

Master's Thesis

Emmi Räsänen 2018

LAPPEENRANTA UNIVERSITY OF TECHNOLOGY
School of Business and Management
Master's Degree Programme in Accounting

Emmi Räsänen

**ADOPTION OF CLOUD ERP SYSTEMS IN THE NORDICS –
BENEFITS AND DRAWBACKS**

Master's thesis
2018

1st Supervisor: Professor Mikael Collan

2nd Supervisor: Postdoctoral researcher Jyrki Savolainen

ABSTRACT

Author:	Emmi Räsänen
Title:	Adoption of cloud ERP systems in the Nordics – benefits and drawbacks
Faculty:	School of business and management
Master's programme:	Accounting
Year:	2018
Master's thesis:	Lappeenranta University of Technology, 101 pages, 7 figures, 1 picture, 10 tables, 3 appendices
Examiners:	Professor Mikael Collan Postdoctoral researcher Jyrki Savolainen
Keywords:	cloud ERP systems, innovation adoption, ERP adoption, cloud ERP adoption

The main objective of this study is to enhance understanding what determines cloud enterprise resource planning (ERP) systems adoption at the organizational level. ERP systems are important to organizations, and now their transition towards cloud based solutions has raised a lot of interest among academia and practitioners, and one aspect of this phenomenon is the adoption of these systems. This qualitative study will focus on exploring which factors are affecting adoption of cloud ERP systems within Nordic organizations. In this study, meaningful factors of cloud ERP adoption are explored based on extensive literature review founded on the theoretical background of innovation adoption theories. The qualitative data for the study was gathered by interviewing ERP professionals and observing Nordic customers and market of ERP systems. Results of the study indicate that despite the fact that the focus of the study was on IT innovation adoption, it is essential that technical, but also organizational and environmental implications of cloud ERP systems are considered in the organizations' adoption decision process. The significance of people during the adoption cannot be neglected, and change management is one critical factor for the success of the process. The study suggests that (Nordic) organizations need to put effort on adoption phase and consider the characteristics of the company carefully and based on those define requirements for the ERP systems. The big picture of the organization's IT architecture should be considered in the adoption phase and whether cloud ERP system fits in it.

TIIVISTELMÄ

Tekijä:	Emmi Räsänen
Tutkielman nimi:	Pilvipohjaisten ERP-järjestelmien omaksuminen Pohjoismaissa – hyödyt ja haitat
Tiedekunta:	Kauppätieteellinen tiedekunta
Maisteriohjelma:	Laskentatoimi
Vuosi:	2018
Pro Gradu –tutkielma:	Lappeenrannan teknillinen yliopisto, 101 sivua, 7 kuviota, 1 kuvaa, 10 taulukkoa, 3 liitettä
Tarkastajat:	Professori Mikael Collan Tutkijatohtori Jyrki Savolainen
Hakusanat:	pilvipohjaiset ERP -järjestelmät, innovaation omaksuminen, ERP -järjestelmien omaksuminen, pilvipohjaisten ERP -järjestelmien omaksuminen

Tämän tutkielman tarkoituksena on lisätä ymmärrystä siitä, mikä määrittelee pilvipohjaisten toiminnanohjausjärjestelmien (ERP) omaksumista organisaatioitasolla. ERP -järjestelmät ovat tärkeitä yrityksille, ja niiden muutos pilvipohjaisiksi järjestelmiksi on herättänyt kiinnostunut niin tutkijoiden kuin ammatinharjoittajienkin keskuudessa, ja yksi näkökohta tähän aiheeseen on näiden järjestelmien omaksuminen. Tämä kvalitatiivinen tutkielma keskittyy tunnistamaan, mitkä tekijät vaikuttavat pilvipohjaisten ERP -järjestelmien omaksumiseen pohjoismaisissa organisaatioissa. Tässä tutkielmassa merkitseviä tekijöitä pilvipohjaisten ERP -järjestelmien omaksumiselle kartoitetaan kirjallisuuskatsauksella, jota pohjustetaan teoreettisella katsauksella innovaatioiden omaksumisen teorioihin. Kvalitatiivinen aineisto on kerätty haastattelemalla ERP -järjestelmien asiantuntijoita sekä havainnoimalla ERP -järjestelmien pohjoismaista markkinaa sekä asiakkaita. Tutkimuksen tulokset osoittavat, että huolimatta siitä, että tutkielma keskittyy IT innovaation omaksumiseen, on tärkeää, että pilvipohjaisten ERP -järjestelmien tekniset vaikutukset, mutta myös niiden organisatoriset- ja ympäristövaikutukset otetaan huomioon yrityksen omaksumispäätösprosessissa. Ihmisten merkitystä omaksumisessa ei voida väheksyä, ja muutosjohtaminen on yksi kriittinen tekijä prosessin onnistumiselle. (Pohjoismaisia) organisaatioita kannustetaan panostamaan omaksumisvaiheeseen ja pohtimaan organisaation ominaispiirteitä ja niihin perustuen, määrittämään vaatimukset ERP -järjestelmille. Organisaation IT-arkkitehtuurin isoa kuvaa tulisi miettiä omaksumisvaiheessa ja sitä sopiiko pilvipohjainen ERP-järjestelmä siihen.

ACKNOWLEDGEMENTS

One phase of the life is now coming to its end. The journey has been memorable, and I feel grateful for all the acquisitions which LUT has provided me for the (working) life. It feels wistful and super exciting at the same time to start a new chapter in life.

First, I would like to thank my supervisor Mikael Collan for all the support and guidance during this thesis writing. I feel that without his gentle pressure I would not be writing these last words. Also, I want to say thank you for my interviewees for their time and genuine interest towards the topic. Without your effort, this would not have been possible.

Marjola girls, who shared the university life with me, deserve big thanks. It was helpful to share also the thesis writing phase with you.

Finally, I want to thank my loved ones – family and friends. The encourage you gave me to finalize this thesis was invaluable, and I feel grateful that I have such supportive and loving people around me. Thank you.

In Helsinki, 02.03.2018

Emmi Räsänen

Table of Contents

1. Introduction	9
1.1 Motivation and background of the study	9
1.2 Theoretical framework and focus of the study	12
1.3 Research questions and objectives	15
1.4 Research methodology	17
1.5 Structure of the study	18
2. Theoretical background	20
2.1 Cloud computing	20
2.1.1 Main characteristics and features of cloud computing	21
2.2 Enterprise resource planning systems	23
2.2.1 Development and main features of ERP systems.....	24
2.2.2 Cloud ERP solutions	26
2.2.3 Stakeholders of cloud solutions	27
2.2.4. Market and trends of the ERP systems.....	28
2.3 Adoption of information technology systems	29
2.3.1 Diffusion of innovation	30
2.3.2 Technology–organization–environment framework.....	32
2.4 Summary of theoretical concepts	34
3. Literature review	36
3.1 Literature review process	37
3.2. Results of the literature review	40
3.2.1 ERP systems adoption.....	40
3.2.2 Cloud ERP systems adoption.....	42
3.3 Analysis of the literature review	47
3.3.1 Technological context of adoption.....	47
3.3.2 Organizational context of adoption.....	50
3.3.3 Environmental context of adoption.....	52
3.3.4 Summary of the literature review findings	53
4. Research method and data	54
4.1 Research methodology	54
4.2 Data collection	55
4.3 Reliability and validity	57
5. Adoption of cloud ERP systems in the Nordics	59

5.1. Cloud ERP systems in the Nordic market	59
5.1.1 Observations from the Nordic customers	61
5.2. Results from the interviews.....	63
5.2.1 Cloud solutions and SaaS service model.....	63
5.2.2 Cloud ERP systems and meaningful factors in the adoption.....	67
5.2.3 Customers adoption process and the ERP market in the Nordics	70
5.3. Analysis and summary of the results	74
5.3.1. Technological drivers and barriers to adoption.....	75
5.3.2. Organizational drivers and barriers to adoption.....	77
5.3.3. Environmental drivers and barriers to adoption.....	79
6. Discussion and conclusions.....	81
6.1 Summary of the findings.....	81
6.2. Conclusions and take-away message for the industry	89
6.3. Limitations and directions for future research	91
References.....	93

APPENDICES

Appendix 1. Sources of the factors in the literature

Appendix 2. Themes covered in the customer interviews

Appendix 3. The half-structured theme interview

LIST OF FIGURES

Figure 1. Theoretical framework	14
Figure 2. Structure of the study	19
Figure 3. Visualization of NIST definition of cloud (Mell & Grance 2011)	21
Figure 4. ERP characteristics regrouped under three dimensions by Uwizeyemungu and Raymond (2012).....	24
Figure 5. Overview of the basic ERP modules.....	25
Figure 6. The technology-organization-environment framework (Baker 2012; Tornatzky & Fleischer 1990).....	33
Figure 7. Conceptual model of the research	35

LIST OF PICTURES

Picture 1 Cloud maturity by industry in the Nordics. (Radar 2017).....	60
--	----

LIST OF TABLES

Table 1. Technological factors affecting adoption	48
Table 2. Organizational factors affecting adoption.....	51
Table 3. Environmental factors affecting adoption.....	52
Table 4. List of interviewees	56
Table 5. Technological factors of adoption.....	76
Table 6. Organizational factors of adoption.....	78
Table 7. Environmental factors of adoption	79
Table 8. Benefits for adoption	85
Table 9. Drawbacks for adoption.....	87
Table 10. The most important take-away messages of the study	90

ABBREVIATIONS

AI	Artificial Intelligence
CAGR	Compound annual growth rate
Cloud ERP	Cloud based enterprise resource planning system
DOI	Diffusion of innovation theory (Rogers 1995)
ERP	Enterprise resource planning
HR	Human resources
IaaS	Infrastructure as a Service
IoT	Internet of Things
IS	Information system
IT	Information technology
MRP	Material requirement planning system
PaaS	Platform as a Service
SaaS	Software as a Service
TCO	Total cost of ownership
TOE	Technology-organization-environment framework (Tornatzky & Fleischer 1990)

1. Introduction

This thesis begins with a chapter introducing the topic and explaining the motivation and background of the study. After that focus of the study is described with the help of theoretical framework, aiming to highlight the theoretical starting point and perspectives of the study. Justified by the recognized research gap, research problem, questions and objectives are defined. At the end of this chapter research method is defined, and structure and outlining of the study are presented.

1.1 Motivation and background of the study

“Thus, the computing world is rapidly transforming towards developing software for millions to consume as a service, rather than to run on their individual computers.”

(Buyya et al. 2008)

Digital transformation is a fast growing phenomenon and a global trend, affecting nearly every industry and the whole society, reshaping the global business' revenue centers with digital or digitally enhanced products and services. Organizations are now looking for more digital ways to connect people, processes, and things, also in the critical core of the business, such as with their enterprise resource planning (ERP) systems. The new core of the business, where automation, analytics, real-time analysis, and reporting are built into systems and processes requires innovation which means imagining what is possible and making it happen. (Briggs, Ehrenhalt, Gish, Haddad, Mussomeli, Sher, Katyal & Perinkolam 2017; Whitehead 2017)

The purpose of this study is to find out which factors are determining the decision to adopt cloud ERP systems and with it enhance organizations' digitalization. This study aims to explore driving and preventing factors by first recognizing them from the previous literature and then concentrating on the Nordic market by observing customers' interviews and market information, and by interviewing professionals working among ERP systems. Results of this study are aiming to create understanding about the important factors of innovation adoption in the new core of the business with cloud ERP systems. Topics covered in this thesis can

be useful for enterprise resource planning systems' vendors, to widen understanding what customers are considering while deciding whether to adopt cloud solutions or not. In addition to that, potential customers of cloud ERP systems can leverage this study to extend the knowledge of the factors they should consider during the adoption decision-process. In general, this study enhances the research about cloud ERP adoption and provides insights to determining factors of it.

One way to enable this kind of innovations and innovativeness to digitalize business is technology, harnessed to change the way organizations operate, and one technological source of innovation is cloud based solutions. Cloud computing has gained a lot of attention in academia and among practitioners in recent years, and now organizations are finding out ways to consolidate their information technology (IT) infrastructure and services to reshape their business. When viability and benefits of cloud computing are getting proved, the adoption rate is rapidly increasing even with more strategically complex IT solutions such as ERP systems. Studies are showing that customers are evaluating the promised advantages and considering the use of cloud services in their business processes together with enterprise resource planning systems and by deploying disruptive technologies such as cognitive, robotics and Internet of Things (IoT). (Benlian, Hess & Buxmann 2009; Briggs et al. 2017; Mangiuc 2011; Schubert & Adisa 2011; Whitehead 2017)

In the Nordics digitalization path of organizations has been active in recent years, according to Finnish study Digibarometri 2017, which compares digitalization capabilities in private and public sector among 22 countries. Results of the survey show positive outcomes for Nordic countries, the top four countries in the utilization of digitalization among companies, society and citizens are Norway, Finland, Denmark, and Sweden. (Etlatiety Oy 2017) Nordic companies are apparently looking for ways to be more digitalized, and this is also noticed among vendors of digital solutions, such as cloud computing, and Nordic customers have stated to be "among the most innovative users of cloud computing in the world." (Nylander 2014)

Now, when there are a lot of new technological innovations available, companies should be able to consider which ones they adopt, to keep up with the digitalization journey, and one possible matter of consideration are organizations' ERP systems. Almost two decades ERP

systems have been on premise solutions, but now cloud based innovations are emerging. There is increasing trend to migrate internal ERP systems and database to cloud where the software is provided by the cloud service provider as a Service from the cloud (SaaS). (Briggs et al. 2017; Mangiuc 2011; Schubert & Adisa 2011; Whitehead 2017; Peng & Gala 2014) According to Gartner by 2020 at least 35% of large enterprises ERP systems deployments will be SaaS based with integrations to on premise manufacturing systems (Guay, Chandra & Montgomery 2017). Statista is predicting that the global cloud ERP market is worth of \$28B by 2022 and MarketsandMarkets are estimating that the cloud ERP market is growing from \$18.5B in 2016 to \$29.84B by 2021 with CARG of 10% (Columbus 2018). Based on these predictions it can be implied that market of cloud ERP systems is expanding and there is a lot of interest towards SaaS ERP systems among organizations.

Previous studies about ERP systems, cloud ERP systems, and cloud computing are existing, but empirical research of SaaS ERP systems is narrow. (Johansson & Ruivo 2013; Salleh, Teoh & Chan 2012). The concept of ERP systems will drastically change with cloud ERP systems when everything is produced and delivered by the cloud service provider (Johansson & Ruivo 2013), and it will have a significant influence on many organizations – that is why research into determining factors of cloud ERP is needed.

As stated, ERP systems can be considered as technological innovations for companies, and despite the operation mode of the system, the initial adoption of an innovation is an essential step also to ERP systems related project. Adoption of enterprise system forces company to make significant monetary and resource commitments. Most of the previous studies about ERP systems are focusing on the implementation phase of the systems, but also adoption phase including introduction and acquisition should be considered (Ram, Corkindale & Wu 2013; Verville, Palanisamy, Bernadas & Halington 2007).

Reflected by the topics mentioned previously in this chapter, the goal, and motivation of this study is to find effective factors that influence adoption of cloud based enterprise resource planning (ERP) systems and determine the significance of these factors in the process of adoption decision-making among Nordic organizations. The aim is to find out which factors drive customers to adopt a cloud based solution for ERP systems and can there be identified

some particular issues which vendors of these ERP systems could improve so that adoption of cloud ERP systems would be more attractive to customers.

1.2 Theoretical framework and focus of the study

In this chapter theoretical framework and focus of this study are presented. Theoretical framework visualizes the theoretical perspectives of the research by showing theoretical starting points and concepts used in the study. The focus of this study is in the cloud based ERP systems adoption in the Nordic market and the target is to enhance understanding the factors affecting it at the organizational level. The aim of the study is to explore which are the factors that customers and vendors see as benefits and disadvantages for the adoption and with that fill a gap in the previous literature.

Given the importance of ERP systems for companies they have been studied from many perspectives during recent years, prior literature has covered topics such as its implementation and critical success factors, but lack of studies focusing on adoption is recognized (See e.g. Ram et al. 2013; Seethamraju 2014). Cloud computing is a phenomenon which has gathered a lot of attention among academia and practitioners in recent years, and studies of it have focused on, for example, definition, adoption, and advantages of it (See e.g. Armbrust, Fox, Griffith, Joseph, Katz, Konwinski & Zaharia 2009; Buyya et al. 2008). One service model of cloud computing is Software as a Service (SaaS), which has recently attracted interest among research and practice of different IT systems and solutions (Abd Elmonem, Nasr & Geith 2016; Johansson & Ruivo 2013; Mell & Grance 2011). Cloud computing and SaaS service model have provided a whole new model and platform to leverage also with ERP systems, and cloud ERP systems are seen as a possibility to enhance organizations competitive advantages and processes through scalable and flexible information systems (IS) landscape (Adisa & Schubert 2011; Salleh et al. 2012).

ERP systems are a critical part of the enterprises business processes, and investments made to them are significant which makes it essential to understand the ERP systems adoption and factors affecting it as a part of the overall success of the process. Despite these issues mentioned above there is recognized lack of studies of the adoption phase. (Ram et al. 2013) Cloud computing adoption studies have been mostly focusing on how cloud computing can

support business activities, which applications are used as cloud based and what kind of business value is gained with it. More focus should be put on to understanding the advantages and challenges of cloud ERP adoption. (Buyya et al. 2008; Salleh et al. 2012) Based on these notifications from the previous studies, focus point of this study is in the adoption stage and exploring the factors influencing it. To emphasize importance of the adoption phase, it has been stated to be one of the most critical steps of any IT innovation process and adequately done adoption phase will enable later leverage and use of the system in the most optimized way (Markus and Tanis 2000; Seethamraju 2014). In this study, Roger's definition of adoption is used to describe the adoption stage as "the decision of any individual or organization to make full use of an innovation as the best course of action available" (Rogers 1995, 177).

In this study, Diffusion of innovations (DOI) theory by Rogers (1995) is utilized to explain the innovation spreading and adoption process in the organizations, and helping to recognize the essential factors in the adoption. After meaningful elements of ERP systems adoption are identified from previous studies, they are grouped under three contexts; technology, organizations, and environment based on technological innovation adoption theory Technology-organization-environment (TOE) framework by Tornatzky and Fleischer (1990). This grouping will assist the author to recognize what are the main reasons in each category and by that eventually build a view which factors affect to SaaS based ERP systems adoption from the theoretical perspective.

The theoretical framework of the thesis aims to highlight from where recognition of the drivers and barriers of adoption starts and how coherent view of these factors can be built with the help of innovation adoption theories. Figure 1 visualizes the focus area and intersection of the theoretical perspectives covered in this study, in which the new deployment models of ERP systems as cloud solutions are investigated with innovation adoption theories to enhance understanding about cloud ERP adoption from the theoretical perspective.

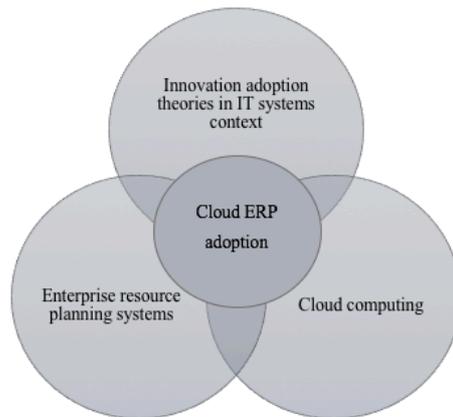


Figure 1. Theoretical framework

Like mentioned, current literature about ERP systems is extensive, but it is merely focused on premise solutions. According to many studies, there is raising interest towards SaaS ERP systems among practitioners, but the studies of adoption process of cloud ERP systems are limited. (Johansson & Ruivo 2013; Peng & Gala 2014; Seethamraju 2014) Specially studies of SaaS ERP systems adoption in the Nordic markets are not existing. This study focuses on this recognized gap found from the previous studies of cloud ERP systems adoption in the Nordic market, excluding all the other cloud based solutions from the scope.

