is that the tempo has increased. The pace of change has increased."* (Interviewee B)

Things change incredibly fast in a Cloud environment. With constant updates and new services, some expertise might be old news in a year or two. Therefore, it is essential to have personnel that is willing to learn new knowledge. Organizations need to find employees that like a fast-paced environment and with the will to learn.

> *"A lot happens in AWS, there is a ton of new services all the time, so it is understood that you need to learn these services as they are released along the way. You can't just go out on the street and find a person that knows everything about AWS, by the time he has entered the door there will be 20-30 new products, so there are constantly things happening. So the most important quality the people in the teams have is the will to learn*

and adapt. That is a lot more important than knowing stuff when you enter the door." (Interviewee G)

"[..] the will to learn is incredibly important and the learning curve is very steep, it never stops." (Interviewee G)

We see that this way of thinking is reflected through a lot of our interviews. This was especially clear in one interview.

"*What we see with Cloud now is that there are huge amounts of pressure on competence, and the companies are having a hard time building the competence they need and change. Optionally they can try to recruit the competence you want. You can have unlimited money, but you still won't be able to get a hold of the people you want."* (Interviewee I)

Cloud competence is scarce and hard to get, and it is, therefore, vital for the organization to be able to train their employees and retain them.

5.3.5 Departmental Growth

In this section, we want to address what the findings said regarding the size of the IT department, whether it has increased or decreased since adoption CC. There have been mixed answers regarding this topic. Some people have trouble visualizing what the end results may be as their Cloud journey has only begun, while other organizations have already dealt with the increase/decrease.

"We have probably increased in size, but we are not fully adapted yet. I want to say it is because the need for IT has increased, and we have chosen Cloud as a solution to solve the problem. We need new knowledge and new capacity to manage it." (Interviewee B)

We see that the majority of our participants support this statement. In some cases, the need for IT grows, but the organization has to act as an enabler and support that the IT department grows in line with the demand of IT, otherwise, the IT department may experience increased responsibility as there is much more to do, but with the same or fewer resources.

"Downsizing is only a result of not being able to acquire new knowledge so you no longer find a spot or something to do in the company. If downsizing happens, it is not because there is nothing to do, because there is actually a lot more to do." (Interviewee G)

Interviewee F, however, argues that they can not predict that the IT department will increase in size due to the increased automation where scripting will take over the work that had to be manually operated. They are unsure, though, as they are in the early stage of SaaS adoption and can not argue for the unforeseen future before they migrated more on-prem solutions and started with the automation.

5.3.6 Vendor Cooperation

Some IT departments will have the assignments of cooperating with the CSPs. Some industries are unique, and software services for these industries are limited. This requires both parts to work together to build solutions. Interviewee B states that, since their production is unique, they have been in contact with Microsoft to cooperate on developing services to optimize the

processes. This is important because Microsoft has the capability of building the services, while the organization has domain knowledge around that industry and knows what needs to be done.

> *"We have a lot of industry experience, so our partnership with Microsoft is not just about using Azure. It's also about building solutions. So one of the fun things is that our employees have been in dialogue with Microsoft for over three years in terms of how Microsoft's energy solutions should be built. So we kind of sit on the inside, influence the domain model, influence the solutions, what are we really looking for, what is the energy world needs."* (Interviewee B)

It was also mentioned in the *data management* section that both parts could cooperate in preparing the business for Cloud adoption in the context of regulatory factors. In other settings, it'll be harder to work with the CSPs in some aspects. For an organization that utilizes SaaS only, the organization will have to follow the requirements that are set by the CSP. Interviewee F mentions that they can not just call Microsoft and tell them that downtime or maintenance does not fit their schedule and ask for a postponement.

> *"Now, Microsoft may not be the ones who have the most downtime, but let's say other cloud vendors then. It's not easy for us to say that it's not appropriate to have maintenance because it's important for us to keep the operations up just as an example"* (Interviewee F)

5.4 Summary of Results

We identified many factors and categories. The figure below shows a condensed summary of our results and is presented in the same order we presented the results earlier. In total, we identified 15 core themes, which we divided into three categories. We created table 6 to summarize the most important and common findings from our interviews.

Table 6: Summary of Results

Category	Summary
Cloud Computing Adoption	
Motivational Factors	The most common motivational factors for adopting CC was innovation and security. Organizations were adopting Cloud to be a part of the CSPs' innovation pace and their security infrastructure. Cost control was more important than cost reduction.
Service Models	All organizations used SaaS solutions due to simplicity, while only some of them were using Platform and Infrastructure services.
Deployment Models	People usually utilized a hybrid deployment model, where simple applications were procured through a public cloud, while more complex on-prem systems were running in a private cloud.
Digitalization	Cloud Computing was usually the answer for most organizations as a part of their digitalization journey. It was not necessarily the plan to use Cloud, but Cloud was often the best solution for the digitalization process.
IT Governance Mechanisms	
Application Management	Evaluate the needs of the organization and develop the service portfolio accordingly.
Architecture Management	An important aspect, whether it is in the Cloud or not, but requires a different approach in the Cloud aspect, such as being Cloud native and security being embedded since its accessible through the internet.
Resource Management	Enforcing policies and streamlining processes to ensure that organizational resources are being used responsibly.
Security Management	Security was one of the most critical managerial aspects to have competence about. This is because when you are in the Cloud, your data is now in the outside world, compared to old solutions on-prem
Access Management	Reduction of human error and increase data integrity and confidentiality by setting policies about who can access, and make modifications.
Configuration Management	Cloud services are not always optimized. Therefore it is the responsibility of the client to optimize it correctly.
Risk Management	Clients have to make risk assessments to evaluate the risks around CC adoption and how it can impact their operations.

Data Management	The increased volume of data requires processing due to regulatory aspects, data sharing cross-functions, and inside information related to business intelligence.
Governance Frameworks	Frameworks such as PRINCE2, SIAM, CCOE, and ITIL were used. However, generally a mixture of best practices were most common in "the real world".
New IT Department	
IT restructuring	Many organizations were restructured as matrix organizations instead of functioning as isolated silos. The IT department was also often split into different divisions with different responsibilities.
IT & Business Alignment	The distinction between IT and business diminishes as both departments are required to have knowledge about each other's field of competence. IT is used to realize the business goals of the organization
Responsibility Shift	CC introduces a whole new world of competence. IT and its employees need to adapt and learn as their role changes within the organization. Less hardware-driven IT, instead IT becomes more software dominant.
Change Management	An important aspect in CC adoption, as most organizations aim to train their employees and give them the needed knowledge to work in a Cloud environment as competence is hard to find in the market.
Departmental Growth	The IT department experienced an increase in tasks and responsibilities, but the size and resources of the department usually stayed the same. Hard to predict growth or decrease, but the general consensus was that it would not decrease
Vendor Cooperation	Some organizations had a closer relationship with their CSP. These organization usually cooperated with the CSP to find out what the market needed, and develop useful tools with their expertise.

6 Discussion

The results gave us insights into why the different organizations adopted CC in their organization, and how far they were in this process. In correlation with this, we found out what aspects of the IT department had changed due to this adoption, and what different management responsibilities had increased in importance and why. This chapter will evaluate the different finding we have in our results and connect them to the existing literature on the topic, to answer our RQ: *What impact does Cloud Computing have on the IT department and its IT governance mechanisms?*

As mentioned, we created two more sub-questions to help answer the RQ. These sub-questions were constructed based on our subjective understanding of the phenomenon:

SQ1: How will the role of the IT department within an organization change after adopting CC services?

SQ2: How will CC affect the managerial responsibilities within the IT department?

The chapter is structured so that SQ1 will be elaborated in section 6.1 and 6.2, while SQ2 is the focus of section 6.3.

6.1 Cloud Computing adoption

There is a lot of research done in the field of IS regarding reasons for adoption CC. Carrol, Van Der Merwe & Kotzé (2011) did an extensive qualitative study, which showed that the literature stated that cost was the biggest driver for adopting Cloud. We saw that this trend did not correspond with our findings. However, a lot of the literature seems to mention cost as a primary driver or benefit (Borgman, Bahli, Heier, Schewski, 2013: Khanye, Ophoff & Johnston, 2018; Qian & Palvia, 2013;). Most of the interviewees mentioned that the cost was merely a small factor in the bigger picture. Many organizations even said that they are prepared to pay a bit more when adopting CC in exchange for increased control of the cost. The cost perspective was important in the aspect of, instead of having high initial investment on infrastructure, one could scale dynamically depending on the needs, thus making it a variable cost and not static and increasing the flexibility of the organization (Hetzenecker, Weiner & Amberg, 2011).