In addition, other limitations are made to this study to make it more coherent and extensive review of the chosen subject field. The first limitation is that this study focuses only on Nordic ERP systems market and customers meaning Finland, Norway and Sweden for two reasons, first the material for the qualitative study is gathered from this region and secondly because obvious research gap was recognized in this geographical area. Limitations to industries or company sizes in the Nordic ERP market are not defined. Time wise, empirical material for this study is gathered between from 2016 until the beginning of 2018 but other limitations to timeline are not made.

1.3 Research questions and objectives

This study aims to fill the gap in existing literature by studying customer adoption of cloud based ERP systems among Nordic organizations. The primary objective of the thesis is to build a view and understanding of the factors which determines adoption of cloud based ERP systems in Nordic organizations and find out what is the importance and role of these factors to organizations when deciding adoption of cloud based ERP solutions. The study aims to describe factors that influence the adoption process of cloud based ERP solutions and by that develop a better understanding of the customers' needs in the Nordics. There are already a lot of existing studies about benefits and drawbacks of cloud-based ERP solutions compared with on premise ERP systems. (See e.g. Abd Elmonem et al. 2016; Schubert & Adisa 2011) However, there are still not common understanding what determines the decision of cloud based solution adoption in the Nordic market and what are the advantages and disadvantages which influence on the decision of adopting cloud based ERP systems in this particular market.

Many predictions and studies imply that cloud market will expand, and SaaS service model for ERP systems will have a significant influence on companies despite their size, and that is one reason why understanding about determinants and challenges of SaaS based models are needed (Johansson & Ruivo 2013; Seethamraju 2014). This trend is also recognized in the Nordics, and transition towards cloud also with ERP systems is increasing (Abeleen, J. & Hall, L., T. 2015). Adoption phase is critical for ERP systems when considering the financial and resource commitments related to it, and it is essential to understand this both by theoretical and practical means (Ram, Corkindale & Wu 2013; Verville, Palanisamy, Bernadas & Halington 2007; Karahanna, Straub & Chervany 1999). To be able to find these determining factors in the adoption process in the Nordic context, following main research question is stated.

What are the factors which Nordic organization take into account when adoption decision about cloud based ERP system is made?

Sub-questions are determined to assist answering the main question. Innovation adoption can change organization in many levels and change can happen in different degrees which

makes it essential to understand what determines the adoption decision so that influencing factors can be recognized. In this study TOE framework is used in to help to recognize the essential factors in different contexts of organization. (Baker 2012; Oliveira & Martins 2011; Torntzky & Fleischer 1990) Based on this, the first sub-question aims to create understanding about the overall decision-making in the adopting organization and clarify what determines the decision. Second sub-question is enabling to understand differences, similarities, benefits, and advantages of SaaS based ERP systems recognized in the literature and also among practitioners such as ERP consultants. The success of cloud ERP adoption is dependent on different internal and external issues and aspects of the organization and it is critical to recognize these various implications it might have (Peng & Gala 2014). Target is to create an overall picture of the subject by recognizing the factors at the organizational level.

What determines adoption of ERP systems in the companies?

What benefits and disadvantages are seen to be related to SaaS based ERP systems?

Due to ERP systems high-value to organizations, this drastic change to cloud based operation mode makes it crucial to understand customers' requirements and characteristics (Lind & Back 2014). Third sub-question is focusing on creating an understanding of the Nordic market, what are the needs of the customers, are the special features recognized in Nordic organizations, and are there a lot of differences compared to other markets. Professionals of ERP systems provide answers to this question based on their strong experience about the different ERP solutions and the Nordic market.

What are customers expecting and requiring from SaaS based ERP systems to be willing to adopt them in the Nordic market?

This thesis aims to answer these research questions by first creating comprehensive view about cloud ERP applications, and concepts related to them such as cloud computing and ERP systems and IT innovation adoption according to literature. Theoretical part continues with extensive literature review about ERP systems adoption and then in the empirical part materials gathered from ERP solutions experts and by utilizing insights from ERP systems'

customers are examined. Finally, by reflecting the theoretical and empirical findings, answers to research questions are given in the last chapter of this study.

These issues are particularly important for vendors of ERP systems because by knowing the pain points of customers they could innovate more suitable ERP solutions to their customers. Customers are demanding more scalable and flexible digital solutions for their business, but on the other hand, it seems that they are not still ready to give up traditional on premise solutions. With this study, it is also possible to enhance customers' understanding about critical issues to be considered when evaluating possibilities for more digitalized business processes. This study is a qualitative study about determinants to adopt cloud based ERP systems in the Nordic market.

1.4 Research methodology

This research includes theoretical and empirical part. The first part begins with theoretical background, which introduces concepts used in this thesis and also innovation adoption theories are covered to support the literature review. Academic research about concepts used in this study, such as cloud computing, are still quite rare, and most of it is from recent years, and because of this, the author has used some secondary sources as references when explaining the meaning of the concepts. The literature review is the other theoretical section of this study, and it aims to recognize and find the most critical factors related to ERP systems adoption based on the previous studies in this subject field.

The empirical part of this study aims to improve understanding of an IT innovation with a limited amount of previous research, meaning cloud ERP solutions adoption in the Nordics. To achieve this objective, a qualitative exploratory case study is used as a research method (Yin 2003, 5-7). The target of this study is to create comprehensive view about the adoption of SaaS ERP systems from professionals working with these solutions and also to get a view from customers who are the prospect adopters of these solutions. Data collection for the empirical study is carried out with interviews with consultants and managers working with ERP solutions in the Nordics. In addition to this, interview material from Nordic customers is used as a base for the empirical study of this thesis, additionally to market predictions.

Research method and data collection for the empirical part are described more detailed in chapter 4. Research method and data.

1.5 Structure of the study

Outlining of this study is presented in figure 2. The thesis begins with an introduction which familiarizes the reader to subject, justifies the research topic and defines research problem. After the introduction, the theoretical background is covered by determining and explaining main concepts related to cloud based solutions and especially to cloud ERP solutions. The chapter continues by explaining chosen theories about innovation adoption in more detail, focusing on IT systems adoption at the organizational level. The second chapter aims to give an overall picture of the subject field and what is the starting point for this study by the theoretical means. In the third chapter, a literature review is carried out, enabling to find determining factors about ERP systems adoption in organizations by deep diving to existing literature about the topic. The chapter focuses on enhancing understanding about the factors that are seen important for SaaS based ERP systems adoption according to different studies and then reflected with innovation adoption theories, which are covered in the theoretical background chapter.

The empirical part of this study has two chapters. The first chapter explains research method and data collection process of the study by explaining how the method for this study was chosen and then giving detailed information about the data collection process for the empirical part. The fifth chapter presents the case about the Nordic market and SaaS ERP solutions from material gathered from customers and market predictions, and then discusses the results of interviews giving insight to the topic from the practitioners' point of view. Discussion about results and conclusions are the final part of this thesis, theoretical and empirical findings are discussed and reflected, and eventually, answers to research questions are given. In the last chapter, overall view of the topic will be given by presenting results about the adoption of SaaS ERP solutions in the Nordic market, what advantages and disadvantages can be recognized based on theory and empirical part of the study. Limitations of the study and suggestions for future research directions are also covered in the last chapter.

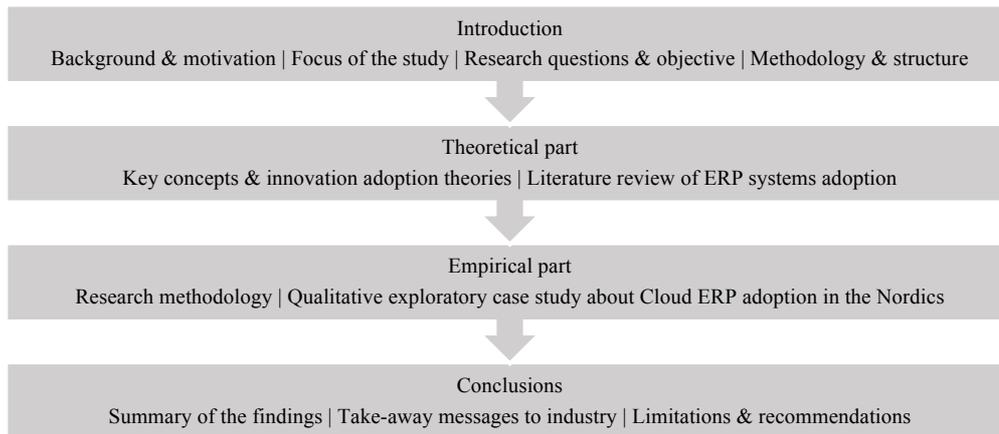


Figure 2. Structure of the study

2. Theoretical background

In this chapter, first, all main concepts of the study and differences between them are described, and then section continues by covering current trends among cloud based solutions and ERP systems based on market surveys and predictions. After that two theories about innovations' adoption are discussed in more detail. Chosen theories to be covered are Diffusion of innovation (Rogers 1995) and Technology – organization– environment – framework (Tornatzky & Fleischer 1990), because they are proven to be useful when IT systems adoption is studied in the organizational level (Oliveira & Martins 2011). Purpose of this chapter is to give an overall view of the concepts used in this study and introduce applied theories about IT innovation adoption, because later on this study, they are used as a foundation for literature review analysis. The chapter ends with a summary of the concepts used in this study.

2.1 Cloud computing

According to Marston et al. (2010), “cloud computing is changing fundamentally the way information technology (IT) services are invented, developed, deployed, scaled, updated, maintained and paid for”. The concept of cloud computing consists of applications which are delivered as services over the Internet, and applications' hardware and software systems which are maintained and stored in the data centers, and provided from there to customers (Armbrust et al. 2009; Marston et al. 2011). Definitions of cloud computing and the cloud, in general, are many, and definitions vary a lot from each other. One commonly used, and widely accepted definition is by Mell and Grance (2011) “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 which is illustrated in figure 2, is composed of five essential characteristics, three service models, and four deployment models.”

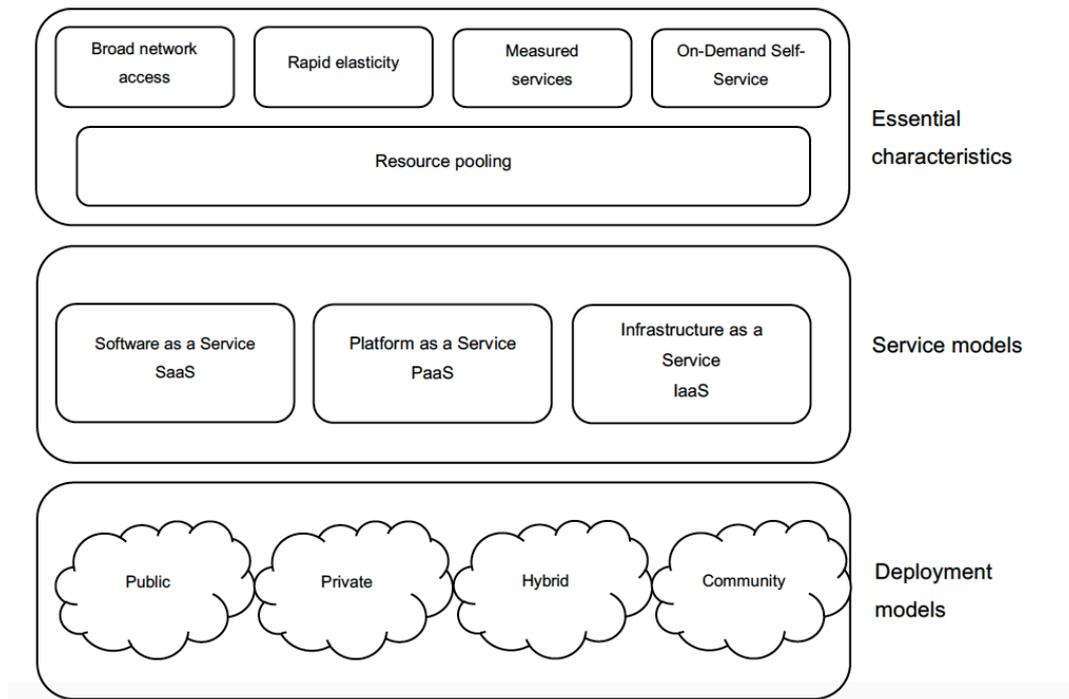


Figure 3. Visualization of NIST definition of cloud (Mell & Grance 2011)

In figure 3, all main features of cloud computing are visualized, and following sub-chapter 2.1.1 Cloud computing main features explains them in more detail (Mell & Grance 2011). In addition to features characterizing cloud computing, it can also be seen as a combination of two major trends of IT industry. The first trend is IT efficiency which means that scalable hardware and software resources are utilized with high performing computers. The other trend of IT is business agility where IT can be used as a competitive advantage for example by utilizing rapid deployment of application and more interactive applications which are more responsive to real-time requirements of users. (Marston et al. 2011, Armbrust et al. 2009)

2.1.1 Main characteristics and features of cloud computing

Five essential characteristics of cloud computing, according to NIST (2011) are “**on-demand self-service, broad network access, resource pooling, rapid elasticity and measured services**” (Mell and Grance 2011). Cloud computing is provided and delivered in different models which are commonly known in three service models (Fershtman & Gandal 2012).

- The most utilized model of cloud computing is **Software as a Service (SaaS)**, which means software distribution model where the software applications are hosted and maintained by vendor or provider, and the user access services exclusively via the Internet. SaaS applications are accessible from different devices and customer can access through the client interface, for example, a web browser or program interface. Management and control of cloud infrastructure meaning networks, servers, operating systems, storage are handled by the SaaS service provider. Since cloud application is deployed in service provider's computing infrastructure, it means that configuration and testing of certain application are easier for the provider because it is not restricted due to the fact that it is in service provider's data center. (Manguic 2011; Mell & Grance 2011; Youseff, Butrico & Da Silva 2008)
- Another form of cloud service model is **Platform as a Service (PaaS)**, which provides cloud infrastructure including programming languages, libraries, services, and tools such as well-defined APIs to facilitate interaction between environments and the applications, and to accelerate scalability of cloud based applications to customer and customer creates or acquires applications to PaaS by themselves. (Mell & Grance 2011; Youseff, Butrico & Da Silva 2008) The main difference to SaaS is that customer manages deployed applications and possible configurations for the application-hosting environment (Mell & Grance 2011).
- The third service model is **Infrastructure as a Service (IaaS)**, in which service provides manages cloud infrastructure but all the other control of operating systems, storage, and applications are taken care by the customer. (Mell & Grance 2011)

Cloud based services can be deployed in various ways depending, for example, on privacy and security requirements of the customer.

- Deployment of cloud can be done in **private** cloud which means that cloud infrastructure is used by only one organization, but it still can be owned, managed and operated by the provider of the service or it can be done in a cooperation of

organization and service provider. and the hosting of the private cloud can happen on or off premises.

- **Community** cloud is similar to private cloud despite the fact that it is provisioned for exclusive use for a specific group for example for few organizations that have similar demands for security.
- **Public** cloud, on the other, hand means that it is open to anyone. Ownership of public cloud can be for example on business or government organization, and it stands on premises of the cloud provider.
- Fourth deployment model of cloud is **hybrid** where two or more discrete cloud infrastructures that are unique entities, but tight together by standardized or proprietary technology so that data and application can be portability when required. (Mell & Grace 2011)

2.2 Enterprise resource planning systems

Technological process innovation is one important source of improved competitiveness of company and enterprise resource planning systems are one origin of this kind of innovation (Ram et al. 2013). ERP systems can radically change the way business is operating, changing it to work more process-oriented way (Verville, Palanisamy, Bernadas & Halington 2007). Enterprise resource planning (ERP) systems which are also called enterprise systems are organization wide information systems entities, which include a broad set of software modules aiming to support and integrate all key business processes of an organization by using single data repository. ERP systems can be called as the backbone of medium and large size organizations' information systems. Traditionally these systems are hosted and maintained internally by the company which refers to on premise solution. (Grabot, Mayere & Bazet, 2008, 2; Peng & Gala 2014) The enterprise resource planning systems aims to integrate all functional units of the organization in a cooperative way (Abd Elmonem, Nasr & Geith 2016).

2.2.1 Development and main features of ERP systems

Development of ERP systems has started already in the 1960s from first accounting and inventory systems. After that they evolved to material requirement planning (MRP) systems and during the 1980s came MRPII which was extended version having more operations and processes, like procurement processes compared to first MRP systems. Then in the 1990s first ERP systems were released which had even more processes to the whole organization and not just for production processes. ERP systems also offered integrations to other systems of an organization. (Elragal & Haddara 2012) After that evolvement of ERP systems has gone towards even more flexible and agile solutions which are integrating all needed systems of the organization (Saran 2017).

Following characteristics (see figure 4) of ERP systems are widely accepted and later regrouped by Uwizeyemungu and Raymond (2012) under three dimensions. The first dimension is technical which refers to capabilities and facilities of ERP system compared to traditional systems. Organizational aspect is related to the deployment of the system in the organization. The third dimension is informational which refers to quality and usefulness of information which the ERP system provides to the organization.

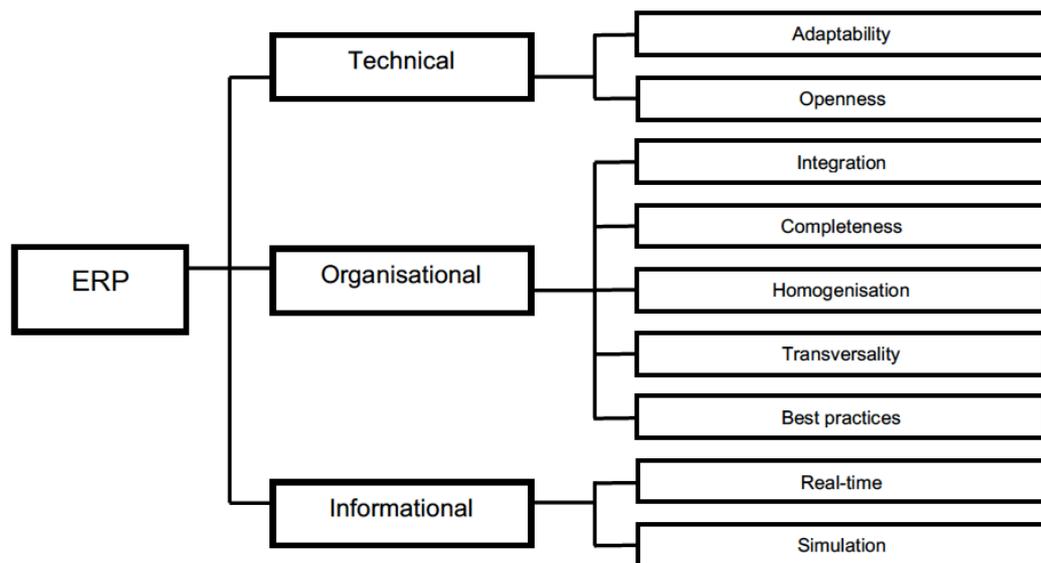


Figure 4. ERP characteristics regrouped under three dimensions by Uwizeyemungu and Raymond (2012)

ERP systems consist of different modules, which are illustrated in figure 5 and these modules are integrated to each other across the functions and data involved (Klaus, Rosemann & Gable 2000; Marnewick and Labuschagne 2005). The most common module is **finance** which is the one that most of the ERP systems have including concepts related to financial processes such as general ledger and accounts receivable and payable. Another common module is **supply chain management** which consists of materials, finances, and information flowing from supplier to consumer including all parts in between such as manufacturer, wholesaler, and retailer depending on the specific business process. Besides, **supplier relationship management** can be done within ERP system, enabling an organization to collaborate on strategic sourcing and procurement processes. **Human resources** can be managed with ERP systems, meaning administration of personnel including for example recruitment, travel and cost expense management. **Customer relationship management (CRM)** can be done in ERP system, and all data and information related to customers, products, and offerings are available there for the sales organization. **Business intelligence application** enables analytics and reports which help the organization in decision-making and reporting. The target of the system is that all modules are process-oriented and supported so that business processes flow seamlessly. (Klaus, Rosemann & Gable 2000; Marnewick and Labuschagne 2005) Despite these explained modules ERP system can also contain engineering, project management, and access control.



Figure 5. Overview of the basic ERP modules

All in all, ERP system can be described to be more than just a product or software and it is defined as follows by Marnewick and Labuschagne (2005) “A packaged business software system that lets an organization automate and integrate the majority of its business processes, share common data and practices across enterprise and produce and access information in real-time environment. The ultimate goal of ERP systems is that information must only be entered once.”

2.2.2 Cloud ERP solutions

At the moment, there exists growing interest to migrate previously internally hosted ERP applications and databases into the cloud environment. Cloud ERP solutions will bring new possibilities but also challenges to companies when they consider moving from traditional on premise approach towards cloud based hosting and infrastructure provided by third party service provider. Cloud computing will provide a completely novel concept and platform for enterprise systems which until recently have been licenced products on local or hosted servers. The biggest difference between on premise and cloud based ERP systems is that SaaS ERP solutions are accessed via the Internet, application and data are managed and controlled by the service provider, and payment is handled as subscriptions which can be based on, for example, per user on monthly basis fee. With SaaS based ERP systems, there will not be installations or configurations done by the customer. Despite the hype of cloud based ERP systems among practitioners, the current literature and research have mainly treated ERP systems and cloud computing separately, and there are not that many consistent definitions for cloud based ERP systems yet. (Abd Elmonem, Nasr & Geith 2016; Lind & Back 2014; Salleh et al. 2012; Peng & Gala 2014)

Despite the lack of the definitions, there exist one by Salleh et al. (2012), who defined cloud based enterprise system as follows “Scalable and flexible integrated ES (enterprise system) use through the Internet with the concept of pay per use.” When describing cloud enterprise systems, it is often associated with Software as a Service model for the ERP systems, but there are also IaaS and PaaS for ERP systems which shortly means that they provide hosting and pre-defined software for the customer. Still, the most common offering is SaaS based ERP systems where the whole enterprise system is provided by the service provider, meaning that cloud service and ERP vendor are joint and in practice service provider delivers

enterprise system “as a service.” ERP systems can be defined cloud-based when it has characteristics of cloud computing. (Lind & Back 2014; Schubert & Adisa 2011)

One big differentiator between on premise and cloud ERP systems is the system operation mode. Importance of this difference is crucial for ERP systems as it is for many other applications, based on facts that ERP systems have high strategic value to the company, implementation of ERP system is expensive, and implementation of the system takes a lot of time. Also, it requires careful implementation and adaptation to company’s operational processes and integrations to organization’s other IT systems. Customer’s requirements and characteristics have vital importance when the operation mode of ERP system is chosen. (Lind & Back 2014) In this study with traditional ERP systems are meant hosted and on premise solutions, and SaaS based ERP systems means purely cloud based solutions which fulfill the requirements of cloud solution (Duan, Faker, Fesak & Stuart 2013).

2.2.3 Stakeholders of cloud solutions

Cloud computing services in general changes the previous setup of IT systems stakeholders, with cloud based ERP system customer and vendor are vertically integrated (Johansson & Ruivo 2013; Marston et al. 2011). Before roles of different stakeholders were simply; consumers were using, owning, maintaining, and upgrading all the IT systems and service provider took care of sales, installation, licensing, consulting and maintenance of systems. Now in cloud computing era, these roles will change, and also regulators might have bigger role because they need to be aware of service provider’s IT infrastructure locations. (Marston et al. 2011)

Marston et al. (2011) have defined four roles which are valid to be considered for cloud computing and ERP system operations.

- **Consumers** are the ones who use ERP system in their daily business operations and can be seen as subscribers who purchase the right to use some IT system. This change can lead to IT departments to become more innovative since they do not need to spend that much time in maintaining of systems and they can focus developing innovative IT solutions and processes for the organization.

- **Providers** will offer the full-stack service from installation to maintenance for the consumers and in that way, take care of the whole IT lifecycle and in some cases, there might also be separate ERP vendor and cloud service provider, but often these are the same vendor.
- **Enablers** which can also be called as ERP implementation partner are the party which sells products, services and sometimes also licences which are used to facilitate delivery, adoption, and use of cloud computing. In many cases, provider and enabler can be the same company.
- **Regulators** are the fourth part of this value chain, and they are watching that all legal aspects will be fulfilled when the physical location of some system is in the cloud. (Adisa & Schubert 2011; Marston et al. 2011)

2.2.4. Market and trends of the ERP systems

Undeniably, one of the most significant trends in the ERP system market, in general, are cloud based ERP systems. It has been anticipated that in the following years SaaS service model will become the preferred service model for different kinds of businesses, but before that, there might be time for “mixed” solutions where still some parts of ERP system might be in on premise and part in the cloud which can give flexibility in the transformation phase towards cloud. (Ceccarelli 2017)

The global ERP systems market predicted to be worth of \$41.60 billion by 2020 which indicated steady growth with CAGR of 6% over the next years, and now new delivery models allow new ERP providers to challenge big players such as SAP, Oracle, and Microsoft in the ERP market. User experience is getting growing importance in customers’ mind also with ERP systems which also contributes to the development of the current ERP systems. (GP. Bullhound 2016)

In current world where everyone is using applications with different mobile devices, there is raising demand for ERP systems to be more ease-of-use and flexible, meaning intelligent software which can proactively determine a process and notify users when needed

(Ceccarelli 2017). These customer demands lead to the same trend as with many other IT solutions at the moment, to the Internet of Things (IoT). IoT will enable more data to be automatically funneled into the ERP systems and by that users can leverage ERP systems even more. (Martinez 2017)

Another trend related to IoT and ERP systems is the Artificial Intelligence. IoT can provide information in real time, and it can be leveraged with “smart solutions” based on artificial intelligence, which can learn over time. They can, for example, predict processes in manufacturing from data provided to these solutions. One current trend for ERP systems are instant innovations, which are enabled by cloud based solutions and easier integrations to needed applications can be created faster and more accurate. Last but not least, one trend is business intelligence, which allows easily to analyze data which is gathered in ERP systems. (Ceccarelli 2017; Moore 2017) Common to all of these expectations and trends is that they demand cloud based solutions because at the moment these features are requiring cloud platform. With on premise platforms, it is not possible to leverage these because they do not fully enable these enhancements mentioned for ERP systems. (Ceccarelli 2017)

Cloud based solutions support ERP system evolvement to be more flexible and agile, to be more so-called post-modern ERP systems which can be defined as “a strategy that automates and links administrative and operational business capabilities with appropriate levels of integration that balance the benefits of supplier-delivered integration against business flexibility and agility” (Saran 2017). Trends in the ERP systems market encourage to study which factors are crucial for customers to adopt these solutions in the Nordic market.

2.3 Adoption of information technology systems

It is necessary to understand motives and origins of IT adoption to be able to find which factors in the organization drive IT innovation adoption and sourcing decisions. Despite understanding adoption from the practical perspective, it is also vital to know theoretical models which have been used to understand IT adoption within the individual and organizational level. (Oliveira & Martins 2011) Knowing the process of IT technology adoption also by theoretical means will lead to obtaining the advantages of information technology (Karahanna, Straub & Chervany 1999). The used definition for adoption in this

study is by Rogers (1995, 177) “the decision of any individual or organization to make full use of an innovation as the best course of action available.”

During the last two decades in the research field of information systems, there has been a substantial but quite diverse body of theoretical and empirical works about adoption and diffusion of innovations related to information systems (Jeyaraj, Rottman & Lacity 2006). From theoretical perspective, IT adoption behavior of companies have been investigated from many angles, but there is raised concern that academia should be closer to the IT practice to enhance research in the field of information systems (Arnott and Pervan 2008; Low, Chen & Wu 2011).

Widely used theories in IT adoption research includes Technology Acceptance Model (TAM) (Davis, 1989), Unified Theory of Acceptance and Use of Technology (Venkatesh et al. 2003) and Theory of Planned Behaviour (Ajzen 1991). All of these three theories are at the individual level (Oliveira & Martins 2011; Jeyraj et al. 2006) but in this thesis' target is to concentrate on IT adoption at the organizational level. The most prominent theories which are used in IT adoption in firm level are Diffusion of innovation by Rogers (1995) and technology, organization and environment (TOE) framework by Tornatzky & Fleischer (1990). (Oliveira & Martins 2011)

2.3.1 Diffusion of innovation

The adoption of innovations means generating, developing and implementing new ideas or behaviours and intention is to increase performance or effectiveness in the adopting organization. Opposite of adoption is rejection, meaning that organization rejects currently used or new technology or operating model. Often administrative and technical innovations relate to different decision-making processes, and they can lead to different changes in the organization. (Damanpour 1991) Diffusion is a process where innovation is communicated to members of the certain social system, and this communication includes a specific message about new idea or innovation. (Rogers 1995, 5) Roger's diffusion of innovation theory (DOI) is based on large empirical data, and it is widely accepted theory to be used in researches related to IT adoption. DOI theory has also been used in ERP systems research, one example is Bradford and Florin's (2003) study where DOI theory was used to create model that

examines success factors related to ERP systems, and it enabled to explain some contextual factors which can affect to achieving benefits and satisfaction among users of ERP systems. (Bradford & Florin 2003)

According to Oliveira and Martins (2011) main idea of DOI is to “explain how, why, and at what rate new ideas and technology are spread with cultures, operating at individual and firm level”. Innovations are first communicated and then adopted within the certain company. Individuals are adopting innovations in different degrees, but in the end, this adoption is normally distributed among individuals. From the normal distribution of population, Rogers has divided segments which defines five categories of adopters; innovators, early adopters, early majority, late majority, and laggards. In an organizational level, there might be people from all of these categories, which makes IT adoption decision-making more complex since there are at the same time supporters and opponents of innovation. (Oliveira & Martins 2011; Rogers 1995, 22-25)

Innovation-decision process flows among these organization’s individuals from the first perception of an innovation to forming an attitude towards to decision to adopt or reject it, to implementation and confirmation of the decision of accepting new innovation. This process can happen in individual or some other decision-making level, for example at the firm level. As mentioned innovation-decision process includes five stages, first is knowledge meaning that innovation is recognized and some information about it exists. In the second stage which is persuasion, attitude towards innovation is formed in the decision-making unit and after that comes decision stage where adoption or rejection starts depending whether innovation is accepted or not. If innovation is adopted in the previous stage, implementation begins in the organization. The last step is confirmation which is the final decision to go forward with the innovation. (Rogers 1995, 163-206) The rate of adoption is bounded by individual’s perceptions of characteristics of innovation, according to Rogers (1995), these are a relative advantage, compatibility, complexity, triability, and observation (Rogers 1995, 15-16).

Roger’s (1995) theory about the diffusion of innovations is very complex, and in many researches, Technology-organization-environment –framework (TOE) by Tornatzky and Fleischer is used together with DOI to conduct more comprehensive theory. Reasoning to

often use TOE framework (Tornatzky & Fleischer 1990) along with DOI theory in studies, is because TOE framework is more focused on adoption of technological innovations (Pan & Jang 2008). Other reason is that it is also consistent with Roger's (1995) DOI theory by means of attributes as precedents for all adoption decisions, meaning the characteristics of innovation (Low et al. 2011). These reasons lead to the decision to use Diffusion of innovations theory (Rogers 1995) and TOE framework (Tornatzky & Fleischer 1990) as a theoretical framework for this thesis.

2.3.2 Technology–organization-environment framework

Several studies (see for example Lin & Lin 2008; Shirish & Teo 2010; Zhu et al. 2004) have used TOE framework by Tornatzky and Fleischer (1990) to study IT adoption of organizations (Low et al. 2011). As said TOE framework has been used in various researches related to IT system adoption, and for ERP adoption it has been used by Pan and Jang (2008) to determine adoption of ERP system in Taiwan's communication industry. According to this study, TOE framework enabled to provide insights whether for example "technology readiness" and "company size" factors influence to ERP adoption in Taiwan's communication industry. (Pan & Jang 2008) TOE framework explains organization contexts' meaning to the adoption and implementation of innovations (Baker 2012).

TOE framework (see figure 6) identifies three aspects in the organizational level which affect organization's decisions to adopt and implement a technological innovation, aiming to explain how the firm level context impacts on adoption and implementation of innovations. Aspects according to TOE framework are following; technological, organizational and environmental. (Baker 2012; Oliveira & Martins 2011) All of these contexts together need to be taken into account when a new innovation is considered to be adopted to the organization. (Baker 2012; Oliveira & Martins 2011) The technological context consists all technologies which are applicable to the company, meaning technologies, which they are already using and also those which are available to them but not used within the certain organization. Technologies which they do not use yet can be seen as innovations for the organization – they show what is possible by means of technology and in that sense showing the way where the organization could evolve in the future. Already

used technologies also set boundaries to scope and pace for technical change in the company. (Baker 2012)

Adoption of some innovation can change organization significantly, and some might have just a minor impact to organizations and to the industry which it is part of (Baker 2012). Organizational context includes characteristics and resources of the company such as size, processes, managerial structures, and possible slack of them. (Baker 2012; Oliveira & Martins 2011). Organizational context impacts to innovation adoption in many levels and depending on how the organization is structured, it may have dramatic meaning in the innovation adoption process. (Baker 2012) Environmental context means those parties which at certain level effects on the organization such as the industry, competitors, technology service providers and regulatory environment. The way these are affecting determines willingness and the needed speed of the organization to adopt innovations. (Baker 2012; Oliveira & Martins 2011)

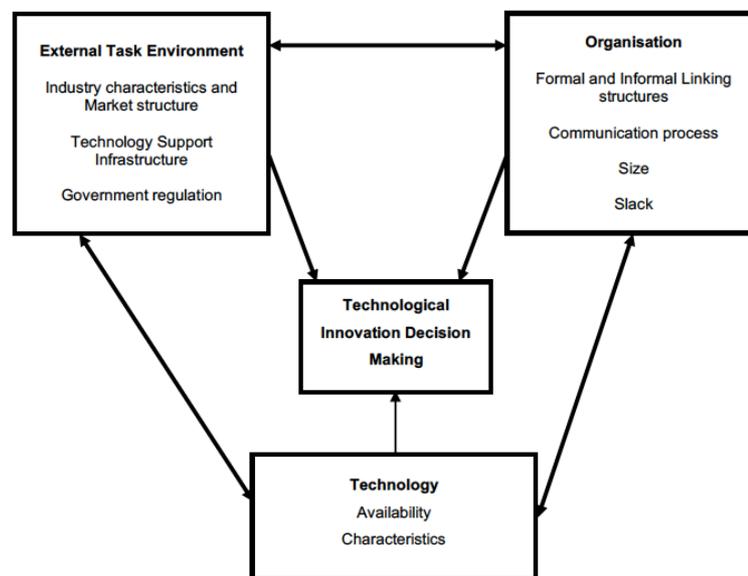


Figure 6. The technology-organization-environment framework (Baker 2012; Tornatzky & Fleischer 1990)

All three elements described will impact how successful innovation of adoption is in a certain organization because these elements can constrain the adoption but also create

opportunities for technological innovations. The TOE framework (Figure 6) has proven to be useful when studying technological innovations and framework because it has helped to explain different contexts' meaning in the adoption process. (Baker 2012) In this thesis, SaaS based ERP system's diffusion, and adoption among Nordic companies can be studied with the help of TOE framework because it assists in recognizing different technological, organizational and environmental factors which impact to the adoption process at the organizational level.

Innovations that are external to a firm are three types, and the difference is based on the change they create to the organization. Innovations that bring new elements or versions of existing technologies are incremental innovations, and this kind of innovations create fewer risks and change for the adopting organization. Innovations which combine existing ideas or technologies in a new way create synthetic change to the organization. Discontinuous change is created by innovations which are radical, meaning significant improvements to current technology or process. Cloud computing and innovations related to that are said to be innovations that create discontinuous change, which means that innovation is competence-enhancing or competence-destroying. (Baker 2012) SaaS based ERP system can be classified to innovation which creates this discontinuous change and cloud computing functionality might be competence-destroying because firms which have strong IT function do not get competitive advantage of this knowledge anymore with cloud based solutions. On the other hand, for some companies SaaS based ERP system can create a competitive advantage for example by enhancing processes and then, in that case, it is a competitive-enhancing innovation.

2.4 Summary of theoretical concepts

Cloud computing does not have one unique and universal definition, but shortly cloud computing means ubiquitous availability and accessibility of computing resources via Internet technologies. In this study definition of NIST (2011) is used to describe cloud computing. (Mell & Grance 2011; Oliveira, Thomas & Espadanal 2014) Organization wide information systems, which are called enterprise resource planning and enterprise systems are discussed, and meaning of these concepts are treated as the same in this thesis (Grabot, Mayere & Bazet, 2, 2008; Peng & Gala 2014). Like all the other IT systems, also ERP

systems are now moving towards cloud, for ERP systems this mostly means SaaS based solutions, where ERP system is delivered as a service (Johansson & Ruivo 2013; Peng & Gala 2014). In this study, concepts cloud ERP and SaaS based ERP are used in the same sense. Companies are starting to consider adoption of cloud based solutions for their business transformation towards digitalization. In the academic studies and literature, adoption phase is often forgotten even though it is very crucial in the innovation process, especially with ERP systems, because those are big investments to organizations. As described earlier in this study, innovation adoption is based on Rogers (1995) definition. Adoption of cloud ERP systems is analyzed in the coming chapter where drivers and barriers of ERP system adoption are reviewed based on previous literature. The starting point of the following literature review is that some factors related to adoption are the same despite the operation mode of the enterprise system. (Markus & Tanis 2000; Ram, Corkindale & Wu 2013; Verville, Palanisamy, Bernadas & Halington 2007)

The conceptual model, seen in figure 7, of this study aims to visualize concepts covered in this study and their interrelation. Model includes customers, vendors, and digitalization which were starting points for recognition and decision to study cloud based ERP adoption in the Nordics, these three are the parties which are determining the benefits and drawbacks of adoption. After recognition of factors, they are grouped under different contexts at the organizational level to enhance understanding of their influence on the cloud ERP adoption process.