The biggest inhibitor for the organizations that did not migrate their primary legacy systems was due to the complexity of them. Heavy on-premise solutions or legacy systems could sometimes be too difficult to move in the Cloud (El-Gazzar, 2014), making it a very costly and time-consuming task, which makes it hard to move to the Cloud (Khanye et al., 2018). We saw that this was especially relevant in organizations that were not that mature in regards to CC and relied on their core on-premise systems, which was not built cloud-native and would require a lot of restructuring to migrate to the Cloud.

Our findings do reflect the literature in some aspects as, e.g., innovation is a huge factor for SMEs to instantly be a part of a huge innovation pace with a lower entry cost (El-Haddadeh, 2019). Other factors, such as security, were prominent factors for which the organizations chose to adopt CC, as seen in table 4.1. These are also mentioned in the literature (Borgman et al., 2013; Carroll, et al., 2011) but generally is not rated as critical as cost. These factors are not obsolete as organizations have different goals and ambitions with Cloud usage. However,

through our interviews, we saw that security was seen as one of the biggest motivators for CC adoption. The organizations have a whole different budget in regards to security, and there is no way for them to provide the same level of security and infrastructure as the large CSPs like Google, Amazon, or Microsoft. The literature however often refers to security and privacy as a concern and an objection for CC adoption as this is an aspect that can be controlled to a better degree if purely held responsible internally within the organization (Armbrust et al., 2010; Raut, Priyadarshinee, Gardas & Jha, 2018; Vithayathil, 2018). We believe that the context matters a lot, where this might apply to a higher degree when talking about smaller CSPs. All our interviewees talked about the big three, and they have such high expectations and reputation that these factors do not apply, and are more like an enabler for adoption, due to high trustworthiness and professionalism. Innovation was a considerable part of adopting Cloud services. The big three CSPs have an insane budget in regards to developing new services with constant patching and updates. This enables companies, both large and small, to be a part of a huge innovation pace by utilizing the different services that the CSPs provide, which they could not have managed to create on their own, at least not at the same pace.

The most noticeable service model was by far SaaS, as all the organizations we contacted had adopted at least some services, and the most redundant one was Office 365. Office 365 offers a lot of standardized services that are widely used across different departments. Even though the organizations that did not fully regard themselves as Cloud adopters due to having primary on-prem solutions, had adopted SaaS services. Some had adopted PaaS and IaaS also, but not to the same degree. This is evident in Gartner's forecast for public cloud revenue from 2018-2022, where SaaS is far above the other two service models (Stamford, 2019). We believe that simplicity has a high correlation with this, as SaaS requires nothing more than a subscription to utilize, where the CSP has all the responsibility for the software, except for identity management and such. This can be seen in figure 1 (Shared responsibility model).

However, across the various organizations and industries, security was seen as one of the biggest motivators for CC adoption. The organizations have a whole different budget in regards to security, and there is no way for them to provide the same level of security and infrastructure as the large CSPs like Google, Amazon, or Microsoft. The literature however often refers to security and privacy as a concern and an objection for CC adoption as this is an aspect that can be controlled to a better degree if purely held responsible internally within the organization (Armbrust et al., 2010; Raut et al., 2018; Vithayathil, 2018).

It was also evident from the interviews that the most desirable deployment model was a hybrid cloud. This is because some applications are better suited on-premise due to factors such as latency, and also some applications were hard to deploy in the cloud, either due to too much work or regulations that prohibited them. These regulatory factors were more seen in the public sector. The hybrid deployment model enables them to have the best of both worlds, where simpler services can be procured or migrated in the cloud, while other services, an example that was used was printing, could be settled on-premise. This matches the finding from Enterprise Cloud index 2019 edition, stating that 85% of 2650 IT decision-makers stated hybrid cloud as the ideal IT operating model (Nutanix, 2019).

Microsoft recently opened up a cloud data center in Norway as one of the first global CSPs to do so (Keane, 2019). We saw from our results that geographical location and latency was a big barrier for adoption, and with the opening of a local datacenter in Norway, we believe that many

more organizations in Norway will migrate to the Cloud. This view was shared by many of our interviewees, especially the consultant firms, as they had experienced firsthand that a lot of firms have already started migrating to the Cloud.

6.2 Managing IT in a Cloud environment

This section will highlight our findings on the sub-question: *How will CC affect the managerial responsibilities within the IT department?* The presented results show that the need to align the traditional governance mechanisms for responsibilities is important when talking about CC adoption. Transforming the focus from traditional governance but adding a new perspective, which includes CC governance, is also presented in the literature. This means that while they have to control on-prem solutions, it is also essential to define policies, processes, roles, and responsibilities to manage and control CC adoption (Becker & Bailey, 2014; Bounagui et al., 2019; Khan et al., 2016). Formal acceptance of CC alone is not enough to guarantee organizational competitive advantage. It can, however, maximize competitiveness when grounded in an absorptive capacity that assimilates Cloud environments, meaning that they can recognize the value of external knowledge, understand it and apply it (Chang et al., 2019). In this subchapter, we'll discuss the different managerial types that we found in our results and compare them to the literature to see if they are addressed.

6.2.1 Managing Applications in a Cloud Environment

We found that application management was important in two different perspectives. First, having the competence of assessing the market and service portfolio to procure services that might be beneficial for the organization. Secondly, having the competence of building cloud applications with important architectural perspectives in mind, such as security, where the Cloud users will be responsible for the security on application-level and the CSP will have on the physical-level (Armbrust et al., 2010). Khan et al. (2016) mention that one success factor for allocation of role in IT controls is for technical competencies, which implies the coordination with the cloud vendor and integration of cloud services and existing systems. This means that the architectural perspective always has been an important factor; one just has to have a different approach to it. The first perspective, though, is not as much mentioned in the literature. We believe that this might be because of the fast evolution of Cloud services, where many CSPs have increased their portfolio size. Competition in the market between the different CSPs has introduced the race for the best SaaS, thus bringing a lot to the market. Acting as an assembler and having the competence to evaluate which ones can contribute to meeting the organizational goals is essential (Overeem & Vreeken, 2014).

6.2.2 Managing Resources in a Cloud Environment

Transforming from on-premise to a public cloud business model increases the quantities of data, the dependency of third-party IT services, and the complex chain of distributed management. Since the Cloud introduces a large number of shared resources through its complex system, it is essential to manage resources through policies and optimization (Garcia, Espert & Garcia, 2014; Marinescu, 2013). When the system is distributed and is mostly built up of the pay-as-you-go model, meaning that they pay for the resources they use, it is important to have policies that work as a controlling factor not to get unexpected costs. The IT department will have the main task of controlling the resources and cost, and that it is cost-effective through optimization of processes and other mechanisms. IT departments have to consider different aspects, such as run-

time environments. The different virtual machines and other development environments that are not being used have to be actively turned off to streamline resource management. Having policies enforced around the usage and when to open new environments is key to control this cost. It is also crucial to consider who can have these privileges, and who can connect and use resources or deal with upscaling and downscaling of the given services and platforms.

6.2.3 Managing Security in a Cloud Environment

Security is one of our most controversial findings compared to what much of the literature that we found states. An often stated problem associated with CC is security, privacy, and reliability aspects (Overeem & Vreeken, 2014; Rohmeyer & Ben-Zvi, 2012; Sultan & Bunt-Kokhuis, 2012). Hetzenecker et al. (2011) also states, "*By outsourcing parts of the firms IT, security and reliability issues are handed over to the SaaS provider thus equalizing the need for IT security staff"*. These findings do not correspond with the results that we found. Security was one of the bigger reasons why people migrated to the Cloud, but it had to be done right. This does not mean that security is outsourced to the CSP, thus eliminating the need for this competence internally in the organization. Having competence around security was one of the most important aspects of Cloud, where one must ensure security mechanisms related to information, data privacy and confidentiality, ownership, and technology-related issues (Khan et al., 2016). CC was just an enabler that could help with security to a higher degree, but it was up to the organizations utilizing this technology to do something about it. However, it was mentioned that security was harder after CC adoption, compared to on-premise because instead of securing the perimeter around the services, you have to protect each service.

SaaS-applications needed tailoring and increase its security through configuration management, where the IT department will have to utilize its expertise to set parameters to allow change, for example, in its business rules (Overeem & Vreeken, 2014). This was evident in our results, where adopting SaaS-applications does not necessarily mean that one just adopts the service, but that there will be tasks relating to it. Borgman, Heier, Bahli & Boekamp (2016) mention that traditionally, applications existed within business functions as organizations might have had more of a silo structure, and the applications were mainly employed by a couple of selected users. Now that applications are shared across departments, it'll become harder to understand the data structures, etc., thus making it also harder to retain access control for the services and different data. This was an element that was mentioned in our results also, that access control was an essential aspect to consider, since there was a higher transformation from the silo structure in organizations and more towards DevOps, meaning that teams consist of different departmental members working together. Securing who has access to what will thus be essential.