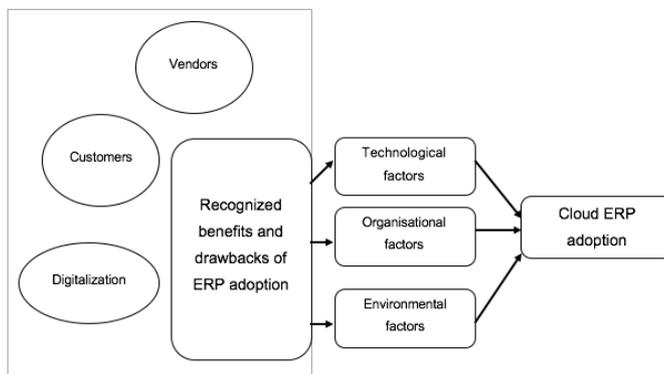


Figure 7. Conceptual model of the research

3. Literature review

Literature review in this study aims to find and determine factors which can be seen as benefits and drawbacks for adopting SaaS based ERP system at the organizational level. A literature review is an effective approach which enables to advance knowledge and facilitate theory development by conceptualizing research topics and synthesizing prior literature and eventually summarize state of the art in the certain subject field. While doing literature review author is capable of seeing what research is already carried out about a certain topic, and also uncovers areas where further research would be beneficial. (Rowley & Slack 2004; Watson & Weber 2002) According to Levy and Ellis (2006), literature review process can be described as “sequential steps to collect, know, comprehend, apply, analyze, synthesize and evaluate quality literature in order to provide a firm foundation to a topic and research method.”

Literature review for this thesis is conducted as a systematic literature review. Systematic literature review enables more precise acceptance and rejection process of results because criteria for used literature need to be defined more carefully. A systematic literature review has three objectives, first is to gather original studies, so that illusion of selected information is minimized; secondly quality of research methodology needs to be verified so that every research gets right importance in the review and thirdly research results can be combined so that those can be exploited as efficiently as possible. (Metsämuuronen 2003, 16-17) Systematic literature requires well defined research questions which then enables concise review and summation to be made (Rousseau 2008).

This literature review aims to gather an understanding of all related issues and indicate factors which are related to ERP system adoption and more detailed to SaaS based ERP system adoption at the organizational level. Based on the literature review factors, risks, benefits, and opportunities of adopting cloud based ERP system will be recognized and grouped so that it is possible to analyze these factors, determine the importance of the factors and potentially identify new factors which affect to the adoption of SaaS ERP system among Nordic organizations.

3.1 Literature review process

To conduct the literature review, the process needs to be described so that same review could be iterated if needed. When research questions are defined, there needs to be a definition of protocol, which leads eventually to answers for these defined research questions. The protocol can be seen as “roadmap” for review, and it outlines the selection criteria for researches to be reviewed. In the selection of studies, reviewer selects studies based on criteria and only from sources which are defined to be used in the protocol. After this, reviewer retrieves studies and concentrates only on studies, which are applicable to research questions and criteria. After this selection process, the certain material will be considered to be part of the literature review. (Metsämuuronen 2003, 16-17; Okoli & Schabram 2010; Rousseau 2008)

One part of the protocol for a literature review is criteria for accepting and rejecting articles. The aim is to select as a representative set of articles as possible from subject field. Acceptance criterion defines what kind of articles are chosen for the literature review. The limitation is also needed to determine from where, when and how long searches are done. (Metsämuuronen 2008, 37-38)

Protocol of literature review is described in this chapter. Protocol for this study was created so that it will show the way for conducting the literature review in consist and efficient way. In this study following criteria is used for the selection process of articles. Material for the literature review is gained from databases that are available in Lappeenranta University of Technology library’s licenced database LUT Finna. All articles are from international article databases such as Ebsco, Emerald Journals, Scopus (Elsevier), Springer and Wiley Online Library. Beside few exceptions, books are not used in this literature review, and the few used are also from previously mentioned databases. All material used in literature review is in English because in Finnish there was not feasible material available about this subject. Articles are chosen according to theoretical framing and research questions of this thesis. By using this criterion, literature acceptance criteria were defined. Criteria were kept static for literature review during the literature review process.

Acceptance criteria used in the literature review:

- Academic literature
- Publishing language: English
- All publishing years
- Articles available via Lappeenranta University of Technology's library
- Articles that are relevant for ERP and SaaS based ERP adoption in organizations

Exclusion criteria used in the literature review:

- Publishing language other than English
- Articles which are not available via Lappeenranta University of Technology's library
- Articles which are not relevant for adoption of ERP and SaaS based ERP in organizations

Deployment of search begun so that few test searches were executed to databases and articles were checked to get an overview of the topic and also to get familiar what kind of studies are made about this subject. The aim of this test search was also to check which words were useful for searching. One notice that was made during this testing was that there are few different ways to use term "adoption" in IT systems related studies. "Adoption" can describe the initial adoption decision and process which is the intention of this thesis, but it can also be used as a synonym for implementation process of an IT system.

After test searches, real searches were done to databases. All results were checked against the criteria which were selected for review and only those which fulfilled the criteria were taken to closer look. After that skimming was made to all articles that were considered to be relevant and only those, which seem to be worthy of closer look were listed in the literature review. Following words and combinations were used in the search.

Words and combinations used in the database search for literature review:

- SaaS ERP adoption
- Cloud ERP adoption
- ERP system adoption
- Adoption AND ERP systems

First real search with "ERP adoption" conducted 157 results altogether. Amount of results decreased when more searches were conducted with "cloud ERP adoption" and "SaaS ERP adoption" searches and totally from these three searches for more closer scanning 31 articles were chosen, and eventually, 22 articles were used to find the factors affecting to ERP system adoption. Results from these three searches were similar, meaning that some of the articles were found in all of these searches and especially with combinations "cloud ERP adoption" and "SaaS based ERP adoption" results were almost the same but with "SaaS based ERP adoption" fewer articles were found. All search results were saved from LUT Finna database so that it was possible to return to those if needed. Also, combination "adoption" and "ERP systems" with Boolean operator "AND" was used but this combination did not provide any other relevant results compared to previous searches.

After searches, content analysis was carried out to chosen articles so that categorization of the factors affecting to SaaS ERP adoption could be done. Content analysis is a method which can be used in qualitative studies to create a model which describes the phenomenon in a conceptual model so that written, verbal or visual communication messages are analyzed. The aim is to create a systematic and objective description of a certain phenomenon which leads to concepts or categories describing the phenomenon. The content analysis enabled systematic and objective analyzation for documents, which in this thesis were research articles. (Elo & Kyngäs 2008; Tuomi & Sarajärvi 2009, 91-100, 103)

During the content analysis, articles were read carefully, and then common factors were recognized, analyzed and listed. After listing these factors, they were grouped based on framework presented in chapter 2.3.2. Technology–organization–environment framework and only those factors which occur in different articles were taken into consideration. During the process, a lot of similar studies with same concerns, benefits, and problems were found. After listing these factors, findings of the review are discussed in the results of literature review for better understanding, what are the factors that influence to the adoption of ERP system in general and after that to SaaS based ERP system more specifically. Eventually, the target of the content analysis is to create a description in a compressed and general form which then can be constructed to conclusions. (Tuomi & Sarajärvi 2009, 103) In this thesis, the aim is to create an understanding which factors affect to SaaS based ERP adoption according to previous studies.

3.2. Results of the literature review

In this study aim of the literature review is to determine the factors, which affect ERP adoption and more specific to cloud based ERP adoption. The goal is to find these factors from previous studies related to SaaS and in general ERP system adoption and decision-making process. In this chapter results of the literature review are described.

3.2.1 ERP systems adoption

ERP system adoption is a considerable big investment to many companies regarding time, money and effort and that is why adoption decision has a huge impact on the organization (Davenport 1998). ERP systems are seen as business innovations, and deployment of ERP systems is considered to be beneficial to organizations despite their size (Seethamraju 2014). Reasons for adopting ERP system or enterprise system, are different for small and medium size companies when compared to large enterprises, but despite the size of the company, they can all benefit strategically and technically from adoption. It is also notable, that reasons for adopting ERP system are technical such as reduce operating costs by unifying IT infrastructure with ERP system but there are also **business reasons for adopting**, like ability to present “one face to customer”. Common to almost all companies in reasoning adoption is to **enhance process** improvement and **standardization** by ERP system which then leads to improvements in production and operations. Often “**best practices**” offered in ERP system are seen as an enabler for these above mentioned improvements. (Markus & Tanis 2000; Oliver, Whymark & Romm 2005; Pan & Jang 2008)

Despite these changes to strategic implications it is also important to emphasize that enterprise systems have **impact on organization and culture**, meaning changes in management structures, for example creating more flexible and flatter organizations but, in some cases, they can also create more hierarchical and centralized control due to fact that with ERP systems, information is centralized and processes need to be more standardized among organizations. (Davenport 1998) Since ERP systems may require a lot of changes in adopting organization which highlights the importance of change management. The **degree of fit between firm and ERP** system is crucial also from this point of view, and that may require customization and configurations. (Elragal & Haddara 2012)

Size of the organization clusters the ERP market because it is variable that is recognized to be crucial matter in the adoption decision. While organizations are considering ERP systems adoption, company size is seen important because ERP projects are expensive and risky, there are examples from the real world where companies have invested hundreds of millions of dollars in making all necessary technical and business related changes for ERP systems. It is also known that these ERP implementation projects can in some cases last for years. Another issue which is considered is that smaller companies, there are less complex requirements for the system which leads to different requirements for the system and different needs in organizational level changes, such as business processes changes and legacy systems consolidations compared to bigger companies. (Buonanno, Faverio, Ravarini, Sciuto & Tagliavini 2005; Laukkanen, Sarpola & Hallikainen 2007; Markus & Tanis 2000; Pan & Jang 2008) Laukkanen et al. (2007) have studied ERP system adoption and company size relationship, in the means of objectives and constraints to adoption, based on data gathered from 44 Finnish companies. In this survey, it was found that large companies have more problems with organizational changes related to adoption, and for small companies, problems were more related to lack of resources and knowledge. (Laukkanen et al. 2007)

From a technical perspective, **integrations** and capabilities of ERP systems integrations are noticed to be an important factor in motivating to adopt ERP systems. Integrations are seen important to increase transparency, increase information-flow, assure more reliable data and enable better decision-making. Purpose of ERP systems is considered to be able to eliminate complex and expensive interfaces between company's IT systems. Integrations can also be preventing reason for not to adopt ERP systems if organizations think that with other solutions they can perform better. Reason for that is that enterprise systems may require a complete restructuring of organizations' IT architecture. Integrations are also seen a more important issue for larger organizations because they have more systems which need integrations. On the other hand, small companies might require integrations with external systems outside company's boundaries. (Laukkanen et al. 2007; Markus & Tanis 2005; Oliver et al. 2005; Ram, Corkindale & Wu 2013)

Competitive pressure is also seen as a reason for adopting ERP system in the literature because in many studies it has been recognized as an important factor for adopting any innovation. This pressure has been affecting to adoption decision for ERP system in small

and medium size organizations (Ram, Corkindale & Wu 2013). On the other hand, some studies are showing that competitive pressure does not have significance for ERP adoption (Duan et al. 2013; Pan & Jang 2008).

3.2.2 Cloud ERP systems adoption

Most of the ERP systems are implemented on premise. Traditional on premise approach has been seen beneficial because of the possibilities of greater customization and integration, but now in recent years, software applications have been shifting to cloud computing which is one of the fastest growing segments of IT industry. (Duan et al. 2013; Seethamraju 2014) The success of cloud ERP adoption is depended on many issues such as different organizational and managerial aspects and also **legal and technical complexity** and limitations associated with the cloud environment. Due to these concerns, it is critical that overall technical, organizational and strategic implications of cloud ERP solution are considered in the organization. (Peng & Gala 2014) Data transition from legacy systems to the cloud can lead to savings of time and money which can increase their return on investment, but it can also help companies to be more compliant which is important in the current more complex regulatory environment (Robinson 2011; Salleh et al. 2012). There are differences between on premise ERP adoption and cloud ERP adoption, but in general, there are a lot of things that need to be taken into account with both operation modes.

The most prevalent concept found in many studies, seen as a benefit for SaaS based ERP systems, are **costs and structure of costs**. These costs related factors are the reason why many companies are interested in SaaS based ERP. (Castellina 2011; Johansson & Ruivo 2013; Salleh, Teoh & Chan 2012) Cloud ERP applications are considered to reduce IT costs compared to on premise ERP systems in many areas such as hardware and **licence costs**, the total cost of ownership (TCO), upfront cost and costs related to upgrades. Implementation is said to become easier since the best fit solution is available despite the delivery model. This of course also increases standardization of system. (Salleh et al. 2012)

Costs related to SaaS based ERP system are mostly variable, and cloud provides immediate access to hardware resources because the cloud ERP systems are paid with a **subscription model** and because of that, they do not require any upfront capital investments, which leads

to faster time to market for business. (Castellina 2011; Marston et al. 2011; Seethamraju 2014) **The total cost of ownership** has been identified to be a key factor in adoption decision, despite the recognition of the fact that costs can be the same as in on premise choice in the long-run. Although, this lower total cost of ownership, has been stated the most prominent factor in advocating SaaS based ERP compared to on premise system by many researchers and experts. (Johansson & Ruivo 2013; Seethamraju 2014)

Ease of implementation has been associated with SaaS based ERP and by that also costs related to implementation can be less than in on premise version. Aberdeen has found that in cloud ERP systems implementation time is shorter and this will lead to lower costs and faster “Go Live” milestone. (Castellina 2011; Lechesa, Seymour & Schuler 2012; Peng & Gala 2014) Cost savings are also recognized for customers’ IT department because with SaaS based ERP solutions all **support, maintenance and infrastructure** are handled by the vendor. (Peng & Gala 2014) Despite costs, there are of course also other factors that are seen valuable for cloud based option.

Real-time visibility is recognized as a beneficial factor for organizations to consider cloud ERP systems because it can lead to more agile decision making (Castellina 2011). **Application specificity** is associated to ERP systems, and this is seen as a reason why companies can be reluctant to adopt SaaS based solution, meaning that ERP system is valued too important and often as a core system of organization, to be managed as a SaaS based solution. It is also noticed that companies are not willing to give control of the systems to the third party and for example control over upgrades and future development are often handled by the customer, and they might be reluctant to give up from this. (Castellina 2011; Johansson & Ruivo 2013; Lechesa et al. 2012)

As mentioned **integrations** to other systems are a vital issue when considering ERP systems and this is also considered with cloud ERP systems. With SaaS based ERP systems integrations to other systems have raised concerns because customers do not manage it and they have more **limited control over customization** which might be required to get all needed integrations to other systems. Apprehensions are related to problems in integrations of SaaS based ERP to new systems but also existing systems of customers. (Peng & Gala

2014; Salleh et al. 2012) Integration to in-house IT infrastructure is stated as an open issue which can prevent customers to adopt SaaS based systems. (Adisa & Schubert 2011)

Cloud ERP systems offer “best practices”, and this can enhance **standardization** and lower the costs since less customization is required. Standardizations are seen as an advantage because then organizations can focus on their strategic activities more and by that create **competitive advantage**. This can be beneficial especially for small companies, but Davenport (1998) pointed out that too standardized processes may also decrease competitive advantage for some companies. (Davenport 1998; Duan et al. 2013; Johansson & Ruivo 2013; Salleh et al. 2012) In turn, companies might have a lot of **customization requirements** which enables competitive advantage and might be crucial for certain customers’ business processes. These kinds of requirements are more difficult to accomplish with SaaS based ERP systems, and that is why customizations can also be seen as a barrier to SaaS based ERP systems adoption. (Lechesa et al. 2017) ERP vendor’s willingness to implement improvements required by an individual firm is seen important and could help with customization requirements. In practice, meaning that when some customization is required from one company, it could be copied to other customer’s system when needed, this could then benefit both, the vendor and the customer. (Seethamraju 2014)

Scalability has been recognized to be a driver for the adoption of SaaS based ERP system because cloud based SaaS solution provides a possibility to fast increase or reduce resources. The elasticity of cloud offers the possibility to scale up and down used necessary resources based on current needs of the organization. (Abd Elmonem, Nasr & Geith 2016; Adisa & Schubert 2011; Navaneethakrishnan 2013)

Cloud ERP systems are not physically installed on any local PC or hosted in companies’ local servers which releases them from location restrictions, and for users, it means **ease of access** from anywhere. Of course, remote access can solve this issue with on premise solutions, but it is often an additional cost for companies. Ubiquity could be improved with cloud based ERPs when anyone can access from anywhere with a web browser to company’s enterprise system which can lead to more efficient and flexible work. When companies nowadays are more global, and interaction between employees located in different places is required, cloud based ERP systems could improve this interaction, because they could share

a common view of enterprise data via internet without any location restrictions. (Castellina 2011; Johansson & Ruivo 2013; Peng & Gala 2014)

Cloud solutions freedom from location specificity also relates to data security and privacy, which are recognized to be key reasons for customer reluctance to adopt cloud based ERP system. (Johansson & Ruivo 2013; Lechesa et al. 2017; Peng & Gala 2014) In SaaS based ERP systems internal hardware and servers are separated from user companies' internal IT infrastructure which leads to less transparency. This lack of transparency is seen a problem and raises concerns about **data privacy**. Concerns are related to issues like whether companies' sensitive data is appropriately protected. (Johansson & Ruivo 2013; Peng & Gala 2014) Parts of the concerns are recognized to be associated with the fact that customers are not aware and lacking knowledge how SaaS ERP systems exactly operates. (Johansson & Ruivo 2013)

Data security and confidentiality are other concerns related to the safety of cloud environment for ERP systems. Data security refers to practices of securing critical data from unauthorized access, disclosure, and use. Customers are afraid that internal financial or customer data are exposed for example to competitors. (Castellina 2011; Johansson & Ruivo; Peng & Gala 2014) Studies have however proven that data leakage is more probably happening due to a human mistake and that is why there exist opinions that ERP vendors could be more capable of securing data in SaaS based ERP systems compared to customers taking care of it by themselves with on premise solution. (Castellina 2011; Johansson & Ruivo 2013) There are also studies showing that data security is better managed by ERP vendors than the customer by themselves and by that stated, data security and integrity is safer and more reliable in SaaS based ERP systems (Seethamraju 2014).

The transition from the cloud ERP provider to another might not be easy because moving ERP systems' master data to different cloud environment is time-consuming and expensive because cloud infrastructures can be very complex. (Peng & Gala 2014) **Legal regulations** can affect this since it is regulated where provider's cloud needs to be located, for example, some data might need to be kept for example in a certain country or European Union area. (Adisa & Schubert 2011; Peng & Gala 2014)

Changing ERP system to another cloud can also cause changes in other operational, organizational and managerial things. This is a phenomenon called **vendor lock-in**, and it is a very common concern related to cloud based services. (Peng & Gala 2014) On the other hand, it is also considered that “rental” cost model of SaaS ERP where customer pay as they use, can lead to reduced vendor lock-in (Johansson & Ruivo 2013). Despite the vendor lock-in there exist general **dependency on the cloud vendor**. If the connection to the Internet is lost by customer or service provider exits the business, it can lead to a situation where users lose access to the system. These issues can be taken care with **service level agreement (SLA)**, and this contract is crucial with cloud based solutions. SLA contract is a very complex process to be defined for cloud based solutions because it should include all aspects of provided services and liabilities between contract parties. (Abd Elmonem, Nasr & Geith 2016; Arnesen 2013; Duan et al. 2013)

Mainly ERP systems are SaaS model offerings, and it can be seen as the best opportunity for small and medium size companies because it enables features of ERP systems without the up-front investment related to the on premise option. On the other hand, some researches have shown that outsourcing based on SaaS solutions should be seen as a valid option also for larger organizations. (Benlian, Hess & Buxmann 2009; Seethamraju 2014) Fundamentally cloud environment is completely different and also changes the whole idea of delivery and maintenance of ERP systems from the customer point of view. Due to these issues, technical factors get a lot of attention from the customers when considering cloud based ERP systems. Despite this, **organizational changes** also affect heavily on organizations’ adoption decision. Cloud ERP solutions are considered to effect on organizational, cultural, process and **job role changes** in the organization. (Peng & Gala 2014) As mentioned earlier, roles of IT people in the organization can dramatically change because of this completely different operating mode. (Adisa & Schubert 2011; Marston et al. 2011)

3.3 Analysis of the literature review

Analysis of the literature review is founded so that from reviewed studies, determining factors are recognized and then grouped to tables 1, 2 and 3. Grouping is based on TOE framework (Tornatzky & Fleischer 1990), so that factors affecting to ERP system adoption are under the technological, organizational and environmental concepts, another grouping variant is determining whether the factor is driving or preventing the adoption decision. Factors are grouped and listed, and unified concepts are created. Unification was done because studies (Appendix 1) were using different descriptions and concepts, even the meaning of them are the same. The main reason for this chosen grouping is that adoption of ERP systems can change organization's culture, structures, and processes and also affect different dynamics and distributions of power, autonomy, rights, and obligations of organizations and its' people. (Peng & Gala 2014) It can be seen that adoption affects multiple ways to an organization and its people so TOE framework (Tornatzky & Fleischer 1990) can be seen as an effective way to group these determined factors and to be used as a base for the empirical part. Purpose of this section is to discuss the influence of technological, organizational and environmental factors to SaaS based ERP systems adoption decision process at the organizational level. The aim of this chapter is to get answers from the theoretical perspective to research sub-questions; *“What determines adoption of an ERP system in the organization?”* and *“What benefits and disadvantages are seen to be related to SaaS based ERP systems?”*.

3.3.1 Technological context of adoption

Technological context is two folded because it refers to all existing technologies that company already has and limitations which these existing technologies can cause for adoption process of new technological innovations. On the other hand, technological context means all the technology that is available for the company in the market, but the company is not yet using. (Baker 2012; Oliveira & Martins 2011) It is notable that ERP adoption can be considered as a technological innovation adoption and when it is linked to cloud computing it can create discontinuous change to adopting organization (Baker 2012). From reviewed studies radicalism of the innovation is reflected in driving and preventing factors, customers see a lot of technological benefits in SaaS ERP system, which could enhance

competitiveness but clearly, they are also concerned about the transformation it may bring by destroying some competitiveness inside the company. In table 1 technological factors influencing to adoption process are listed based on literature review.

Table 1. Technological factors affecting adoption

Drivers for adoption	Traditional ERP system	SaaS ERP system	Source
<i>Technological</i>			
Customization requirements	x		5, 18, 21, 22
Data privacy	x	x	9, 11, 22
Data security	x	x	9,10,11, 14, 17, 22
Enhanced processes	x	x	1,2,3,4,7,8,9, 12, 13, 14, 17, 18, 20
ERP system fit to firm	x		2, 5
Faster time to market and shorter implementation time		x	9, 10, 11, 12,13, 14, 15, 17, 20, 22
Integrations to other systems	x		2,3,7,8,14,17, 20
Maintenance and upgrades		x	9, 11, 12, 17, 20, 22
Ease of access		x	9,10,11, 14, 16, 17, 18, 20, 22
Flexibility and scalability		x	12, 16,17,18, 20, 22
Standardization and best practices	x	x	1,2,3,4,9,11,12, 17, 18
Subscription model and licences		x	10, 12 13, 14
Total cost of ownership		x	10, 11, 12, 14
Cost savings	x	x	2, 3, 9, 10, 12, 13, 15, 16, 17, 20, 22
Barriers for adoption	Traditional ERP system	SaaS ERP system	Source
<i>Technological</i>			
ERP system fit to firm	x	x	1, 2, 5, 14
Integrations to other systems	x	x	2,7,9, 11, 12, 16
Customization requirements	x	x	5, 11, 12, 14, 15, 17, 20, 22
Data security	x	x	9,10,11, 12, 14, 15, 17, 18, 20
Data privacy	x	x	9, 10, 11, 14, 17, 22
Vendor lock-in		x	9, 11, 12, 14, 22
Application specificity		x	10, 11, 14, 15, 17
Control over system		x	10, 11, 12, 15, 17
Implementation timeframe	x		1, 5, 6, 7, 9

Based on the literature review, there are a lot of technological factors which influence on adoption of ERP systems in both operation modes. When comparing tables 1, 2 and 3, it can

be noticed that factors which are driving or preventing SaaS based ERP systems adoption are mostly related to technological context.

There are a lot of concepts in this category, but the most prevalent to drive the adoption of SaaS based ERP systems are according to all reviewed studies for this thesis, are costs. Cost related factors are grouped under technological context since cost savings are mainly coming from lower costs related to implementation, maintenance, and upgrades, which can be seen as technological concepts. Almost all costs related to cloud based solutions are variable, and customers think that this will provide savings. (Castellina 2011; Johansson & Ruivo 2013; Salleh et al. 2012) This factor is related to SaaS based ERP adoption, but costs savings are also mentioned in studies related to traditional ERP systems adoption, in that case, cost savings are expected to come from streamlined processes. (Markus & Tannis 2000; Oliver et al. 2005)

Literature review proved that there are benefits and disadvantages seen in both operation modes and there exist some factors which are mentioned as benefits only for SaaS solutions. Drivers for adoption mentioned in many studies are the faster time to market and shorter implementation timeframe compared to traditional ERP systems' implementation projects. Maintenance and upgrades are taken care by the vendor in SaaS model, and many studies are showing that customers see this beneficial. Ease of access is mentioned almost in all reviewed studies, and now when companies are operating more and more globally, accessibility from anywhere is even more important. (Castellina 2011; Johansson & Ruivo 2013; Peng & Gala 2014) Flexibility and scalability are assumed to lower the costs because customer only pays for use and resource can be scaled when needed (Abd Elmonem, Nasr & Geith 2016; Adisa & Schubert 2011; Navaneethakrishnan 2013). Related to lower costs subscription model and licences are mentioned, and it is tightly related to scalability.

One factor that is seen preventing adoption is vendor lock-in, meaning that changing cloud solution provider and the vendor might not be easy, even though it is not easy to change ERP vendor with on premise solutions either. (Adisa & Schubert 2011; Johansson & Ruivo 2013; Peng & Gala 2014)

One factor that has driving and preventing influence on adoption of ERP systems are integrations. According to many studies, integrations are one of the most important factor. (Laukkanen et al. 2007; Markus & Tanis 2000; Oliver et al. 2005; Ram, Corkindale & Wu 2013) With cloud based solutions integrations are seen more as preventing factor, even though technology related to them is evolving all the time. Another factor that is two-sided, having benefits and drawbacks for adoption, is data security and privacy. According to the literature review, for customers, this is often preventing issue even it is proved that with cloud solutions data is more secured by the vendor. (Castellina 2011; Johansson & Ruivo; Peng & Gala 2014; Seethamraju 2014)

3.3.2 Organizational context of adoption

Organizational context reflects the characteristics and resources of the company and these things affect heavily on every decision that company makes (Baker 2012) and in this case technological innovation adoption decision process. Like Davenport (1998) stated ERP systems adoption is a big investment in many levels – money, time and effort, which requires a different kind of changes in the organization. In general, despite operation mode of ERP system, it is essential that organization and system match in all levels, meaning that people and processes of an organization are able to use the new system as efficiently as possible in the future (Davenport 1998; Elragal & Haddara 2012). In table 2 organizational factors affecting to adoption process are listed based on literature review.

Table 2. Organizational factors affecting adoption

Drivers for adoption	Traditional ERP system	SaaS ERP system	Source
<i>Organizational</i>			
Business requirements for system	x		2,3,4, 6, 7, 10, 12, 20
Changes in job roles of IT		x	9, 12
Company size	x	x	2,4,6,7,16, 21
Organizational changes and change management	x	x	1, 5, 6, 8, 9
Real time visibility	x	x	3, 10, 14
Barriers for adoption	Traditional ERP system	SaaS ERP system	Source
<i>Organizational</i>			
Company size	x	x	2,4,6,7, 16, 21
Changes in job roles of IT		x	9, 11
Organizational changes and change management	x	x	1, 2, 5, 6, 7, 9, 12, 14, 17
Business requirements for system	x	x	1, 2,4,6,7, 15, 17, 22
Investment of time and money	x		1, 2, 14, 15

When talking about changes in the organizations because of adoption, with the cloud based ERP systems these changes can be substantial, because the whole idea behind the systems is different from the customer point of view compared to traditional IT systems, and this can drive adoption but on the other hand slow down willingness to adopt cloud based systems. (Peng & Gala 2014) One essential factor in the organizational context is changes in job roles of IT personnel, which is caused by this fundamental change in the operational model of SaaS based solutions. Based on literature review it can be seen as a benefit but also as a drawback depending on the study.

In the literature review, organization size was mentioned almost in all articles to be a factor affecting to adoption decision and all studies stated that company size is driving but also preventing the adoption. According to studies, SaaS ERP systems are often seen as a good option for small and medium size companies and large companies are said to be more reluctant to transit to cloud environment. (Seethamraju 2014) In general, company size affects to adoption decision by determining the requirements of the system and those can be very different depending on the size (Laukkanen et al. 2007). Business requirements are seen as a benefit, but also as a disadvantage for the adoption of the systems, this was

dependent on the company size, but also industry and company culture are affecting the requirements, the current situation of the company mainly determines whether requirements can be better fulfilled by adopting ERP system. It is mentioned as a benefit only in ERP systems adoption literature, and it might have more seminal meaning before when customers did not have ERP systems at all. Currently, many customers already have an ERP system, and the question is more about whether they want to change to cloud based option.

3.3.3 Environmental context of adoption

Business environments of companies are complex and the external environment of the company is expected to affect to organization's adoption decision (Baker 2012; Oliveira & Martins 2011; Pan & Jang 2008; Seethamraju 2014). From the reviewed literature, this assumption was proved, there are factors affecting to ERP adoption but what was surprising competitive pressure was the only benefit mentioned in studies for both operation modes.

Table 3. Environmental factors affecting adoption

Drivers for adoption	Traditional ERP system	SaaS ERP system	Source
<i>Environmental</i>			
Competitive pressure	x	x	4,8
Compliance to stakeholders		x	12, 13, 19
Competitive advantage	x		3, 20
Barriers for adoption	Traditional ERP system	SaaS ERP system	Source
<i>Environmental</i>			
Fulfilment of legal requirements		x	4, 13, 16, 17, 20
Stability of vendor and SLA		x	13, 14, 17, 20, 21, 22
Competitive advantage	x		1,2, 15

Environmental factors influence to SaaS based ERP systems adoption process mostly in the means of competitive pressure. Literature has various results how competitive pressure affects to ERP systems adoption. Some of the researchers are saying that it is not significant and others see it very crucial for ERP systems adoption decision. (Pan & Jang 2008; Ram, Corkindale & Wu 2013) As an environmental factor, regulatory requirements are affecting to adoption decision because ERP systems contains a lot of sensitive data of the organization and system needs to fulfil all legal requirements. Especially for SaaS based ERPs

competitive pressure and regulatory requirements are not mentioned as a critical factor based on the literature review, probably these issues are seen more critical in general for an enterprise system, and it is not dependent on the operational mode of the system, whether it is the in-house or cloud based solution. The most important factor according to literature is vendor stability, and SLA determined as preventing factor for adoption decision. Customers are concerned about the SLA agreements, whether they cover everything and also the stability of vendor is seen important. (Abd Elmonem, Nasr & Geith 2016; Arnesen 2013; Duan et al. 2013)

3.3.4 Summary of the literature review findings

Analysis of literature review revealed that there are factors affecting adoption decision making in every context. Rogers (1995) definition for innovation-decision process includes different stages, and when reflecting found factors to these stages, it can be recognized that some of them are based purely on attitudes and not so much on knowledge, this illustrates well the importance of vendor's knowledge and ability to support customer in the adoption process towards suitable ERP system.

When comparing the importance of different categories of TOE framework, organizational context eventually might have the most significant impact on adoption decision-making in the firm level, because often organization can have the biggest wave of changes when new innovations are adopted. Even technological factors were the biggest group; there might be more critical factors in organizational context. Environmental context can be somehow thought to be given for organization – factors mentioned there are external, but for example, legally required. Grouping these factors under different contexts helps to perceive the complexity of adoption process in case of ERP systems.

4. Research method and data

The empirical part of this thesis aims to understand cloud ERP systems adoption in the Nordic market and which factors influence to this adoption process. Based on the research questions and theoretical part of this study, the author has interviewed six people working with ERP solutions in the Nordic market to get insight into the subject field. In addition to that, the author had the possibility to use interview data from Nordic customers, which includes customers' overall view towards their current ERP solutions and how the whole solution and service could be improved. By leveraging the data, the target of this part is to gather view and understanding of Nordic customers' adoption of cloud ERP system. This chapter introduces research design, data collection and data analysis methods, also reliability and validity are explained.

4.1 Research methodology

In this chapter research methodology of this study is described in high-level. Empirical research needs to have a research design, which has said to be “the logical sequence that connects the empirical data to a study's initial research questions and eventually to its' conclusions” (Yin 2003, 18). Quantitative analysis is based on analyzing causalities and correlations often from numerical data. On the other hand, qualitative analysis aims to describe, understand and explain a certain phenomenon happening in our reality. (Metsämuuronen 2008, 14-15) Qualitative analysis is often conducted with interviews, perceptions, text analyzing and by combining aforementioned methods (Metsämuuronen 2008, 37-44; Tuomi & Sarajärvi 2009, 71).

A qualitative study can be performed in many ways, and all of the research strategies have some benefits and disadvantages. Following three conditions affects to the selection of the strategy; type of research questions, control of investigator and author to actual behavioral events and focus of phenomenon – whether it is contemporary as opposed to historical. (Yin 2003, 3-4) Target of this study is to gather specific, intensive information from a small sample and because of this requirement, the exploratory case study was chosen as a method to conduct this study. According to Robson (2002, 177), the case studied can be for example

organization, situation or whatever that author is interested in, the phenomenon about ERP system moving to cloud based solutions is the case of this study. The aim of the study is to gather new insights and also assess phenomenon in the new light, and based on these deductions, exploratory approach can be seen as suitable for this study. (Robson 2002, 59) By using case study, it is possible to study “real life” situations and processes and to answer questions “how,” “why,” and an exploratory study also gives the possibility to answer the “what.” (Hirsjärvi et al. 2004, 123; Robson 2002, 60; Yin 2003 3-4) In this study, one particular phenomenon is studied, so the study is using single-case design because the target of the study is to confirm whether factors recognized to drive or prevent SaaS ERP adoption are accepted among practitioners too (Yin 2003, 39-40).

4.2 Data collection

Data for the empirical part was gathered with interviews, which can be seen as a flexible method for data collection because it fits for many different kinds of studies. The aim is that through an interview, the interviewer can communicate thoughts, beliefs, experiments, and feelings of the interviewee. With interviews, it is possible to gather more detailed information about the subject by asking arguments and clarifications during interviews. (Hirsjärvi & Hurme 2008, 41-48; Hirsjärvi et al. 2004, 192; Tuomi & Sarajärvi 2009, 72-73) Interviews can roughly be classified into three groups, and the main difference is how structured, and formalized interviews are. Different ways of conducting interviews are following; structured interviews, semi-structured interviews or theme interviews and in-depth interviews. (Hirsjärvi & Hurme 2008, 41-48; Saunders, Lewis & Thornhill 2009, 320)

When the aim of the study is to find answers and explanations to the “what,” “how,” and “why,” related to certain topic, non-structured interviews such as semi-structured and in-depth interviews are used (Saunders 2009, 321). In this study, the target is to enhance understanding of the factors driving or preventing cloud ERP system adoption decision-making by using semi-structured interviews. This approach enabled the interviewer to define questions around themes but at the same time during interviews discussions with interviewees were able to flow within the limit of the themes. This form of interview supported the data collection because it enabled to adapt questions along the interview and

get insights from various aspects, depending on the interviewee. (Saunders 2009, 320-321; Tuomi & Sarajärvi 2009, 73)

In qualitative analysis, the appropriate target group for interviews is chosen, and all cases are treated as unique (Hirsjärvi, Remes & Sajavaara 2004, 155). There is no absolute measure for sufficient amount of data, but it is often measured with saturation, meaning that, for example, interviews are continued until the author decides that any new information is no longer brought to the material (Hirsjärvi et al. 2004, 171). In this study author considered that six interviews were providing sufficient enough information about the subject. In this thesis, interviews' target group was limited to few criteria. All of the chosen interviewees have worked with ERP systems to ensure that all of the interviewees have the appropriate expertise in the subject field. Secondly, interviewees were working in different roles in the customer interface related to ERP systems, principally among sales and consulting, to enable different perspectives on the subject. One requirement was that they have all been working among these solutions at least five years assuring that they have experience with different customers and evolution of solutions during their career. In table 4, interviewees are introduced.

Table 4. List of interviewees

Interviewee	Role	Experience in ERP systems
C1	Integration architect and team manager	7 years
C2	Solution sales	13 years
C3	Lead consultant	8 years
C4	Principal consultant	15 years
C5	Lead business consultant	15 years
C6	Consultant	7 years

Interview data from the customers are giving additional input to this thesis by showing customers' real pain points with ERP systems and widening the understanding of the factors driving and preventing the adoption of cloud ERP system. Interview data consists of nine customers who are using some ERP solution at the moment and operate in the Nordic market, and themes covered in the interviews can be found from appendix 2. Themes covered in the customer interviews. None of the interviewed customers were yet using cloud based ERP

solution. Interviews were conducted by consultants working in IT company during 2016-2017. Interviewees were chosen by the company representatives. The aim of the interviews was to gather comprehensive view about the issues which should be improved with ERP systems from the customers' point of view.

Interview questions for the study are based on the theoretical part of this study, research questions and author's combinations of these. The aim of the interviews was to gather broad enough view about the subject. Questions were carefully planned in advance, but more specifying questions were presented during the interviews. Interview questions were grouped under themes related to cloud computing and cloud ERP systems so that overview of the concepts associated with SaaS ERP systems could be covered. The third theme was the adoption of the cloud ERP systems and more specifically in the Nordic market, which aimed to cover adoption process in this very market and find out benefits and drawbacks related to ERP system adoption process at the organizational level. More precise information about interview questions can be found from appendix 3. The half-structured theme interview. During interviews, slightly different things were emphasized which made every interview unique.

Interviews last about an hour depending on the interview. All of the interviews were conducted in Finnish. Interviews were recorded, transcribed and translated into English by the author, and after that gathered data was analyzed to and collected into the same document so that it was more straightforward to analyze the answers, explore similarities and differences and eventually leave inaccurate parts out from the study.