Risk management is of the managerial types that are considered across the whole organization, including applications, resources, data, etc. The different aspects of the Cloud have to be evaluated regarding legal and compliance-related risks (Khan et al., 2016). This is an ongoing process that has to be taken into account at all times, and risk assessments have to address IT assets, disaster recovery, and continuity of operations and will increase in importance exponentially with CC adoption (Becker & Bailey, 2014). We believe that risk management is a critical aspect because even though you utilize a CSP, it does not mean that the responsibility lies on them. They will have the task to keep services operating, but if an unexpected error occurs, it'll be the organization's fault in the perspective of its clients and customers. From our results,

however, we found that disaster planning and continuity were found to be easier with CC adoption since its easier to utilize such strategy from a smaller scale compared to having backups on-premise.

6.2.4 Managing Data in a Cloud Environment

Data management has dramatically increased in importance due to CC solutions. This is not something that is unique to the Cloud, but rather in an increasingly digitalizing world. More and more data and types of data are available for processing, and organizations try to utilize this through BI systems. The organization will require insight into the data to make business-critical decisions. The IT department will have the task of employing analytical tools from the public cloud to get insights for the increased data size from within and beyond organizational boundaries (Borgman et al., 2013)

Another aspect of data management that is essential is often referred to in the literature as *compliance management*. Compliance management refers to addressing concerns related to that CC infrastructure, platforms, services, and the data accumulated by such means, comply with existing laws and regulations (Bounagui et al., 2019). The organizations will have to consider two perspectives, internal and external-compliance (Khan et al., 2016). Internal compliance refers to the adherence of rules, regulations, and best practice policies defined internally in the organization, while external compliance refers to compliance-related to laws, guidelines, and regulations imposed by the government and industry standards (Smartsheet, n.d). There are many regulatory factors that can make the process of data migration and processing more complicated, and has to be done thoroughly to eliminate the risks that come with this. What data can be shared with the CSP, and what information should we keep on-premise? These types of questions are essential, and we see through the interviews that this challenge is more visible in the public sector. As data and information sharing has increased to a higher degree due to the services that are across departments, it is essential to incorporate policies regarding access management to ensure integrity and confidentiality on data, as this can increase the public confidence for the organization (Smartsheet, n.d).

6.2.5 Frameworks for CC Governance

When discussing if the organizations used any frameworks to govern the transformational outsourcing delivery in their hybrid IT environments, it was clear that there was a lack of correlation between the frameworks that we identified in the literature and which ones they utilized. While Becker & Bailey (2014) describes different frameworks such as COSO, CoBiT, ISO 27001, ISO 9000, and ITIL, but it was apparent that the only framework that was utilized to its fullest potential was ITIL. We did get a few insights on frameworks that could help structure the complex IT environments presented by adopting CC. SIAM is one framework that was mentioned, which describes different elements of management and governance, supplier co-ordination, etc. but the framework is tweaked uniquely depending on the organization tailoring it. CCoE is also a framework that was identified in the interviews, where the organization used it as preparatory documentation for how to adopt public cloud in an effective manner and what aspects need consideration, as this organization was utilizing a private cloud. Scrum and PRINCE2 were also mentioned as frameworks for project management, as many organizations now work cross-department, building teams with different competencies, thus having a structured method to process the different projects in an effective way is crucial. We believe that the reason why there was a lack of specification on what frameworks were utilized is that many

of the frameworks can seem overwhelming. Our interviewees, however, mentioned that they picked and customized parts of different frameworks to tailor the needs down to their organizational requirements and context. We believe that the utilization of frameworks is so broad because such control mappings related to the different frameworks are *ad hoc*, and because there might be absent guidelines to implement the frameworks (Bounagui et al., 2019), the implementation might heavily depend on tacit knowledge, which decreases the repeatability of the process.

6.3 The new functions of the IT Department

A commonality from the results is that the IT department will have a new function and responsibilities due to CC adoption, and this aspect is also presented in the literature regarding this topic (Becker & Bailey, 2014; Choudhary & Vithayathil, 2013; Vithayathil, 2018). In this chapter, we will present the identified functions from our results and see if it corresponds with the literature and try to answer our sub-question; *"How will the role of the IT department within an organization change after adopting CC services?"*

6.3.1 Service-Oriented View

When adopting CC services, a lot of the heavy hardware-defined work is lifted off the organization's shoulders. When they start to outsource in the Cloud, it is then the responsibility of the CSP to operate and keep the services up and running (Overeem & Vreeken, 2014). The employees that previously worked the more traditional IT jobs like operating hardware and different on-premise solutions have to change and adapt to still be relevant within the IT department. The literature suggests that the change that needs to happen for the IT department to stay relevant in the Cloud age is to become more service-oriented, as well as having an external-facing IT department in addition to being internal-facing (Heier et al., 2012; Vithayathil, 2018).

As organizations start adopting CC services, parts of the IT department will have to additionally transform into an external-facing role from its pure internal-facing before. This meaning that they have the task to predict measure and sustain cloud service outcome (El-Gazzar, 2014). They have this external view because it is important for the organization to utilize the new services and functions that become available on the market so that they can better address the needs or goals of the organization, while still maintaining the internal-facing role of supporting the business with the old processes. The external facing responsibilities are elaborated in section 6.2.

The IT department has also become more service-oriented internally. Not only is IT supposed to support the organization and meet its business goal, but as they start to adopt more CC services, there are fewer operations internally, and therefore the shift has gone to a more service-oriented IT department. However, this is not obsolete as many organizations still have on-premise solutions that need to be operated and maintained, but the demand for operational knowledge relating to your own hardware and people with these skills is decreasing with the adaptation of CC services. By adopting simple services such as SaaS, the procurement is sometimes done without consulting IT (Hetzenecker et al., 2011). This could prompt some problems due to other departments, not knowing the extent of what it takes to maintain the services they acquire. We saw that the IT department then took on a more consulting role towards the other departments, and sometimes creating even more work for IT as they could not monitor the services well enough independently.

6.3.2 Development Focused

As the technical hardware-defined competence diminishes in the IT department due to Cloud, the software-oriented competence rises. The high technological environment that is the Cloud creates a whole new field of Cloud competence, increasing the demand for developers. Especially the need for people with competence in scripting. Automation of processes such as the deployment of servers is a big part of the Cloud infrastructure. The general consensus was to automate as much as possible as long as the task had to be done more than one time.

Prior to this thesis, we assumed that the roles of developers would diminish. Mainly due to the huge changes services such as SaaS brings to the software development industry and limiting the need for on-premise solutions (Kaltenecker & Hess, 2014). We thought that there would no longer be an incentive to retain a lot of the software developers and their knowledge based on the simplicity of adapting different CC services, but that was not the case. Maintaining and creating the infrastructure where the firms run their Cloud services require a lot of work. A lot of development competence is needed for the people who operate the CC infrastructure. Not only the operational side of the Cloud, but we saw that there was an increase in demand for developers in a Cloud environment, even though the firms started outsourcing some of their services. We believe this is due to the highly innovative capabilities that are enabled in the Cloud environment and let software developers directly code and deploy into the Cloud infrastructure with automated processes. So even if the demand for on-premise solutions is going down, the need for software developers is slightly increasing.

Organizations must have the capability to learn and apply new external knowledge. This capability increases the innovative capabilities and performances within the firms (Chang et al., 2019). Our findings suggest that when dealing with the relocation and hiring of employees, their willingness to learn is a high priority. As the competence and knowledge with Cloud get outdated fast, and there is not actually anyone available on the market with the knowledge you want, you have to train your employees. It is, therefore, essential for firms dealing with Cloud technology to retain their employees and create an environment that enables learning. We saw that this was the primary case in our findings, but there were some instances of firms acquiring people with prior knowledge, but that was on rare occasions.

6.3.3 Alignment of IT & Business

One of the benefits of adopting CC is a better communication flow. CC integrates business partners and end-customers while using CC to streamline business processes and information sharing across the value chain (Borgman et al., 2013). As the focus of the IT department changes towards an internal and external-facing department, one of their primary functions is to consult the business side of the firm (Alshammari et al., 2018; Vithayathil, 2018). The organizations experienced a better communication flow while using CC services, making it a better environment for interoperability between the different departments. By working in teams that are cross-departmental instead of isolated siloes, the firms were aiming to achieve better products and services.