4.3 Reliability and validity

The aim of every research is to produce accurate and reliable results, and often study's success with these issues are measured by reliability and validity. Reliability of the research refers to the repeatability of the study, meaning that which extent data collection and analysis practices will yield consistent findings if someone else would repeat the study. Reliability aims to measure how objective results study offers and are they independent of the researcher. The validity of the research measures how well research method is able to study

chosen factors and are the findings what they appear to be about. (Saunders et al. 2009, 156-157; Tuomi & Sarajärvi 2009, 135; Yin 2003, 36-37)

With qualitative study reliability and validity are more challenging to measure because for example when conducting case study about people or culture, the author can consider that study describes one unique situation which cannot be repeated. Despite this, the author can increase reliability and validity of the study by defining precisely the course of the research. (Hirsjärvi et al. 2004, 216-217) While doing this study, the goal was to gather more in-depth insight about the adoption of the relatively new solution with the exploratory case study among few countries and how extensively results can be generalized is left to the audience of the study to determine. The target of the study is not to provide an exact opinion on the subject, but to give new perspectives to people who are interested in the topic.

5. Adoption of cloud ERP systems in the Nordics

This part presents discussion and findings of the empirical part of the study. The empirical section consists of the introduction and deep dive to current Nordic market of ERP systems and trends, based on studies and market predictions. The chapter continues with author's observations from interviews held with ERP systems' customers, and after that six interviews with experts of ERP systems' vendor are presented. All of the empirical findings are based on topics related to SaaS solutions, ERP systems, adoption of ERP systems and Nordic market of them.

The chapter begins by covering current trends among cloud based solutions and ERP systems in the Nordics based on market surveys and predictions. After that, customer data is presented, bringing out current pain points of the customers with their ERP solutions. After that chapter continues with themes related to adoption process and insights from interviewees to each topic. At the end of this part results of the interviews are analyzed, and summary is given. Results are grouped based on TOE framework (Tornatzky & Fleischer 1990) in a similar way as in the literature review part of this study to enabling coherent view about the significant factors of the cloud ERP adoption in the Nordics.

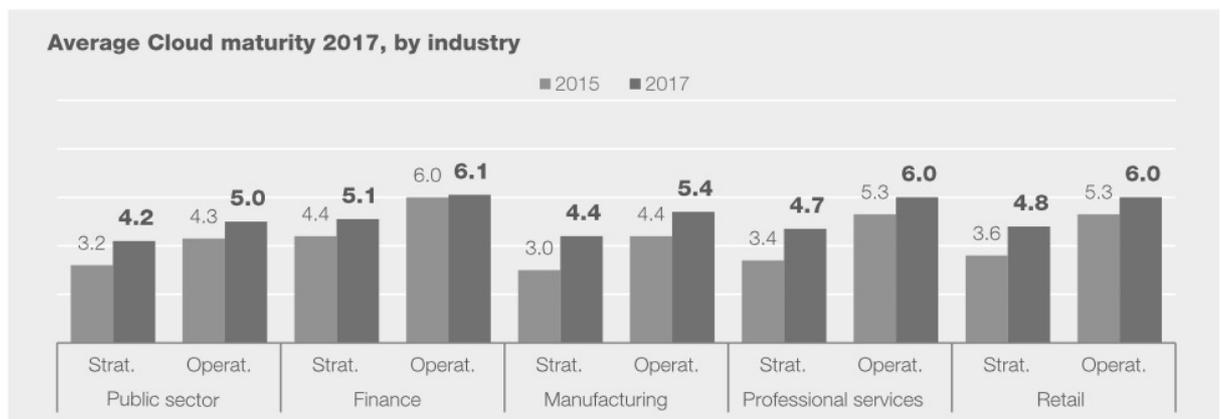
It is obvious that customers now consider SaaS based ERP systems as one option, but which are the determinant factors for IT sourcing in general and in this case especially for SaaS based ERP in the Nordic countries? How do companies decide which systems or applications they adopt? This chapter's goal is to give answers and insights to these open issues by presenting first the Nordic market of ERP systems followed with a short review to interview data from Nordic customers and finally by presenting results of the interviews conducted within ERP solutions' professionals in the Nordics.

5.1. Cloud ERP systems in the Nordic market

Digital transformation is on-going, and it is difficult to predict precisely what impacts this transformation will have, but what is for sure is that digital disruption will influence almost to all organizations and their business processes and models, and in general to the whole

society (Radar 2017). KPMG's survey in the Nordics about shared services and outsourcing, predicted already in 2015 that maturation and growing customer demand for innovative technologies like cloud will have a high positive impact on customers. Still, at the same time, they said, that the most significant challenge is how customers successfully undertake these initiatives towards innovative technologies such as ERP system's platform because these solutions are also the biggest investments related to technological innovations for businesses. (Abeleen, J. & Hall, L., T. 2015)

Demand for cloud services is raising in the Nordics, and according to Radar's survey about cloud maturity in the Nordics in 2017, cloud services penetration has increased significantly among organizations in Finland, Norway, and Sweden. Nordic organizations use different types of cloud services (SaaS, IaaS, and PaaS) much more, compared to the year 2015, when a similar survey was done. Among Nordic organizations there exists more readiness to deploy different models of cloud, and cloud resources are utilized in more complex and in more business critical areas than earlier. (Radar 2017)



Picture 1. Cloud maturity by industry in the Nordics (Radar 2017)

On the five main industries, which are seen in picture 1, cloud maturity has been growing among all of them and differences between industries have decreased. In the picture 1, it can be seen that operational maturity is higher than strategic maturity, which indicates that cloud services are used more for single and independent services than leveraged in strategical level in the organization. In strategical level is meant that strategy and definition for cloud services in the organization are clearly defined, and organization would also have competences and

resources to implement cloud services. (Radar 2017) The same kind of issues are indicated by Mowry, managing director business development EMEA of Amazon Web Services, who said that Nordic countries are eager to adopt cloud solutions, but they still lack skills to adopt cloud, especially in organizations with more traditional IT architecture (Haaramo 2017).

There is growing interest towards all kinds of cloud based services and solutions in the Nordic organizations and according to Bilderbeek (2016), in the Nordic leading SaaS category is Finance and ERP in Denmark and Finland, but in Norway and Sweden Communications are ahead at the moment. This finding is also supported in the survey of TechTarget (2017) in which Nordic organizations were asked to determine, which packaged business applications they will implement in 2017 and ERP system was ranked highest (69%) among Nordic organizations in the IT priorities survey (TechTarget 2017). According to studies from IDC and Gartner, one reason why ERP systems are seen as a priority is that there is need to renew core ERP systems for digital transformation. In the same study, it was also mentioned, that Nordic organizations should consider post-modern ERP, meaning flexible ERP systems which combine on premise applications with cloud based solutions and business process outsourcing, instead of heavily customized legacy systems. (Haaramo 2015)

5.1.1 Observations from the Nordic customers

One accelerator for this thesis were customer interviews related to pain points with their current ERP systems, which was collected during 2016-2017 by consultants working among cloud solutions and ERP systems. In this thesis, this data is used only as a secondary source and in this chapter observations from the data are discussed. All interviewed companies are treated anonymously in this study.

The most difficult issue raised by all of the interviewed customers were scalability issues, at the moment with traditional ERP systems organizations buy licences which are long-term, and the price is dependent on the amount of the licences, which means that it is not efficient to buy just few new ones when needed. Customers are demanding more scalable solutions by means of users and also data handling capacity and performance. Another very complicated issue at the moment are upgrades and releases because organizations need to

take care of that by themselves and in many cases, ERP systems are so customized that upgrades are not even possible to do. New solutions for release and upgrade management are welcome, and companies seem to think that it could be outsourced to the vendor. The third issue that most of the customer were raising as a pain point was the implementation projects, those are seen as time consuming and difficult to handle, only one respondent told that they had successful implementation projects. Some customers even told that they are not at the moment doing any big implementation projects, but smaller developments time to time.

Best practices and standard processes were seen as a good thing by all of the customers. Some of them have already taken best practices into use, and they were satisfied how everything works and how much easier it is to do for example upgrades even with on premise ERP systems. Standard processes were also discussed and seen as an advantage, but many of the respondents added that business is not leveraging them. Some also told that it is impossible to get business requirements to fit standard processes because people are reluctant to do the changes in the business units. This was seen the most critical issue at the moment because many of the interviewees noted that standard processes are the ultimate intent of ERP systems. It was noted that possible benefits from business processes and best practices would require change management at the organizational level and more support for this is required from the vendor. They also noted that when these best practices and standard processes are in place – all issues related to version management and upgrades would get easier.

Data security and privacy were mentioned as pain points when talking about cloud ERP systems but more because it was unclear to them how these are taken care with cloud solutions. Some customers also noted that the data location is crucial for them due to legislation, but otherwise they do not see any major problems with the public cloud. Customers also stated that they see private cloud as a good option and they believe it has some additional value compared to public one. Real-time visibility and enhanced analytics with cloud ERP solutions were seen as beneficial but noted from the customers that there are not yet that many business requirements for these. They said reporting and real-time information issues are developed already at the moment, but it is not the most critical thing

with ERP systems at the moment. Only a few of the customers raised the lack of real-time information and visibility as an issue in their current situation.

All in all, customers had quite consistent opinions about the discussed issues and in the Nordic market pain points with ERP systems seem to be quite similar despite the industry of the organization. Many of the customers already had some smaller IT solutions as cloud based and interest towards SaaS ERP systems was notable, and one reason for the interest are the current pain points with their current ERP systems.

5.2. Results from the interviews

This chapter presents results from the interviews to professionals working among ERP systems in the Nordic market. Results are divided into themes based on the theoretical part and the research questions. All of the interviewees are treated anonymously and identified with number and letter combination in the study.

5.2.1 Cloud solutions and SaaS service model

The first theme of the interviews were cloud computing and SaaS solutions in general, and questions focused on investigating professionals' opinions and views about customers interested in general towards cloud computing and in the other hand overall suitability of IT solutions to be offered with SaaS service model. The first theme aims to get an overall picture of the attitudes of professionals towards cloud solutions, and last covered sub-theme was related to job role changes in customer and vendor side originating from SaaS solutions deployment, and how they see it will change their work and customers' role.

Overall feeling from all the interviewees was that customers are interested about cloud based solutions, but it was also pointed out, that at this point most of the Nordic customers are only getting to know cloud based solutions and considering whether there are solutions, which could be suitable for them. Interviewees, who are working in sales were stating that there is a lot of interest and curiosity among customers, and companies are eager to know how they could leverage cloud solutions in their business. One interviewee stated, that when customers get more insight about cloud solutions, the interest will increase because they know better

what to ask from vendors. One interviewee has more experience about cloud based solutions, and she told that even the customers who are already implementing SaaS based ERP solutions are stating that this is really new to them. To conclude there is interest among customers towards cloud based solutions, but in many cases, it is still more like one interviewee stated;

“Knocking the tires, like what is this thing, and could there be something for our organization” (C2)

The second question was more technological and aiming to know whether professionals have an opinion about the suitability of different solutions to be offered as a SaaS solutions, and are there even any restrictions which applications are suitable. All of the interviewees stated that they cannot name any applications which could not be cloud based, but two of the interviewees pointed out that there might be some security restrictions in some industries, which can prevent them to leverage SaaS based solutions in some cases. Many of the interviewees said that HR and Finance, which can be referred as administrative solutions, are very suitable as SaaS solutions and especially HR because it is used quite a generic way among organizations.

“Administrative solutions as SaaS applications have become general faster but also operational functions will move to the cloud, it is just that it is difficult to know what the timeline for the change is.” (C5)

The third question was related to cloud deployment model and whether it matters to customers is the application running in the public or private cloud. This question was obviously dividing the interviewees' opinions, some of them said that they really do not know whether it matters to customers. Two of them pointed out data privacy and security issues, and one interviewee said that customer can also consider, for example, coming GDPR legislation and whether it has some implications to which deployment model is possible for customers' applications. All in all, the cloud is seen as a new thing, and even professionals saw it challenging to determine the meaning of the deployment model for customers. C2 also said that:

“Private cloud is something which is not even that far from hosted servers, and it is only a stepping stone towards public cloud model for customers.”

The fourth question was related to SaaS application adoption and what are the reasons why customers start to adopt these solutions and what they are expecting to get by adopting SaaS solutions. Reasons for adoption mentioned were many, and all of the interviewees said that it is difficult to determine what eventually has the weight in customers' mind. Innovativeness and capability to try something, which was not possible previously were mentioned, meaning that SaaS solutions are more agile and enabling faster implementation of new features and they are seen as a “light” option for traditional solutions. The user interface was mentioned since it is often modern and with better usability than traditional solutions such as SAP ERP systems. Cost savings were mentioned by all of the interviewees, but some of the interviewees also added, that it is the expectation of customers and it might not yet be the reality. These aforementioned issues were stated to be the topics that customers are seeking when they decide to adopt cloud based solutions.

Next question in this theme, was aiming to get opinions whether interviewees believe that IT personnel's roles in the customer organization change when they implement SaaS based solutions, and the discussion continued about how vendor role and especially consultants' role in the customer organizations changes when SaaS solutions are implemented. Everyone said that role of the IT personnel will change, but the change is not just because of cloud based solutions but due to the fact that at the moment need for understanding business and translate it into technical is a general requirement for organizations' IT personnel. SaaS might be changing the roles so that some IT roles may even disappear, but on the other hand consultant, who has done SaaS implementation, said that in their model customers should take more responsibility about maintenance of the solution, but they are not capable of doing that, and they want to outsource that to vendor. All of the interviewees pointed out that size of the organization also affects to this because small organizations might not even currently have that many people working for IT.

“I believe that customer's IT personnel roles change, not just because of SaaS solutions, but because they need to work more closely with business and really understand what

added value IT solutions bring to the business, and it is far more difficult than just understanding the technical perspective of solutions.” (C5)

Interviewees agreed that since SaaS solutions are more standard, there will be less design work and fewer possibilities for customization work done by consultants and also some technical work will disappear, one interviewee also told, that based on her experience the role of the consultant is quite the same as previously, but since the solution is more standard you can have broader responsibility area in the implementation project. None of the interviewees thought that consultant role would not exist anymore, it is just changing towards more business and advisory, meaning that solution consultants need to be able to advise and talk with business how to use the solution in the most efficient way.

“Maybe it changes so that because the solutions have some elements already given, it can steer the design and implementation work to a certain direction and it is not possible to meander with the solution and customizations in it as much as previously.” (C3)

The final question in the first theme was leading question to the following theme, whether interviewees believe that ERP systems will be provided more as SaaS services in the future. The conclusion of this was that ERP systems would be provided more and more as cloud based, but the timeline for this change is difficult to determine, one consultant said that the pace of the change would get faster as it has been. One consultant noted that this change will happen in pieces so that part of the ERP system is taken to cloud and then partially more and more. Other consultant continued the stepping stone idea, so that first ERP systems are taken to private cloud and then to the public cloud. The transition towards cloud is happening, but in sequences when customers get to know cloud solutions better and gain experience about them.

“There is no doubt that transition towards cloud for ERP systems is happening, but the time line for the change is still a bit of an enigma.” (C3)

5.2.2 Cloud ERP systems and meaningful factors in the adoption

The second theme of the interviews was related to SaaS based ERP system and experts' view of the driving and preventing factors of adoption. Benefits and drawbacks of adoption were discussed so that experts were giving input what they think customers see important.

The first question under this theme was to determine whether there are any major differences between traditional and SaaS based ERP solutions recognized by the interviewees. In purpose, this question was defined as open so that interviewees would point out things that come first to their mind when comparing the different ERP systems. This approach resulted in variations of perspectives and issues related to differences. From the technical point of view, it was said that the code is not different in the systems, but capabilities to change it are enhanced in SaaS solutions making them lighter and more agile. This same was said about the user interface, in SaaS solutions it is more user-friendly. Almost all participants also said that the SaaS solutions are faster. Two of the interviewees also pointed out the scope of the ERP project, and if there are operational processes in the scope, they said that this makes a huge difference how much changes are needed to organization's processes compared to only administrative functionality. For operational processes due to these business requirements, often more customization is required, and that can make SaaS solutions more difficult to leverage.

The theme continued with SaaS based ERP systems' benefits and drawbacks, and they were discussed so that interviewees were asked to give their professional opinion about the meaningful factors but in addition to that author asked interviewees to think also from the perspective of the customers. Almost all the interviewees pointed out as a very beneficial feature of cloud ERP system, that when upgrades are done at the same time for all of the customers, they have the same versions, and there are not customers who are using outdated versions of the solution and by that new enhancements and features are available for all. Related to this quality of the systems was also mentioned, meaning that all the things are ensured by the vendor, and if something unwanted happens it touches so many customers that it needs to be fixed fast by the SaaS provider. Despite this, subscription model of SaaS was mentioned as a benefit, with the "pay-as-you-go" –model was expected to bring cost

savings. All of these factors together were assumed to lead lower total cost of ownership which, of course, is beneficial and attractive for the customers.

Standard processes of SaaS solutions were also mentioned leading to better quality of the systems since all of them are in the same version and controlling of the systems should be easier. Consultants believe that costs will get lower when upgrades and processes are standard, and there might not be that much need for additional maintenance work. Interviewees were stating that “good enough” value for business can be delivered via SaaS ERP systems with standard processes with lower costs than with traditional highly customized ERP systems.

“Even more important is all the possibilities and features which are available for all of the customers using SaaS ERP system, and how these can be very beneficial for customer’s business.” (C1)

In general agility, accessibility, speed of the system and better user interface were mentioned as benefits for cloud ERP systems, and ease of use was also mentioned. Again, it was noted that SaaS solution could offer possibilities to try out new features more easily and enable innovativeness which can bring competitive advantage and real benefits to customers’ business.

“It is not valuable to anyone to think how to keep the system up and running, manage updates or think how to spin performance of the system, these kinds of things do not bring any additional value to business, so if cloud can enhance and simplify these issues it is for sure a good thing.” (C1)

Drawbacks of the SaaS ERP systems started from the same thing – standard processes and best practices and the problematic nature of them. “Best fit” problem was described well by one interviewee.

“These standard processes and best practices are like a suit from Dressmann, they are okay but not fitting like the tailor made suit.” (C5)

Interviewees were commenting disadvantages of standard processes, that business processes of the organization need to be changed suitable for the solution, and even ugly modifications might be needed for the current business processes. Related to business requirements and industry specific needs, the lack of customization possibilities was mentioned, because it leads to a situation which requires business process modifications from the customer. For these reasons, it was also mentioned that the real costs associated to cloud ERP systems are difficult to estimate since you get something with the standard fee, but there can be a lot of business, and other requirements which requires additional work and price for that is more difficult to estimate.

It was noted that customers cannot influence the direction of the system development, but this same issue is recognized with traditional systems, with them it is just bypassed with enhancements and customizations to systems. Individual points were made about the possibility of lacking localizations since these SaaS solutions are so new and in the Nordic countries, there are not yet that many customers for these cloud ERP systems. Also, updates to systems were seen as a possible drawback since there might be situations in the organizations that update is not possible to do because there is, for example, closing of financial statements on-going at that time.

“In the Nordics, it may be a drawback that if there are localization needs, are the customers heard enough, but this will be improved of course when there are more and more customers using SaaS ERP systems in the Nordics.” (C4)

In general data security and privacy were mentioned, interviewees do not doubt them with cloud ERP applications, but it is seen as a drawback which customers may consider. Ownership of data was mentioned, this is seen as an unclear issue, how it will be handled since there is not much experience yet and related to this it was also said that with SaaS solutions there is the possibility of vendor lock-in as much as with on premise solution.

There are a lot of statements from SaaS solution providers that implementation and integrations are easier with SaaS solutions, but the professionals did not really sign this statement off. Implementations are assumed to be faster because there are the same building blocks, meaning readymade components and standard processes, but one consultant noted

that there are still the same issues which need to be discussed with the customer about the system implementation than previously with the traditional ERP systems. The implementation might get faster because everything is not started from the scratch, but probably not easier since there are still a lot of things that need to be done. One interviewee stated that with SaaS solutions moving configurations from environment to another is not as easy as with traditional ERP systems. Interviewees said that in theory they believe that implementations are easier, but they are still doubting that, and assuming there will be improvements to implementations coming from SaaS ERP systems' providers.

"I believe that implementation gets easier, of course depending on the software but vendor and customer have the same target stage about it - hoping that it gets easier." (C2)

Interviews continued then to next statement of SaaS solution providers "integrations to other systems will get easier." For this statement concerns were quite the same as for the implementations, overall opinion was that cloud does not really change it easier or more difficult compared to traditional systems' integrations, possibilities with integrations are the same, but what really changes integrations are application programming interfaces (APIs), which can be utilized with traditional and SaaS ERP systems. It was noted that of course a lot of specifications for integrations might be readymade by SaaS provider, but customers' needs can vary a lot depending on their IT architecture.

5.2.3 Customers adoption process and the ERP market in the Nordics

Under this theme, target was to get insight to the topic, which determines the adoption decision of ERP systems among customers in the Nordic market and also get opinions what the trends with ERP systems in the Nordics are.

The third theme began with an overall view of the adoption of ERP systems in the Nordic market and also a detailed understanding of ERP systems' trends in the Nordics. Adoption decision-making was said to be based on consideration of the entire organization's IT landscape, and it was mentioned that ERP systems are an expensive and long-term investment, so there are a lot of issues affecting the adoption decision. Price has a meaning in the adoption decision-making process but it is not the only thing, and in the public sector,

the price can be a more determining factor than in some other industries. Quality of the system was mentioned, and one consultant pointed out that it is also related to branding and also the availability of the consultants and overall services for specific ERP products in the market.

It was also said that eventually the decision is made by the people and then the personal preferences of the solution may have some weight in the adoption decision. Things that can affect adoption decision in the Nordics specifically weren't mentioned that many, despite localization needs, for example, Nordic letters and local accounting provisions. One interviewee also noted that Nordic customers are lagging behind in the SaaS ERP systems adoption compared to US market. Many of the interviewees also pointed out, that in the adoption phase, there should be careful planning and discussions in the organization so that all elements of the overall IT architecture are considered. Consultants assumed that at the moment in the Nordic organizations there is backwater stage on-going, meaning that companies really try to figure out their whole IT architecture and how to do the transition towards cloud with all the solutions, not just ERP systems.

“Companies should consider much more carefully the whole IT organization, not just fast solutions that for example financial management is moved to cloud without considering the overall IT architecture of the organization.” (C2)

Trends in the Nordic ERP systems' market were discussed next. A few of the interviewees mentioned the idea of bimodal IT, meaning shortly that critical processes of the company are kept stable, and new innovative features are tried outside that, with ERP systems it could mean that critical processes are kept in ERP systems' traditional core, and new innovative solutions around it are tried out in the cloud. It was stated that organizations do not get everything they want from one box so this kind of hybrid solutions and landscapes, where part of the ERP system is on premise and part in the cloud might be the trend for coming years, at least in the transition phase towards the cloud.

“These days, few of the customers get all the services and features they need from one box, often they have solutions from different providers, which suit for their different needs and

then IT landscape is easily hybrid, there are on premise components and then cloud components and then how these components play together.” (C1)

Another trend mentioned was the possibility to leverage the big data, customers already know that they have a lot of data, but not all of them know how to leverage it for example with their ERP systems. From expert’s point of view with cloud based solutions, these could be utilized more efficiently because in the cloud there aren’t for example capacity issues with data volumes. The last trend mentioned was service design which is seen important, and growing demand for that is noticed, which also indicates that usability of the user interface is getting more attention with ERP systems.

“If we think about the trends, one of them is big data and how to leverage it. Most of the customers know that they have big data, but they do not know how to leverage it. Then of course Internet of Things and machine learning, which can be highly linked to ERP systems.” (C3)

There are obviously a lot of trends in ERP systems’ market, and somehow all of them are linked to the cloud. Cloud is not a requirement for all of these new innovations, but providers of the ERP solutions are pushing in that direction by providing for example machine learning related features in the cloud.

“Machine learning, IoT and AI will be utilized hugely in the future apart from the fact whether the system is in the cloud or on premise.” (C6)

Last questions were related to possible customers adopting SaaS solutions and how customers could enhance the possibility of succeeding with the ERP systems adoption process. Size of the organization was mentioned by all of the interviewees and opinions were consistent. Small organizations were said to adopt cloud based ERP systems because their requirements are simpler, and they can leverage ERP systems quite cost efficiently as SaaS solutions. It was noted that of course small organizations are not often trying new things as the first ones but amount of the small organizations adopting SaaS ERP system will increase. Medium size organizations were seen as the most prominent market because their business requirements are still quite easy to handle, and they can benefit from the scalability

possibilities of the system. Big enterprises were said to move to cloud gradually because their requirements for the systems are much more complex and they have invested so much already in the on premise solutions.

Differences in the SaaS ERP adoption among industries shared opinions between interviewees. Some interviewees noted that data security and legislation requirements in some industries could make it more complex to adopt cloud based solutions, but one interviewee commented opposite - for example in banking and insurance industry they have the same “cloud first” strategies as other industries, so this kind of restrictions might be just for some specific industries. One interviewee said that it is often so that if the company has some physical production, they often then have more requirements for the ERP systems and this can prevent some companies to adopt cloud based ERP systems. Other interviewee said that in the IT industry and some other “newer” industries cloud based ERP systems are adopted faster, for example, Spotify and Netflix are using cloud based ERP systems. It was also noted that public sector is a prominent customer of cloud solutions because they often need to look for cost savings, but this same can be the case for many traditional industries, where profit margin is lower. All in all, these industries were mentioned by the interviewees, but all of them also said that it is difficult to say whether there are that much dependencies between industries.

Last pre-defined question to interviewees was to give advice to customers how to make ERP system’s adoption decision-making process successful. The most common advice, which almost all interviewees mentioned was to precisely define, investigate and plan what the reasons and motives to adopt new ERP system are. This definition can be done by road mapping the needs and the available solutions and also try to keep in mind long-term targets and strategy because ERP systems are big investments and their useful life is longer than for many other IT systems. Openness towards possible vendors was also seen as beneficial because then vendors are more capable of offering better and more suitable solutions, and one interviewee also added that vendors also have the responsibility to offer the most suitable option for the customer. It was noted that the price should not be the only thing that matters in the decision making. Already in the adoption phase, there should be people in the organizations who have time and knowledge about the current IT landscape and solutions, and then also the possibility to go through different options. Commitment to go further, when

implementation of the system begins is also very crucial for the success of adoption and eventually implementation of the ERP system.

“One advice is to do road mapping so that organization really looks for the next five years instead of one and looks what is coming and what is required from the ERP system. Then they should think whether the planned IT landscape is answering for those requirements.”

(C3)

Going further with the requirements for the system it was also said that organizations need to think about the end users of the new system and change management cannot be neglected. Particularly, when there is a change from highly customized ERP system to very standard cloud ERP solution, the change management and training of the users need to be done very carefully, because for the users the change can be even dramatic and affect hugely to their work. To highlight it one interviewee said that eventually, it is all about the people who are using the system.

5.3. Analysis and summary of the results

This part represents analysis and summary of the results collected from experts of the ERP systems, and these findings are presented in tables 5, 6 and 7. Drivers and barriers to SaaS ERP systems adoption in the Nordic market are recognized from the results and grouped under different contexts in the similar ways as in the theoretical part of this thesis. In this part, results are discussed and analyzed based on TOE framework (Tornatzky & Fleischer 1990) with reflections from the customer data, and the objective was to create more insight into the special characteristics of the Nordic market. Analysis of the results revealed a lot of consistent opinions about the drivers and barriers of adoption from vendor and customer data, but there were also differentiating opinions between ERP professionals and based on their role, for example, in the ERP projects there were issues which some of them saw more important than others.

5.3.1. Technological drivers and barriers to adoption

Most of the factors that were recognized from the empirical results are under technological context as can be seen from the table 5. Customization requirements are seen as a benefit for traditional ERP systems and lack of them with SaaS ERP systems were mentioned the biggest barrier to adoption in the interviews. It is notable that professionals stated customization requirements to be in some extent industry related issue, in the manufacturing industry this is often a more critical issue due to more complex logistics requirements. On the other hand, administrative solutions were seen easily more suitable for SaaS ERP systems.

Centrally managed maintenance and upgrades were seen as a benefit for SaaS ERP systems and mentioned as one of the biggest drivers for the Nordic companies to adopt SaaS ERP systems, and this was highly emphasized also by the customers. Flexibility and scalability were mentioned as advantages for two reasons, one that system is easily scalable depending on the current needs of the organization, and secondly because data handling capacity can be scaled more easily than with traditional systems. Nordic customers also highlighted this because the current licensing model is expensive and inflexible to adapt to changing user amounts and data capacities. Agility and lightness of the system among better user interface and accessibility from anywhere were seen as drivers which can attract customers, and this was supported by the customers who said that for example, the possibility to leverage mobile applications with ERP systems is needed.

Standard processes and best practices and overall system's fit to the company are seen as drivers but also as a preventing factor since it brings a lot of positive features such as easier upgrades, but then again it is more difficult to fit these to organization's current business processes. Customers were saying the same, almost all of them mentioned standard processes and best practices as a good thing but then also noted that the challenge is to get business to put these into the practice.

Table 5. Technological factors of adoption

Drivers for adoption	Traditional ERP system	Source	SaaS ERP system	Source
<i>Technological</i>				
Customization requirements	x	C1, C2, C3, C4, C5, C6		
Data privacy			x	C1, C3, C5, C6
Data security	x	C1, C5, C6	x	C1, C3, C5, C6
Enhanced processes	x	C1, C2, C3, C4, C5, C6	x	C1, C2, C3, C4, C5, C6
ERP system's fit to firm	x	C1, C2, C3, C4, C5, C6	x	C3
Faster time to market and shorter implementation time			x	C1, C2, C3, C4, C5, C6
Integrations to other systems			x	C4
Maintenance and upgrades			x	C1, C2, C3, C4, C5, C6
Ease of access			x	C2, C3, C4, C6
Flexibility and scalability			x	C1, C3, C5, C6
Standardization and best practices	x	C4, C5	x	C2, C4, C5, C6
Subscription model and licences			x	C1, C2, C3, C5, C6
Total cost of ownership			x	C3, C5, C6
Cost savings			x	C1, C3, C5, C6
Agility and lightness			x	C1, C3, C6
Modern user-interface and experience			x	C1, C3, C4, C6
Performance of the system			x	C1, C5, C6
Barriers for adoption	Traditional ERP system	Source	SaaS ERP system	Source
<i>Technological</i>				
ERP system fit to firm			x	C1, C2, C3, C4, C5, C6
Integrations to other systems	x	C1, C2, C3, C4, C5, C6	x	C1, C2, C3, C4, C5, C6
Customization requirements			x	C1, C2, C3, C4, C5, C6
Data security	x	C1, C3, C5, C6	x	C1, C3, C5, C6
Data privacy	x	C1, C3, C5, C6	x	C1, C3, C5, C6
Vendor lock-in	x	C3, C5, C6	x	C3, C5, C6
Application specificity			x	C2, C6
Control over system upgrades etc.			x	C5
Implementation timeframe	x	C3, C4, C5		

Data security and privacy were mentioned because interviewees said that customers might see these as barriers to adoption, but from the experts' point of view those are better handled with SaaS ERP solutions. This opinion is supported by the customer data, they see these as possible barriers but many of the customers said that it is because they do not have yet enough knowledge about it. All the interviewees agreed that in the technological context cost savings related to maintenance, upgrades and total cost of ownership are benefits but

one interviewee was a bit doubtful whether there are cost savings if the adopting organization has a very complex IT landscape.

Technological context is seen the most critical part of the innovation adoption because based on experts' experience these issues are the ones that customers are considering the most. At the moment, there are issues such as vendor lock-in and data ownership which customers or even vendors do not have experience and knowledge yet. This can be a barrier to some customers since they want to hold the adoption decision or even the considerations until they get to know how easy it is. Technology related factors raised a lot of different opinions and views, which also describes the complexity of the ERP systems in general and also then the difficulty to determine SaaS solutions suitability for ERP systems even it is already noticed that there are a lot of benefits in them compared to traditional systems. In the end, it can be stated once more, that the entire IT architecture of the organization needs to be considered and also the transition period towards the cloud so that eventually adoption of SaaS ERP system brings real value to the business.

5.3.2. Organizational drivers and barriers to adoption

The most consistent opinions about the drivers and barriers of SaaS ERP adoption were recognized under organizational context, which is visible in table 6. In the organizational context, most of the benefits and disadvantages are related to both operation modes which indicates that these are more dependent on the organization and its practices and structures. Changes in the roles are happening also due to other reasons than the operation mode of the ERP systems. Importance of change management is crucial every time when ERP system is changed. This was also noted in the customer interviews, standard processes and ways of working need to be implemented well because otherwise they are not existing and with SaaS ERP systems this would cause even more problems. There were comments from the customers that they haven't handled this well previously and now their ERP system is highly customized which causes a lot of problems, and they will not accept this to happen with their next system.

Table 6. Organizational factors of adoption

Drivers for adoption	Traditional ERP system	Source	SaaS ERP system	Source
<i>Organizational</i>				
Business requirements for system	x	C1, C2, C3, C4, C5, C6	x	C5
Changes in job roles of IT	x	C1, C2, C3, C4, C5, C6	x	C1, C2, C3, C4, C5, C6
Company size	x	C1, C2, C3, C4, C5, C6	x	C1, C2, C3, C4, C5, C6
Organizational changes and change management			x	C4, C5, C6
Real time visibility			x	C4, C5, C6
Barriers for adoption	Traditional ERP system	Source	SaaS ERP system	Source
<i>Organizational</i>				
Company size	x	C1, C2, C3, C4, C5, C6	x	C1, C2, C3, C4, C5, C6
Changes in job roles of IT	x	C1, C2, C3, C4, C5, C6	x	C1, C2, C3, C4, C5, C6
Organizational changes and change management	x	C4, C5, C6	x	C4, C5, C6
Business requirements for system			x	C1, C2, C3, C4, C5, C6
Investment of time and money	x	C1, C3, C4, C5	x	C2

Company size is seen as a barrier, but also as a driver for SaaS ERP systems because for small and medium size companies it is seen as the best option, but for example for big manufacturing firms, it might not be the best solution due to their complex needs. Business requirements are seen as the most critical barrier because there might more need for changes in the business processes than with traditional systems, but one interviewee also mentioned that there are customers who appreciate it because it forces them to re-think their business processes and make them, for example, more efficient.

Organizational factors are not that many, but interviewees emphasized these issues a lot, for example, change management was mentioned as a critical issue already in the adoption phase. Results indicate that these are also the most difficult for the organization and careful planning is required. Like one interviewee mentioned, it is eventually all about the people working in the organization and using the system.

5.3.3. Environmental drivers and barriers to adoption

Environmental factors, which are seen in table 7, were obviously the ones that some interviewees didn't have a lot to say. Legal requirements were seen the most important barrier to adoption, and one interviewee raised that now when GDPR regulation is coming, it can cause a lot of confusion among customers and they can also consider that with other cloud solutions adoption. Customers were also mentioning legislation requirements but mainly because some of them see the data location as a crucial issue. Competitive advantage was seen as a driver for both operation modes and commented that it is often really important driver for adoption decision-making for customers. It was mentioned that with SaaS solutions there are a lot of new features which can enable organizations to create competitive advantage but on the other way, there are companies which have highly customized ERP systems which create them a competitive advantage and then this is a barrier to SaaS ERP adoption.

Table 7. Environmental factors of adoption

Drivers for adoption	Traditional ERP system	Source	SaaS ERP system	Source
<i>Environmental</i>				
Competitive pressure			x	C2, C3, C5
Compliance to stakeholders			x	C2, C4, C5
Competitive advantage	x	C2	x	C1, C3, C5
Barriers for adoption	Traditional ERP system	Source	SaaS ERP system	Source
<i>Environmental</i>				
Legal requirements fulfilment			x	C1, C3, C4, C5, C6
Stability of vendor and SLA			x	C3, C6
Competitive advantage			x	C1, C2

SaaS ERP systems are a new way to deploy ERP systems, and a lot of new vendors have entered the market, and this was raising opinions among consultants. Issues raised were the stability of them, and how to handle the situation where the customer wants to change the vendor or in the worst case is forced to do that if the vendor is exiting the business. These issues were raising concerns, and no one has not yet answer for this because the market is so immature. Service level agreements (SLAs) were not discussed much, but few interviewees noted that these are difficult for the customer but also for the vendor to

determine the service level and pricing, and definitely a barrier from the systems adoption perspective.

All in all, environmental factors are raising concern among experts, and they expect that these issues are causing uncertainty among customers too. One interviewee stated that this is one challenge as a vendor to manage these concerns and make services related to these interesting for customers.

6. Discussion and conclusions

This final part of the study summarizes the findings of the empirical part by reflecting them with the theoretical findings. Then conclusions of the study are described, and also take-away messages and managerial implications to the industry are given. In the end limitations of the study and directions for the future research are presented.

First, in this study, concepts related to cloud computing and ERP systems were introduced, then theories about innovation adoption and usage of these theories with IT innovation adoption were described. The final part of the theory was literature review which aimed to create extensive view about factors affecting ERP adoption at the organizational level. The study continued with the empirical part which deep dived to Nordic ERP market, and customers' pain points with their current ERP systems and finally Nordic ERP solutions' experts give their insights to cloud ERP systems and factors which are affecting the adoption of these systems in this market. This study enhanced understanding of the driving and preventing factors of adopting cloud ERP systems among Nordic organizations. In addition to that, this study aimed to fill the gap in the previous literature about determining factors influencing on SaaS ERP adoption with empirical study.

6.1 Summary of the findings

This part presents the main findings of this study and answers to research questions. The main target was to enhance understanding of the factors which affect cloud ERP systems adoption decision-making in the Nordic market, including Finland, Sweden, and Norway. This study was carried out with literature review and analyzing qualitative data gathered by interviewing professionals working with ERP systems in the Nordics, and additional support for empirical analysis was gathered by observing and analyzing Nordic ERP market and customers from interview material, market analyzes, and predictions.

Innovation adoption means shortly the decision, which one individual or organization makes, to leverage fully of an innovation as the best possible way in the prevailing conditions (Rogers 1995, 177). In the Nordic context of cloud ERP systems adoption can be recognized

a lot of factors which affect to adoption and surprisingly many of them are not that technological or system related. Next answer to main research question is given based on literature review and empirical findings of the study.

What are the factors which Nordic organization take into account when adoption decision about cloud based ERP system is made?

Innovation's decision and adoption process includes different stages (Rogers 1995, 163-206), and most of the customers in the Nordic market with cloud ERP adoption are currently in the first steps of the process, meaning that they are starting to get to know what cloud ERP systems are and forming an attitude slowly towards those by gaining information about these solutions. The market of cloud based solution for ERP systems is growing, and in coming years it will gain even a bigger foothold in the Nordic market but before that there might be time for bimodal IT where on premise and cloud solutions are leveraged together, at least this was the trend which professionals in the Nordic market are predicting. This kind of approach was not mentioned in the previous studies where more strict polarization between on premise and cloud ERP systems deployment and usage was made.