We saw that IT was no longer just IT. IT personnel are now expected to have a broader field of competence outside of just IT. To be able to consult the business department, IT needs to have

the business knowledge to understand the needs and demands better. Our results show us that CC increased a lot of interoperability between the different departments and limited the distinction between them. As seen with Cloud and its services, it enables quick access from multiple sources, making it easier to cooperate (Qian & Palvia, 2013). Some of the departments no longer work as isolated silos, but rather create teams built from people from all the departments by incorporating a DevOps mentality. By DevOps mentality, we mean a collaborative framework where shared responsibility is integrated from end to end in a project (RedHat, 2020). This means that a project will consist of people with different competencies, potentially from different departments, but will also require them to have a basic understanding of their peer's knowledge areas, such as security. Instead of having the IT department as a central controller for the different managerial aspects we identified, the organizational structure will become more matrix oriented. A matrix oriented organization is often set up as a grid (matrix) structure instead of the traditional hierarchical structure presented in functional organizations. Thus, the employees will often report to both a functional or departmental manager and the product manager (Woods, 2014). From our interviews, we found that each project or product had people with multiple disciplines, where one person took the role of the product owner. The product owner was responsible for the product that they delivered and would coordinate the responsibilities that the IT department would otherwise have. So each product consisted of a team that had its own product owner. So if anything were to happened to the product, it was no longer a specific department that had to deal with it, rather it is the product team's responsibility. We also identified that there was someone on a higher level, that the product owners would deliver their services to, a service owner. The service owner was typically someone with more authority in the organization. The following figure illustrates a typical structure in a matrix organization.

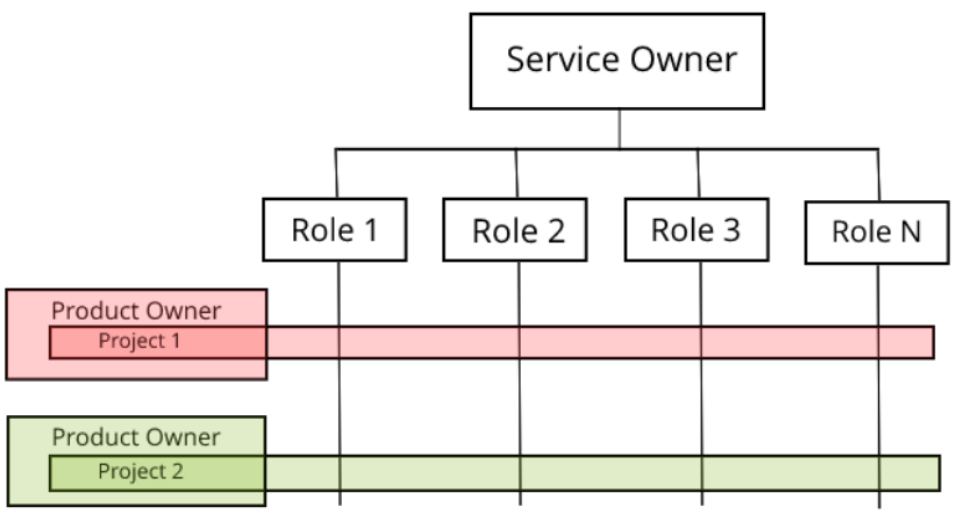

Figure 9: Matrix Organization

6.4 Summary

We have identified many new concepts related to the role of the IT department and the responsibilities that the IT department is part-taking. In this chapter, we'll try to summarize our findings from the interviews and what the literature brings to light. To do this, we have developed a model that builds on our empirical data and which is a further development on the conceptual model presented in section 3.3.

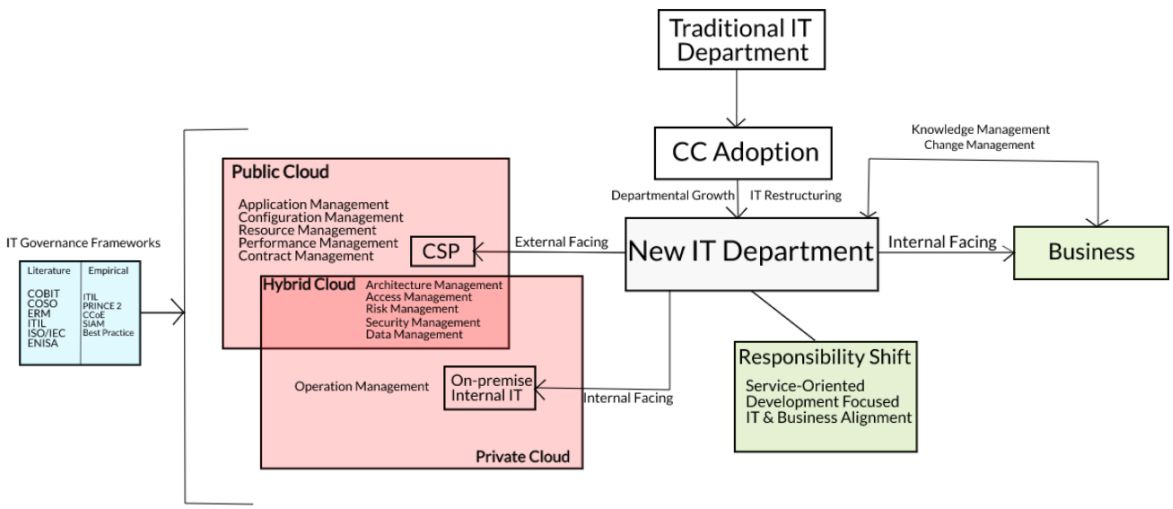

Figure 10: New Roles and Responsibilities for the IT Department

The model represents a visualization of what interactions the IT department has (internal and external-facing roles) and what responsibilities this implies for them. External-facing towards the CSP (Public Cloud) is the broker role for the IT department. They will have the responsibility of managing applications by evaluating the services offered by the CSP as well as evaluating their already existing service portfolio. These applications have to be configured to become streamlined, and resource has to be controlled to become cost-effective. The literature we identified also mentioned *performance management* and *contract* management (Khan et al., 2016; Qian & Paliva, 2013), something we did not identify in our empirical results. We believe that these aspects were not mentioned due to the trustworthiness of the CSPs that were mentioned (MS Azure, Amazon Web Services (AWS), and Google Cloud Platform (GCP). Still, we think that performance management in terms of monitoring the CSP against the SLA can be useful when cooperating with smaller CSPs or even the big three. Contract management is also a concept that was not mentioned by the interviewees, but it was said that the SLAs could not be negotiated, at least in some cases, because they are standardized, but we believe that understanding the SLA and the contract is essential, which is why we included it in the model. They can also serve as the broker for cooperation between the organization and the CSP in terms of customizing services because the organization might have essential domain knowledge of the industry, but also managing compliance and regulations. Under "Hybrid Cloud" are the managerial aspects common to both Public and Private-Cloud. Security Management is the

process of securing organizational assets such as data and applications through different means. We identified management types such as architecture management, which is building applications with security embedded, which is essential for both on-premise and Cloud-Native applications. Access management is crucial to keep data confidentiality and integrity and compliance management in terms of regulations related to data management. Lastly, we saw that risk management is something that has remained important both on-premise and also in a hybrid environment after CC adoption, but elements such as disaster planning can be eased due to CC adoption. The last deployment model is the Private Cloud. We identified that all organizations had some infrastructure on-premise, as some applications could not be migrated to the Cloud due to different reasons, or they were better-suited on-premise due to, e.g., latency issues. This means that they will still require hands-on managerial experience to operate the internal infrastructure. Our goal was also to suggest some frameworks that could be used to control the IT governance aspect, where we recommend frameworks identified in the literature review, and also frameworks that were suggested by our interviewees.

The right side of the model illustrates the internal-facing perspective of the new IT department and its relationship with the business department. IT has the main responsibility of supporting core business functions, but with the adoption of CC, there is a mutual relationship between business and IT, where both departments have to obtain knowledge and competence in each other respective areas. This is because organizations became more matrix oriented, where there is a lot more interoperability between the departments. However, with a traditional functional organization, we saw that both business and IT has to take into consideration and manage the knowledge and changes that CC adoption brings. The responsibility shift illustrates the new functions that the new IT department has undertaken to adapt to the Cloud environment. Two of the primary functions we identified is the IT department becoming more service-oriented, and it is their job to align business and IT. It is the IT department's role to support business and its core functions, therefore IT has undertaken a more service-oriented and consulting role. With the technology specter Cloud brings, the IT department has also become more development focused and can deliver services at a higher speed, which brings higher innovation and agility to the core business functions. The top of the model illustrates the transition from the traditional IT department as described earlier, and the two main effects that the traditional IT department experiences when they adopt CC as they transform into a new IT department. The new IT department often restructured its IT and divided the IT department into several sub-units with expertise in their own respective field. Additionally, the new IT department experiences an effect of increased roles and responsibilities, which increased the size of IT within organizations.

7 Conclusion and Implications

In this chapter, we'll present our most important findings related to our research question and argument on how it contributes to research and practice. The purpose of this thesis has been to investigate the impact that CC adoption has on the IT department. To investigate the issue, we have conducted an explorative qualitative study where we have interviewed eleven top-level managers from organizations that have implemented some CC solutions in both the public and private sectors. We have primarily identified three areas of interest, which are essential to answering our RQ. Two of the areas are divided as sub-questions and directly related to our RQ: *"How will the role of the IT department within an organization change after adopting CC services?"* and "*How will CC affect the managerial responsibilities within the IT department?".* We also investigate one additional area related to how far the organizations had come in their Cloud journey. This is less essential, thus, not presented as an independent sub-question, but we found it important to get a better understanding of their contextual perspective and answers.

Firstly, we found that the organizations are adopting Cloud solutions for the same benefits that are visible in prior literature related to Cloud adoption, such as flexibility and scalability, but we also found that security was one primary motivator. This is something that is often mentioned as an inhibitor for adopting Cloud solutions. All organizations utilized SaaS solutions, as these were easier to implement compared to migrating substantial on-premise solutions due to their complexity. So a desirable state of Cloud adoption was having a hybrid Cloud, where more straightforward applications were procured and utilized in a public Cloud, while more substantial on-premise solutions and applications that required low latency were in a private Cloud.

Secondly, the literature suggests that there are specific changes that have to be made within the IT department to be able to stay relevant in this new Cloud age (Becker & Bailey, 2014; Vithayathil 2018). We identified that the IT department has the responsibility of managing the Cloud, where we identified different managerial aspects unique to private and public-Cloud and some elements that are common in both. To help control these different managerial responsibilities, people used different frameworks such as ITIL & SIAM, but in all cases, people used a breed of best practices from multiple frameworks to tailor them to their own needs.

We do see that some of the suggested changes in the literature match some of the responsibility shifts in our findings. The IT department is becoming much more service-oriented towards the rest of the business instead of operational, due to the decrease in on-premise infrastructure. This way, they'll increase the collaboration cross-department, aligning business and IT, where they have to collaborate in acquiring and processing knowledge related to the Cloud aspect, as well as changing their processes accordingly to streamline this new way of working. However, even though it seems that the organizations are "outsourcing" many of their responsibilities to a third party CSP, we identified that the IT department faces many more challenges and is by no means failing to stay relevant. As CC is adopted and used in the organizations, IT has a lot more tasks and responsibility areas that they need to focus on and support, creating a higher demand for IT and possibly presenting departmental growth due to their importance in such adoption.

7.1 Implications for Research

Our thesis is aimed to expand the field of knowledge around CC by investigating the organizational aspects of what impact it has on the traditional IT department and its managerial aspects of IT governance. There have been a lot of assumptions around this topic (Davidovic et al., 2015; Vithayathil, 2018), but the actual investigation has limited documentation. We see that the literature often states certain aspects and opinions regarding the future of the IT department, but does not research it on a deeper level to explain exactly what happens, and why. We have also included multiple perspectives of both public and private sectors to evaluate the differences in both respected areas. This limitation has especially been absent in a Norwegian context, which is why we believe this is a fascinating research topic.

Our results confirmed many of the unsure assumptions, such as the IT department becoming more service-oriented, but we explain in greater detail how they are transforming. We achieved many of the same results as previous literature (Vithayathil, 2018; Khan et al., 2016; Alshammari et al., 2018; Qian & Palvia, 2013). Still, we also identified additional findings, such as multiple managerial aspects and new functions of the IT department. These showed how IT is restructured as a result of CC adoption, which has not been described in the literature we found. Management types such as *application management* were identified as unique in our thesis and more in-depth reasoning for how *security* is prioritized. We are also proposing newly identified frameworks that the organizations have utilized in their Cloud journey, to help with the different managerial and technical aspects, as mentioned in the discussion. Thus, we have identified a dynamic containing many different elements, which can create the basis of further research.

The presented model in this thesis creates room for further investigation. Researchers could expand on the model and knowledge area and get a deeper understanding of the dynamics between the different parties involved. The model also creates room for a deeper understanding of the different views, internal-facing, and external-facing. Specific directions could be taken and investigate one of the two aspects to get a broader understanding of the particular phenomenon.

7.2 Implications for Practice

The use of CC is increasing rapidly every year, and a lot more organizations will start their CC adoption journey. We have created a model to help organizations who have already begun adopting or are planning to adopt CC. The model illustrates the dynamic between the IT department, business, and CSP. This model can assist organizations in their CC adoption process to be aware of the changes in roles, responsibilities, and dynamics. Hopefully, this will be beneficial in their CC adoption strategy, to help focus on the important aspects to ensure a smoother and successful adoption and digital transformation for the organization.

This thesis showed that there are multiple factors and changes to take into account when adopting CC, especially for the IT department. CC is a complex technology that will change the way people work in their everyday life, and to secure them a future where they can contribute, they need to readjust and learn new knowledge and acquire new competence. It is, therefore, vital to establish a solid strategy for the utilization of CC. CC should not only be something that is being pursued by the upper management, but also on the lower level. Without the correct mindset to change, the IT department may experience a decrease in their size as they fail to

maintain relevance. This is just one of the many challenges organizations and their IT department face.

Many organizations are doing a lot of good things while planning and strategizing their adoption of Cloud services. However, we have identified several aspects that have shown themselves to be a higher priority within the organization than what was previously thought of through the literature. We contribute to the practical field by illuminating specific topics that are critical for a successful CC adoption and transformation of the IT department. Organizations that are planning to adopt, or organizations that have already started adopting need to be aware of the dynamic between the different aspects while adopting Cloud services.

IT Governance frameworks are often overwhelming and complex. It can be hard and resource-demanding trying to fully adopt such a framework fully. Therefore, we suggest that organizations should take best practices from either multiple frameworks or only the areas that are relevant for their own organization. The distinction between literature and practice is often big, making it not a realistic goal for many organizations to adopt such complex frameworks and instead utilize frameworks they are familiar with, and incorporate parts from other frameworks when required.

Lastly, by identifying the critical need for more knowledge and interoperability, organizations need to acknowledge the fact that IT competence is something that the whole organization should have. Of course, this will be in various degrees, but the general need for IT competence increases, creating an environment that requires more effort from their employees to be able to handle the highly innovative and agile environment of the Cloud. We suggest that the organization should hone their own competence within the organization to get the specialized knowledge they need. However, this might be challenging as it can be time-consuming, but the competence that is found in the market will be outdated fast. Therefore, developing knowledge internally is highly suggested to specialize in their own services and to retain their employees and their knowledge.

7.3 Future Research and Limitations

Throughout this thesis, we have discovered several topics that we have discussed. However, through our findings, we found several areas that were not directly related to our proposed RQ, but could serve as exciting fields of study. Specifically, we saw the emergence of Cloud-specific roles within the organizations. It would be interesting to see what types of roles that are a result of CC adoption and necessary to cover the findings we present. We identified that there were no universally used names for these roles, so future research could also identify the different unique roles and categorize them based on their functions.

This study was seen through the focus of the IT department as a central broker. Future research could investigate the impacts of some of the decentralized approaches we identified, for example, a matrix organization using DevOps. The study could focus on the impact of CC adoption of the whole organization, instead of specifically just the IT department. Getting multiple perspectives from different departments and knowledge areas could broaden the knowledge of how CC adoption impacts an organization.

Since all the interviewees were using and referring to MS Azure, AWS, or GCP, it would be interesting to see if our findings related to the IT department's external-facing role would apply in a context where the organizations are utilizing smaller CSP's.

The study was conducted by interviewing mid to high-level employees that were responsible for or related to the adoption of CC in the organization. A limiting factor was that we did not get to interview people at lower levels, such as the employees on the operational level. Therefore, our findings are only from the experiences from the top-level management, and not employees more closely related to daily use. Additionally, our study is limited to organizations based in Norway. This might skew our results as different countries have different laws regarding the use and placement of data and sensitive information, so the results are based on a Norwegian context. Some of the organizations were in an early phase of adopting CC, so the results may vary depending on how far into their Cloud journey they have come. It could be interesting to do a study with organizations that have all adopted Cloud to the same degree.

8 References

Al-Ruithe, M., Benkhelifa, E., & Hameed, K. (2018). Key issues for embracing the Cloud Computing to adopt a digital transformation: A study of Saudi public sector. *Procedia computer science*, *130*, 1037-1043. https://doi.org/10.1016/j.procs.2018.04.145

Alshammari, K., Adamopoulos, A., & Dick, M. (2018, December). *Organisational Transformation as a Consequence of Software-as-a-Service Usage by Small and Medium Enterprises.* In 29th Australasian Conference on Information Systems (pp. 1-11). Sydney, Australia.

Armbrust, M., Fox, A., Griffith, R., Joseph, A. D., Katz, R., Konwinski, A., ...& Zaharia, M. (2010). A view of cloud computing. *Communications of the ACM*, *53*(4), 50-58. https://doi.org/10.1145/1721654.1721672

Association for Information Systems. (2011, 06. December). Senior Scholars' Basket of Journals. Retrieved from https://aisnet.org/page/SeniorScholarBasket

Avram, M. G. (2014). Advantages and challenges of adopting cloud computing from an enterprise perspective. *Procedia Technology*, *12*(0), 529-534. https://doi.org/10.1016/j.protcy.2013.12.525

Becker, J., & Bailey, E. (2014, August). *A comparison of IT governance & control frameworks in cloud computing.* Paper presented at the Twentieth Americas Conference on Information Systems, Savannah, GA.

Borgman, H., Heier, H., Bahli, B., & Boekamp, T. (2016, January). Dotting the I and Crossing (out) the T in IT Governance: New Challenges for Information Governance. In 2016 49th Hawaii International Conference on System Sciences (HICSS) (pp. 4901-4909). IEEE. Koloa, Hawaii.

Borgman, H. P., Bahli, B., Heier, H., & Schewski, F. (2013, January). *Cloudrise: exploring cloud computing adoption and governance with the TOE framework.* In 2013 46th Hawaii international conference on system sciences (pp. 4425-4435). IEEE. Maui, Hawaii.

Bounagui, Y., Mezrioui, A., & Hafiddi, H. (2019). Toward a unified framework for Cloud Computing governance: An approach for evaluating and integrating IT management and governance models. *Computer Standards & Interfaces*, *62*, 98-118. https://doi.org/10.1016/j.csi.2018.09.001

Breaux, T. D., Gordon, D. G., Papanikolaou, N., & Pearson, S. (2013, July). *Mapping legal requirements to IT controls*. In 2013 6th International Workshop on Requirements Engineering and Law (RELAW) (pp. 11-20). IEEE. Rio de Janeiro, Brazil.

Carroll, M., Van Der Merwe, A., & Kotze, P. (2011, August). *Secure cloud computing: Benefits, risks and controls.* In 2011 Information Security for South Africa (pp. 1-9). IEEE. Johannesburg, Sout Africa.

Chang, Y., Wong, S. F., Eze, U., & Lee, H. (2019). The effect of IT ambidexterity and Cloud computing absorptive capacity on competitive advantage. *Industrial Management & Data Systems*, 119(3), 613-638. https://doi.org/10.1108/IMDS-05-2018-0196

Chen, D. Q., Mocker, M., Preston, D. S., & Teubner, A. (2010). Information systems strategy: reconceptualization, measurement, and implications. *MIS Quarterly*, *34*(2), 233-259. https://doi.org/10.2307/20721426

Chilisa, B., & Kawulich, B. (2012). *Doing social research: A global context*. Selecting a research approach: Paradigm, methodology and methods. London: McGraw Hill.

Choudhary, V., & Vithayathil, J. (2013). The impact of cloud computing: Should the IT department be organized as a cost center or a profit center?. *Journal of Management Information Systems*, *30*(2), 67-100. https://doi.org/10.2753/MIS0742-1222300203

Creswell, J.W. (2009). *Research Design. Qualitative, Quantitative, and Mixed Methods Approaches.* (Third Edition.). Los Angeles: Sage Publications, Inc.

Creswell, J.W. (2013). *Research Design. Qualitative, Quantitative, and Mixed Methods Approaches.* (Fourth Edition.). Los Angeles: Sage Publications, Inc.

Danielsen, F., & Vetle, F. (2017). *Towards an understanding of big data analytics as a weapon for competitive performance* (Master's thesis). University of Agder, Kristiansand.

Davidovic, V., Ilijevic, D., Luk, V., & Pogarcic, I. (2015). Private cloud computing and delegation of control. *Procedia Engineering*, *100*, 196-205. https://doi.org/10.1016/j.proeng.2015.01.358

De Haes, S., & Van Grembergen, W. (2004). IT governance and its mechanisms. *Information systems control journal*, *1*, 27-33.

Dillon, T., Wu, C., & Chang, E. (2010, April). *Cloud computing: issues and challenges*. In 2010 24th IEEE international conference on advanced information networking and applications (pp. 27-33). IEEE. Perth, Australia.

Dikko, M. (2016). Establishing construct validity and reliability: Pilot testing of a qualitative interview for research in Takaful (Islamic insurance). The Qualitative Report, 21(3), 521-528.

El-Gazzar, R. F. (2014, June). *A literature review on cloud computing adoption issues in enterprises*. In International Working Conference on Transfer and Diffusion of IT (pp. 214-242). Springer, Berlin, Heidelberg.

El-Haddadeh, R. (2019). Digital Innovation Dynamics Influence on Organisational Adoption: The Case of Cloud Computing Services. *Information Systems Frontiers*, 1-15. https://doi.org/10.1007/s10796-019-09912-2

García, A. G., Espert, I. B., & García, V. H. (2014). SLA-driven dynamic cloud resource management. *Future Generation Computer Systems*, *31*, 1-11.

Gartner (2019) *Gartner Forecasts Worldwide Public Cloud Revenue to Grow 17.5 Percent in 2019*. Retrieved from https://www.gartner.com/en/newsroom/press-releases/2019-04-02-gartner-forecasts-worldwide-public-cloud-revenue-to-g

Given, L. M. (Ed.). (2008). *The Sage encyclopedia of qualitative research methods*. Sage publications.

Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough? An experiment with data saturation and variability. *Field methods*, *18*(1), 59-82.

Heier, H., Borgman, H. P., & Bahli, B. (2012, January). Cloudrise: opportunities and challenges for IT governance at the dawn of cloud computing. In *2012 45th Hawaii International Conference on System Sciences* (pp. 4982-4991). IEEE.

Hein, Daniel. (2019). *Understanding the 4 Biggest Cloud Deployment Models.* Retrieved from https://solutionsreview.com/cloud-platforms/understanding-the-4-biggest-cloud-deployment-models/

Hetzenecker, J., Weiner, M., & Amberg, M. (2011, August). *User-Designed Software as a Service-Can Conceptual Work be Shifted to the End-User*. In 17th Americas Conference on Information Systems, AMCIS 2011, Detroit, MI.

Huntgeburth, J., Förderer, J., & Veit, D. J. (2013). Up in the Cloud: Understanding the Chasm between Expectations and Reality.

IT Governance Institute. (2003). *Board Briefing on IT Governance, 2nd Edition*, Retrieved from: www.isaca.org/knowledge-center/research/researchdeliverables/pages/board-briefing-on-it-governance-2nd-edition.aspx

Israel, M., & Hay, I. (2006). *Research ethics for social scientists*. USA: Sage Publications, Inc.

Kaltenecker, N., & Hess, T. (2014, June). *From on-premises to on-demand: Learning from two cases of transformation of software companies.* In Proceedings of the 22nd European Conference on Information Systems (ECIS), Tel Aviv, Israel.

Kaltenecker, N., Hess, T., & Huesig, S. (2015). Managing potentially disruptive innovations in software companies: Transforming from On-premises to the On-demand. *The Journal of Strategic Information Systems*, *24*(4), 234-250.

Kathuria, A., Mann, A., Khuntia, J., Saldanha, T. J., & Kauffman, R. J. (2018). A strategic value appropriation path for cloud computing. *Journal of management information systems*, *35*(3), 740-775.

Kaplan, B., & Maxwell, J. A. (2005). Qualitative research methods for evaluating computer information systems. In *Evaluating the organizational impact of healthcare information systems* (pp. 30-55). Springer, New York, NY.

Keane, T. (2019, 19. November). *Microsoft cloud in Norway opens with with availability of Microsoft Azure.* Retrieved from https://azure.microsoft.com/en-us/blog/microsoft-cloud-in-norway-opens-with-availability-of-microsoft-azure/

Khan, S., Nicho, M., & Takruri, H. (2016). IT controls in the public cloud: Success factors for allocation of roles and responsibilities. *Journal of information technology case and application research*, *18*(3), 155-180.

Khanye, T., Ophoff, J., & Johnston, K. (2018, January). Issues in migrating legacy systems to the cloud. In *2018 8th International Conference on Cloud Computing, Data Science & Engineering (Confluence)* (pp. 694-699). IEEE.

Langhein, J., & Thomas, O. (2018). Audit Cloud Adoption by German Audit Firms.

Latham, J. (n.d) *Qualitative Sample Size – How Many Participants is Enough?* Retrieved from https://www.drjohnlatham.com/many-participants-enough/

Leonhardt, D., & Hanelt, A. (2018). Outsiders No More? An Empirical Investigation of the Effect of Digital Institutional Pressure on Corporate IT.

Marinescu, C. Dan. (2013). *Cloud Computing.* Retrieved from: https://www.oreilly.com/library/view/cloud-computing/9780124046276/xhtml/CHP006.html

Mell, P., & Grance, T. (2011). The NIST definition of cloud computing. *NIST Special Publication 800-145.* https://doi.org/10.6028/NIST.SP.800-145

Microsoft. (n.d). *Azure Serverless.* Retrieved 12 May 2020 from https://azure.microsoft.com/en-us/solutions/serverless/

Microsoft. (2019) *Shared responsibility model* [Figure] Retrieved from https://docs.microsoft.com/en-us/azure/security/fundamentals/shared-responsibility

Miles, M. B., & Huberman, M. (1994). *Qualitative Data Analysis*. California: Sage Publications, Inc.

Myers, M. (1997). Qualitative Research in Information Systems. *MIS Quarterly*. 21(2), 241-242 https://doi.org/10.2307/249422

Myers, D. M. (2018, 4. September) *Qualitative Research in Information Systems*. Retrieved from https://www.qual.auckland.ac.nz/

Nutanix. (2019). *Enterprise Cloud Index 2019 Edition. Application Requirements to Drive Hybrid Cloud Growth*. Retrieved from https://www.nutanix.com/enterprise-cloud-index

Oates, B. J. (2006). Researching information systems and computing. London: Sage Publications, Inc.

Overeem, G., & Vreeken, A. (2014, January). Implications of SaaS on Competencies of IT-Brokerages. In Proceedings of the European Conference on Information Systems (ECIS), Tel Aviv, Israel.

Palos-Sanchez, P. R., Robina-Ramirez, R., & Velicia-Martin, F. (2019). What Role does Corporate Governance Play in the Intention to Use Cloud Computing Technology?. *Symmetry*, *11*(253), 11-18.

Pappas, I. O., Mikalef, P., Giannakos, M. N., Krogstie, J., & Lekakos, G. (2018). Big data and business analytics ecosystems: paving the way towards digital transformation and sustainable societies. *Information Systems and e-Business Management*. 16(3), 479–491. https://doi.org/10.1007/s10257-018-0377-z

Paranet. (2019). *Which Cloud Computing Service Model is Right for Your Business?* Retrieved from: https://www.paranet.com/blog/bid/128267/the-three-types-of-cloud-computing-service-models

Phaphoom, N., Wang, X., Samuel, S., Helmer, S., & Abrahamsson, P. (2015). A survey study on major technical barriers affecting the decision to adopt cloud services. *Journal of Systems and Software*, *103*, 167-181.

Qian, R., & Palvia, P. (2013). Towards an understanding of cloud computing's impact on organizational IT strategy. *Journal of Information Technology Case and Application Research*, *15*(4), 34-54.

Rabionet, S. E. (2011). How I Learned to Design and Conduct Semi-Structured Interviews: An Ongoing and Continuous Journey. *Qualitative Report*, *16*(2), 563-566

Raut, R. D., Priyadarshinee, P., Gardas, B. B., & Jha, M. K. (2018). Analyzing the factors influencing cloud computing adoption using three stage hybrid SEM-ANN-ISM (SEANIS) approach. *Technological Forecasting and Social Change*, *134*, 98-123.

RedHat (2020) *What is DevSecOps?* Retrieved from https://www.redhat.com/en/topics/devops/what-is-devsecops

Regjeringen. (2019, 30. October). *Personvernordningen (GDPR).* Retrieved from https://www.regjeringen.no/no/sub/eos-notatbasen/notatene/2014/aug/forslag-til-personvernforordning/id2433856/

Resen, R. D., Ibrahim, H. M., Shyaa, M. A., & Stephan, J. J. (2020) INFORMATION TECHNOLOGY, CLOUD AND THE DIMINISHING ROLE OF IT DEPARTMENT. *International Journal of Advanced Science and Technology.* 29(02), 1016-1022.

Rockmann, R., Weeger, A., & Gewald, H. (2015, May*). IT capabilities and organizational utilization of public cloud computing.* In 2015 European Conference on Information Systems (ECIS). Münster, Germany.

Rohmeyer, P., & Ben-Zvi, T. (2012, July). Emerging trends in decision making of IT leaders. In *2012 Proceedings of PICMET'12: Technology Management for Emerging Technologies* (pp. 667-671). IEEE.

Rumsey, S. (2004). *How to find information: a guide for researchers*. McGraw-Hill Education (UK).

Shao, B. B., & David, J. S. (2007). The impact of offshore outsourcing on IT workers in developed countries. *Communications of the ACM*, *50*(2), 89-94.

Smartsheet. (n.d). *Maintain, protect, and Diminish Risk with a Comprehensive IT Compliance Strategy.* Retrieved from (21.05.2020) https://www.smartsheet.com/understanding-it-compliance

Stamford, Conn. (2020). *Gartner Forecasts Worldwide Public Cloud Revenue to Grow 17.5 Percent in 2019*. Retrieved from https://www.gartner.com/en/newsroom/press-releases/2019-04-02-gartner-forecasts-worldwide-public-cloud-revenue-to-g

Sultan, N., & van de Bunt-Kokhuis, S. (2012). Organisational culture and cloud computing: coping with a disruptive innovation. *Technology analysis & strategic management*, *24*(2), 167-179.

Thomas, D. R. (2006). A general inductive approach for analyzing qualitative evaluation data. *American journal of evaluation*, *27*(2), 237-246.

UiA. (2019). *Aktuelle tema og forskningsområder innen informasjonssystemer*. Retrieved from https://www.uia.no/studieplaner/topic/IS-420-1

Vithayathil, J. (2018). Will cloud computing make the Information Technology (IT) department obsolete?. *Information Systems Journal*, *28*(4), 634-649.

Walsham, G. (2006). Doing interpretive research. *European journal of information systems*, *15*(3), 320-330.

Webster, J., & Watson, R. T. (2002). Analyzing the past to prepare for the future: Writing a literature review. *MIS Quarterly*, 26(2), 13-23.

Weill, P., & Ross, J. W. (2004). *IT governance: How top performers manage IT decision rights for superior results*. Boston: Harvard Business Press.

Williams, H. (2019, 20. May) *Is digital killing the traditional IT department?* Retrieved from https://www.itproportal.com/features/is-digital-killing-the-traditional-it-department/?fbclid=IwAR1-pK10fhd_ZkAVahVxr4DrPzw8MszhT_pUKE-H6_ZvyilZgTLSGjJ4_NE

Woods, C. (2014, 23. September). *Matrix Organizational Structure: Advantages, Disadvantages & Examples.* Retrieved from study.com/academy/lesson/matrix-organizational-structure-advantages-disadvantages-examples.html

Wu, J., Ding, F., Xu, M., Mo, Z., & Jin, A. (2016). Investigating the determinants of decision-making on adoption of public cloud computing in e-government. *Journal of Global Information Management (JGIM)*, *24*(3), 71-89.

Yin, R.K. (2003). *Case Study Research: Design and Methods* (Third Edition.). California: Sage Publications, Inc.

9 Appendix

9.1 Appendix A – Interview Guide

1. **Hva er din rolle?**
    a. Hva er ditt ansvarsområde?
    b. Ekspertise / Erfaring?
    c. Erfaring innen skyløsninger?

2. **Hvordan opererte IT avdelingen før dere tok i bruk skyløsninger?**
    a. Roller som IT avdelingen hadde
        i. Ansvarsområder / Oppgaver
    b. Hvem tok de store beslutningene? (CIO, CTO, etc.)
    c. Størrelse på IT avdelingen

3. **Hvordan bruker dere Cloud Computing i deres bedrift?**
    a. Hvor stor del av bedriften er i skyen?
    b. Hvor lenge har dere tatt i bruk Cloud?
    c. Hva slags initiativer eller løsninger er tatt i bruk?
    d. Hvor kom initiativet fra å gå mot Cloud løsninger?

4. **Hvordan har Cloud påvirket IT avdelingen i forhold til hvordan den ble driftet før?**
    a. Nedbemanning eller omstilling
        i. Størrelse på IT avdelingen
        ii. Har cloud åpnet for vekst av it avdelingen eller motsatt?
    b. Hvordan har styringsmekanismene blitt endret?
    c. Kostnader / Budsjettering
    d. Fokuset til IT avdelingen

5. **Har deres bedrift hatt fokus på noen spesielle interne roller som resultat av Cloud?**
    a. Roller som har vært mer ettertraktet?
    b. Roller som er nye?
    c. Omstilling av roller for ansatte?
    d. Hvilken rolle har vært viktigst for dere, eller har krevd mest fokus?

6. **Har toppledelsen sine roller eller ansvarsområder endret seg? (CIO, CTO, etc)**

7. **Hvordan håndterer dere IT governance / IT Controls i deres bedrift når det gjelder Cloud bruk?**
    a. Hvordan håndterer dere dette aspektet, er det noe dere fokuserer på?
        i. Hvorfor
        ii. Hvorfor ikke
            1. Har dere tenkt å fokusere mer i fremtiden?
    b. Følger dere noen forhåndsdefinerte eller egendefinerte rammeverk
        i. Kan du si litt om hvordan det funker?
        ii. Hva er hovedfokusene i dette rammeverket?

   c. Kan du nevne noen av de viktigste grunnene til at dere fokuserer på dette?
   d. Hvordan har dette endret seg når dere begynte med Cloud, eller som resultat av Cloud

8. **Fremtidige prosjekter innen Cloud?**
   a. Har dere noen planer fremover mot Cloud
   b. Har dere allerede iverksatt noen prosjekter
   c. Outsource mer, mindre eller holde det likt?

9. **Egne tanker rundt Cloud og dens påvirkning på IT avdelingen?**
10. **Er det noen spørsmål eller tema vi ikke har spurt om som vi burde ha gjort?**

9.2 Appendix B – Concept Matrix

Articles	IT Department Role	Organizational Transformation	Change Management	IT Management	Process Management	IT Strategy	IT & Business Alignment	Knowledge Management	Risk Management	Security Management	Resource Management	Data Management	Performance Management	Service Level Agreement	SaaS	PaaS	IaaS
Alshammari et al., (2018)	X	X		X		X		X	X	X	X	X			X	X	X
Choudhary & Vithayathil (2013)	X									X	X	X	X		X	X	X
Heier H et al., (2012)	X			X			X		X								
Borgman et al., (2013)				X			X			X	X	X		X	X		
Davidovic et al., (2015)						X		X	X	X	X	X	X	X	X	X	X
Becker & Bailey (2014)	X	X		X		X	X		X	X	X	X	X	X	X	X	X
Kaltenecker et al., (2015)		X	X		X			X	X					X	X	X	X
Qian & Palvia (2013)	X	X		X		X	X		X	X	X	X	X				
Vithayathil (2018)	X		X				X			X	X		X	X	X	X	X
Leonhardt & Hanelt (2018)	X	X					X	X			X						
Khanye et al., (2018)	X	X			X	X	X										
Borgman et al., (2016)				X			X		X	X	X		X		X	X	
El-Haddadeh (2019)		X				X		X	X		X	X			X		
Kaltenecker & Hess (2014)		X	X	X		X		X			X				X		
Khan et al., (2016)	X	X	X	X		X	X	X	X	X	X		X	X	X	X	X
Langhein & Thomas (2018)		X				X					X				X	X	
Carrol et al., (2011)			X				X		X	X	X			X	X	X	X
Bounagui et al., (2019)				X	X	X	X		X	X	X	X	X	X	X	X	X
Wu et al., (2016)	X	X	X						X	X		X			X	X	X
Palos-Sanchez et al., (2019)			X	X	X			X	X	X	X		X		X	X	
El-Gazzar (2014)		X	X		X	X	X	X	X	X	X	X		X	X	X	X
Hetzenecker et al., (2011)	X							X	X	X	X	X	X	X	X	X	X
Armbrust et al., (2010)				X					X	X	X	X			X	X	X
Huntgeburth et al., (2013)	X	X			X								X	X	X	X	X
Kathuria et al., (2018)	X	X	X		X	X		X		X	X				X		X
Raut et al., (2018)						X		X	X	X	X				X	X	X
Chang et al., (2019)		X	X	X	X			X	X	X		X			X	X	X
Rohmeyer & Ben-Zvi (2012)	X	X	X	X		X	X			X	X	X			X		
Breaux et al., (2013)								X	X	X		X		X			
Overeem & Vreeken (2014)	X				X		X		X	X			X	X	X		
Resen et al., (2020)	X	X								X					X	X	X
Rockmann et al., (2015)	X	X		X	X	X	X		X	X	X	X	X		X	X	X

9.3 Appendix C – NSD Informasjonsskriv

Vil du delta i forskningsprosjektet

"[Cloud Computing og dens effekt på IT avdelingen]"?

Dette er et spørsmål til deg om å delta i et forskningsprosjekt hvor formålet er å se på endringene som skjer i IT avdelingen som et resultat av skyløsninger. I dette skrivet gir vi deg informasjon om målene for prosjektet og hva deltakelse vil innebære for deg.

Formål

Formålet med dette prosjektet er å finne ut av hvordan skytjenester kan påvirke og endre IT avdelingen i en bedrift. Da vil vi spesifikt se på rolle endringer til IT avdelingen som en enhet og eventuelt har interne roller forsvunnet, oppstått eller skiftet. Hvis IT avdelingen har endret seg, vil vi også se hvordan styringen av IT har endret seg. Forskningspørsmålet vårt er: "*In what ways can the implementation of cloud computing initiatives in an organization affect the IT department and its IT governance mechanisms?"*

Studiet er en masteroppgave innenfor Informasjonssyster ved Universitetet i Agder.

Hvem er ansvarlig for forskningsprosjektet?

Institusjon for Informasjonssystemer ved Universitetet i Agder er ansvarlig for prosjektet.

Hvorfor får du spørsmål om å delta?

Basert på din ekspertise og den situasjonen din organisasjon befinner seg i (Tatt i bruk skyløsninger i mindre eller større grad), vil vi snakke med deg om å høre dine meninger rundt forskningsspørsmålet.

Hva innebærer det for deg å delta?

Hvis du velger å delta i prosjektet, innebærer det at vi gjennomfører et intervju. Det vil ta ca. 1 time der vi snakker litt åpent om dine tanker og erfaringer rundt skyløsninger og vår problemstilling. Intervjuet vil bli tatt opp på lydopptak, og vil bli lagret i OneDrive gjennom Universitets database.

Det er frivillig å delta
Det er frivillig å delta i prosjektet. Hvis du velger å delta, kan du når som helst trekke samtykke tilbake uten å oppgi noen grunn. Alle opplysninger om deg vil da bli anonymisert. Det vil ikke ha noen negative konsekvenser for deg hvis du ikke vil delta eller senere velger å trekke deg.

Ditt personvern – hvordan vi oppbevarer og bruker dine opplysninger

Vi vil bare bruke opplysningene om deg til formålene vi har fortalt om i dette skrivet. Vi behandler opplysningene konfidensielt og i samsvar med personvernregelverket.

Det vil kun være prosjektgruppen (Magnus Hornnes & Haris Saric) som har tilgang til opplysningene lagret på OneDrive. Dataene vil bli anonymisert og kodet slik at du ikke kan bli identifisert. Universitetet har god sikkerhet og gode rutiner rundt oppbevaring som sikrer deg og din data.

Hva skjer med opplysningene dine når vi avslutter forskningsprosjektet?

Prosjektet skal etter planen avsluttes rundt *01.06.2020.* All data vil bli slettet når prosjektet er ferdig og evaluert.

Dine rettigheter
Så lenge du kan identifiseres i datamaterialet, har du rett til:

- innsyn i hvilke personopplysninger som er registrert om deg,
- å få rettet personopplysninger om deg,
- få slettet personopplysninger om deg,
- få utlevert en kopi av dine personopplysninger (dataportabilitet), og
- å sende klage til personvernombudet eller Datatilsynet om behandlingen av dine personopplysninger.

Hva gir oss rett til å behandle personopplysninger om deg?
Vi behandler opplysninger om deg basert på ditt samtykke.

På oppdrag fra Universitetet i Agder har NSD – Norsk senter for forskningsdata AS vurdert at behandlingen av personopplysninger i dette prosjektet er i samsvar med personvernregelverket.

Hvor kan jeg finne ut mer?
Hvis du har spørsmål til studien, eller ønsker å benytte deg av dine rettigheter, ta kontakt med:

- Veiledere (Universitetet i Agder
    - Eli Hustad (Eli.Hustad@uia.no / 38141621)
    - Ilias Pappas (Ilias.pappas@uia.no / 38141449)
- Studentene
    - Magnus Hornnes (Magnus.hornnes@gmail.com / 95782117)
    - Haris Saric (Saric.haris08@gmail.com / 47686905)
- Vårt personvernombud
    - Ina Danielsen (Ina.danielsen@uia.no / 45254401)
- NSD – Norsk senter for forskningsdata AS, på epost (personverntjenester@nsd.no) eller telefon: 55 58 21 17.

Med vennlig hilsen

Eli Hustad & Ilias Pappas

Haris Saric & Magnus Hornnes

Samtykkeerklæring

Jeg har mottatt og forstått informasjon om prosjektet, og har fått anledning til å stille spørsmål. Jeg samtykker til:

- ☐ å delta i et intervju med lydopptak
- ☐ at mine personopplysninger lagres etter prosjektslutt, til prosjektet er blitt ferdig evaluert

Jeg samtykker til at mine opplysninger behandles frem til prosjektet er avsluttet, ca. *01.06.2020*

(Signert av prosjektdeltaker, dato)