Many of the driving reasons for adopting ERP systems are technical but at least as important are business reasons (Markus & Tanis 2000; Oliver, Whymark & Romm 2005; Pan & Jang 2008) and one of this kind of reason recognized in the Nordic market and the literature, are standard business processes. Thinking has changed towards an approach where IT solutions need to function so that they enable standard functions and "good enough" value gained from the systems with lower costs is sufficient, and business processes can be modified to fit these. Previously approach was different, and back then a lot of customization has been done so that ERP systems fit business processes of the organization. This trend is emphasized in the literature and supported by the practitioners. Besides the strategical implications and changes in business processes, enterprise systems have organizational impacts, and these changes can be dramatic. The influence can be related to current job roles of people or the organizational hierarchies.

In the empirical findings exists concerns and barriers which are related to the fact that Nordic cloud ERP market is very immature and from many of those, such as data ownership, most

of the vendors or customers do not yet have experience. To conclude some might be real pain points in the future but at least these have been clearly considered also on the vendor side based on previous studies and interviews, so probably an early recognition of them will be helpful to tackle these possible problems in the future.

Customers' requirements and characteristics have a vital influence on adoption, and in the literature, many studies indicate that company size has a lot of meaning in the adoption decision, and especially for SaaS solutions industry dependency was highlighted. In the empirical part this was noticed but stated that it is not that straight-forward to say which companies adopt cloud based ERP systems, and one interviewee noted that there are already now big enterprises from traditional industries leveraging cloud ERP systems even though they have not been considered the most plausible customers to cloud solutions.

In this diffusion and adoption process, people can react very differently to the new innovation, and this should be kept in mind during the adoption process. To conclude, it is essential and even inevitable, to remember that in the adoption process the most valuable thing is the people who will be using the system. To quote one of the interviewees, it is all about the people who will eventually use the system.

What determines adoption of ERP systems in the companies?

Like most IT innovations, ERP systems are adopted in intention to increase performance and effectiveness of the company. ERP systems investments require time, money and effort from the organization and that is why adoption decision has a significant impact to organizations, and it needs to be done as systematically as possible, taking all possible aspects into consideration. It is essential to understand determinants of the adoption decision at the organizational level so that factors driving or preventing the adoption of ERP systems can be recognized and fundamental reason for innovation adoption is understood.

This study was focusing on technological innovation adoption which made TOE framework (Tornatzky & Fleischer 1990) useful for highlighting the different contexts from where the factors of adoption decision are originating, and also enhanced understanding of the complexity of adoption decision process, where all of the three contexts technology,

organization, and environment are determining how successful adoption process is in the organization.

Cloud ERP systems can be seen as innovations which create discontinuous change in the organization meaning that it can have competence-enhancing but also competence-destroying influences to adopting organizations. This influence is well reflected from the previous literature of ERP systems adoption and the empirical study. ERP systems are innovations which can radically change the way company is operating, and with cloud ERP it changed even more because the deployment model is affecting the roles of the systems' stakeholders. This can have influences on the determination of adoption when organizations need to consider also this kind of changes coming with cloud based systems. It is notable that even the adoption decision is made at the organizational level the decision is made by the individuals who are involved in the process.

To conclude the main principles of the adoption are the same with traditional and cloud ERP solutions but the importance of the affecting factors might be varying because there are issues such as the degree of fit between firm and ERP system which is more difficult to attain with cloud based solution. The answer to next sub-question will explain this topic more.

What benefits and disadvantages are seen to be related to SaaS based ERP systems?

As theory emphasizes, cloud computing is changing considerably the way ERP systems are, among other things, scaled, updated, maintained and paid for. ERP systems have been until recently licenced products on local or hosted servers, and now with the cloud, ERP applications are accessed via the Internet, the service provider has the responsibility to manage and control application and data, and payment is made based on the subscription fee. This change is reflected in the drivers and preventing factors of cloud ERP adoption and tables 8 and 9 present all these determining issues which are recognized both in the literature as well in the empirical part. In this part summarization of the common factors is made.

The most coherent view about the benefits of cloud ERP systems among literature and practitioners are about maintenance and upgrades, and enhanced processes reached with cloud service model. These features are leading to most important factor according to

previous literature and empirical part – cost savings. Costs and structure of costs will change to more flexible and scalable, and this is because the number of users and data can be scaled when needed, and this is seen very beneficial and needed in the Nordic market and supported in the literature too.

New features and more agile systems were emphasized in the empirical part as well as the bimodal IT and how the cloud can really enhance usage of it. This was stated to result in possible competitive advantages obtained with cloud ERP from its technical benefits in the Nordic market. In turn, it was mentioned that with cloud ERP when customization possibilities are more limited, it could cause losing some of the earlier gained competitive advantages, and similar thoughts were reflected from the literature. In that sense, possible competitive advantages are not brought up to summarization of benefits or either to drawbacks.

Table 8. Benefits for adoption

Drivers for adoption	Literature	Practitioners
Data privacy	9, 11, 22	C1, C3, C5, C6
Data security	9,10,11, 14, 17, 22	C1, C3, C5, C6
Enhanced processes	1,2,3,4,7,8,9, 12, 13, 14, 17, 18, 20	C1, C2, C3, C4, C5, C6
Faster time to market and shorter implementation time	9, 10, 11, 12,13, 14, 15, 17, 20, 22	C1, C2, C3, C4 C5, C6
Maintenance and upgrades	9, 11, 12, 17, 20, 22	C1, C2, C3, C4, C5, C6
Ease of access	9,10,11, 14, 16, 17, 18, 20, 22	C2, C3, C4, C6
Flexibility and scalability	12, 16,17,18, 20, 22	C1, C3, C5, C6
Standardization and best practices	1,2,3,4,9,11,12, 17, 18	C2, C4, C5, C6
Subscription model and licences	10, 12 13, 14	C1, C2, C3, C5, C6
Total cost of ownership	10, 11, 12, 14	C3, C5, C6
Cost savings	2, 3, 9, 10, 12, 13, 15, 16, 17, 20, 22	C1, C3, C5, C6
Changes in job roles of IT	9, 12	C1, C2, C3, C4, C5, C6
Company size	2,4,6,7,16, 21	C1, C2, C3, C4, C5, C6
Organizational changes and change management	1, 5, 6, 8, 9	C4, C5, C6
Real time visibility	3, 10, 14	C4, C5, C6
Competitive pressure	4,8	C2, C3, C5
Compliance to stakeholders	12, 13, 19	C2, C4, C5

Organizational level changes and other factors which can have a lot of weight in the decision making and adoption process (Baker 2012) were seen as benefits but also as barriers, and importance of these factors are also recognized in the interviews of ERP professionals. One example is company size – it is seen as a driver because cloud ERP enables small and medium size companies to take it into use due to lower costs and easier implementation like one expert mentioned the ready building blocks makes it easier and faster to take into use just the pieces certain organization needs. In addition, company size can also be a preventing factor, and same goes for changes in the job roles, and these are very dependent on the current situation of the organization and its needs. That is why organizational changes and change management need to be well planned and implemented because adoption of ERP systems can drastically change the ways of working and business processes in the whole organization.

Other possible disadvantages with cloud ERP systems are recognized in the literature and among practitioners. Lack of customization possibilities was seen as the most critical issue because it affects to business requirements fulfilment and it can also have some influences on competitive advantages of an adopting organization. It is also leading to conclusions that ERP system's fit to the enterprise is a barrier to adoption. The business environments of companies are a complex and external environment of the company is expected to affect organization's adoption decision.

Due to described special characteristics of the Nordic market in the empirical part, localization needs might be emphasized more than in some other markets. Data security and privacy are seen important but mostly due to data location and legal requirements fulfilment but other ways these cloud ERP systems are considered to be secure. Many of the concerns were related to unknown issues such as data ownership and the possibility of vendor lock-in, or are the localization needs of the Nordic market taken into account. These issues were raised in the literature too, and reasons for the concerns were similar but localization needs were not emphasized that much in the prior literature.

Factors in environmental context can be somehow thought to be given for organization – factors mentioned there are external, but for example, legally required and in them, there exist most variation between literature and the empirical part. Stability of vendor and service

level agreement have been mentioned, but in the Nordic market, this is not seen that meaningful issue with cloud ERP systems which might be due to immature nature of the Nordic market, there are not yet that much experience about cloud ERP in the practical level.

Table 9. Drawbacks for adoption

Barriers for adoption	Literature	Practitioners
ERP system fit to firm	1, 2, 5, 14	C1, C2, C3, C4, C5, C6
Integrations to other systems	2,7,9, 11, 12, 16	C1, C2, C3, C4, C5, C6
Customization requirements	5, 11, 12, 14, 15, 17, 20, 22	C1, C2, C3, C4, C5, C6
Data security	9,10,11, 12, 14, 15, 17, 18, 20	C1, C3, C5, C6
Data privacy	9, 10, 11, 14, 17, 22	C1, C3, C5, C6
Vendor lock-in	9, 11, 12, 14, 22	C3, C5, C6
Application specificity	10, 11, 14, 15, 17	C2, C6
Control over system upgrades etc.	10, 11, 12, 15, 17	C5
Company size	2,4,6,7, 16, 21	C1, C2, C3, C4, C5, C6
Changes in job roles of IT	9, 11	C1, C2, C3, C4, C5, C6
Organizational changes and change management	1, 2, 5, 6, 7, 9, 12, 14, 17	C4, C5, C6
Business requirements for system	1, 2,4,6,7, 15, 17, 22	C1, C2, C3, C4, C5, C6
Legal requirements fulfilment	4, 13, 16, 17, 20	C1, C3, C4, C5, C6
Stability of vendor and SLA	11, 13, 14, 17, 20, 21, 22	C3, C6

Integrations are mentioned as an open issue in the literature, and similar conclusion can be made from the qualitative data, the prevailing opinion was that integrations might be done differently in the cloud environment, but they do not get any easier.

Findings of the determining factors between literature and empirical part were mostly consistent, and some of the differences are explained with different regions, companies or timelines of the studies. When comparing the importance of different categories of TOE framework (Tornatzky & Fleischer 1990), organizational context eventually might have the biggest impact on adoption decision-making in organizational level because often organization can have the most significant changes when new innovations are adopted, this was also supported in the empirical findings which emphasized the meaning of people in the organization. Even technological factors were the biggest group; there might be more critical

factors in organizational context. Grouping these factors under different contexts helped to perceive the complexity of adoption process in case of cloud ERP system.

What are customers expecting and requiring from SaaS based ERP systems to be willing to adopt them in the Nordic market?

At the moment in the Nordic market interest towards SaaS ERP systems is raising but customers are a bit in the back-water stage, considering whether cloud ERP system is the right choice for them. ERP systems are seen as a priority in organizations' IT investments in the Nordics because there are a lot of outdated and legacy systems which need to be replaced. Adoption decision is on hold in many companies because they want to re-organize the whole IT architecture to be able to leverage cloud solutions also with other IT applications. This recognition was made by the ERP professionals, and they highly supported it, because they emphasized it to lead the more successful adoption of chosen ERP system. In the Nordics, there are some localization needs for the systems, which can affect so that customers give weight in the decision-making to ERP systems provider because they need to ensure that the legal requirements, for example, in accounting can be fulfilled.

Digital transformation is on-going and Nordic countries have been stated to be among the forerunners, but with cloud ERP systems the development and growth rate have not been that rapid yet. Vendors are at the moment developing more innovative solutions and services which can leverage cloud and new innovations within it, but they were also assuming that transition to the cloud will be sequential and for example bimodal IT will be used a lot among Nordic customers. Trends in the Nordic ERP market are very similar to other markets, meaning that possibilities with artificial intelligence, machine learning, and internet of things are evaluated at the moment. Leverage of them has not yet fully started and understanding of the possibilities with cloud ERP systems are not yet properly explored compared to other markets such as the USA where companies are ahead with these kinds of elements.

In general adoption decision in the Nordics is seen to be affected by quality and brand image of the ERP systems, in addition to those, reputation and availability of solution consultants are seen as meaningful determinants. Customers appreciate well-working cooperation with the vendor and their support with the systems which can also encourage customers to try

cloud based solutions, for example first with less business critical functions of the enterprise systems. There is no doubt that price is not important, but depending on the industry, it will not be the only thing organizations taken into account when making the investment decision. Eventually, it was noted that adoption is affected by the personal views of the decision makers in the Nordic enterprise.

All in all, customers and vendors had quite consistent opinions about the discussed issues and in the Nordic market pain points with ERP systems seem to be quite similar despite the industry of the organization. Many of the customers already had some smaller IT solutions as cloud based and interest towards SaaS ERP systems was notable, and one reason for the interest are the current pain points with their traditional ERP systems.

6.2. Conclusions and take-away message for the industry

ERP systems, which can be called as the backbone of the organizations, are at the moment evolving from large and inflexible packages towards more agile and flexible SaaS applications delivered in the cloud with fewer costs and maintenance work required from the customers. This study was exploratory case study aiming to explain which factors affect cloud ERP adoption in the Nordics. Findings of an empirical study identified and explored critical drivers and drawbacks associated with the adoption and decision-making process. There are a lot of benefits recognized in cloud ERP systems and view of these factors is very coherent between previous literature and empirical study. Theory and practical view are both emphasizing that, despite the benefits, drawbacks of the cloud ERP systems cannot be neglected, and organizations need to consider also those. Cloud environment will change many aspects of the usage of ERP systems starting from organizational changes to new possibilities of the systems provided to end users. Adoption of this IT innovation requires careful planning and exploring from the Nordic customers. All aspects need to be considered and not just put effort into investigating the technical differences of current ERP systems and cloud versions.

Like emphasized in the previous literature, it is essential that overall technical, organizational and strategical implications of cloud ERP solutions are considered in the organization because the success of IT innovation adoption is dependent on many different

variables. Even though with the cloud ERP focus is on IT innovation adoption, it is essential to understand that the factors driving and preventing adoption are based on various issues in the organization, and not just to technological topics, to be able to reach the benefits of cloud ERP adoption. This was also proven in the empirical part where the meaning of the people using the ERP systems was emphasized as an essential part of the adoption process.

Results of this study have practical implications for ERP systems' vendors by replicating the pros and cons of cloud ERP systems from different perspectives – not just focusing on technical differences and details of the ERP systems. The study also gives valuable insights to prospective customers of these solutions because the research findings provide useful aspects to consider in the process of adopting new ERP system as cloud version. Many of the studies have been focusing on implementation phase with ERP systems, and with this study, it is possible to enhance understanding about the adoption phase which can be stated to be as critical as the implementation phase. Table 10 concludes the most important take-away messages for the industry based on the results and findings of this study.

Table 10. The most important take-away messages of the study

Key message to industry	Details
Cloud ERP does not solve all the problems and pain points which customers have with current ERP systems.	Meaning of organizational issues such as change management are existing despite the deployment model of ERP systems and should not be neglected. Customers have problems currently to leverage standard processes and best practices due to the reluctance of business to execute those in their processes. It requires managerial actions and the change management to put these benefits of standard processes into practice. The same mandate goes for all the other pain points which are not originating from the technical features of the systems. To conclude it cannot be said that cloud ERP is better than the traditional one and vice versa, it is the complete set of requirements in the organizational level which should be the determinant for the adoption decision-making.
Meaning and importance of factors affecting to adoption and decision making can vary a lot between organizations.	Altogether common 17 benefits and 14 barriers were recognized in findings of theoretical and empirical parts. Some of the factors are recognized in both categories because they can have two folded influence on adoption depending among other things on company size, industry, personal preferences of the decision-makers, organizations' current ways of working and processes, and legal requirements. In the Nordics, also the meaning of the market size and localization needs should be considered as part of the adoption decision-making.
Importance of putting effort to understand the big picture of IT landscape and its future direction at the organizational level.	Benefits and drawbacks should be considered carefully and think through the whole IT architecture and consider how cloud ERP system fit into the current and planned IT landscape. Give weight to understanding what fits our company, and in the adoption phase, provide these requirements also to the vendor.
Both vendors and customers should explore the possibilities of cloud ERP and new features enabled with it.	Vendors should continue to explore and learn all the possibilities of cloud ERP systems and how to leverage for example bimodal IT in their offerings to the customers, enabling usage of new digital innovations with ERP systems. On the customer side, there should be people who can explore the possibilities and commit to adoption process to make it as successful as possible.

Table 10 reflects well the paradigm around cloud ERP adoption. There are undeniable benefits and drawbacks in those compared to traditional ERP systems, and those can, for example, provide the possibility for smaller companies to take ERP systems into use with fewer costs or for some companies limit their possibilities with the systems. The complex nature of ERP systems and their importance to organizations and already made high investments to systems can affect adoption decision because for larger companies there can be competitive advantages or other requirements which cannot be gained and fulfilled with cloud ERP. On the other hand, there are possibilities to gain competitive advantage with new features and enhancements such as machine learning which cannot be taken into use without cloud ERP systems, solution for this paradigm is now sought in many organizations.

Analysis of literature review revealed that there are factors affecting adoption decision making in every context and this is proved from the empirical findings too. Rogers (1995) definition for innovation-decision process includes different stages, and when reflecting found factors to these stages, it can be recognized that some of them are based purely on attitudes and not so much on knowledge, this illustrates well the importance of vendor knowledge and ability to support customer in the adoption process towards suitable ERP systems acquisition. In the Nordic market where most of the customer are not yet formed even the attitude towards cloud based ERP systems it is crucial to vendors to try to make these cloud solutions attractive to customers, and this study about the benefits and barriers can help in recognizing and solving these barriers with enhanced ERP system services and solutions.

6.3. Limitations and directions for future research

This research does not aim to say the final word how companies are determining their cloud ERP systems adoption in the Nordic region, but rather enhance and widen the understanding of the meaningful factors. The research field of this study is quite novel, and there is not that much previous literature about cloud ERP systems adoption because previous literature has been focusing on the implementation phase of ERP systems which pointed out a research gap but on the other hand, limited the amount of already available literature about the topic. Also, concepts such as cloud computing, ERP systems and cloud ERP systems are wide and there are a lot of definitions for them, and author's knowledge of the concepts is based on

the previous literature used in this study. The results of the study are based on primary and secondary data from the quite limited sample in the Nordic region which limits the possibilities to generalize the results to other countries or regions which can decrease the reliability of the study. Exploratory case study approach was the right choice for this study from the validity point of view, with this approach it was possible to enhance and explain the meaningful factors of cloud ERP adoption in the Nordic market.

This study focused on investigating the determining factors of cloud ERP systems in the Nordic market by observing customer and market materials, and through interviews with professionals working with ERP systems in the Nordics. Study was using organizational level innovation adoption theories and empirical part was also done at firm level which of course can affect. This was indicated in the results of this study – the adoption decision can be based on personal views of decision-makers and be in the hands of just a few people in the organization, which would make it interesting to study this from behavioural theories perspective, focusing more on the individual level factors.

One topic that author would encourage to research more is the stakeholders of cloud ERP systems and their interrelation. How responsibilities and managerial issues change with cloud based ERP application? How roles on the vendor and customer side change with this new service model? It would be interesting to know what the roles of different parties in this value chain would be. One possible topic to explore is the changes in ERP professionals' roles in the customer organization when cloud ERP system is adopted or implemented. In addition to this, outsourcing and willingness to outsource more would be an interesting topic. Obviously, most of the customers are outsourcing as much as possible but would it increase with new cloud solutions when more responsibility is on vendor and provider of the solution?

Another interesting subject would be to study companies who have already adopted and eventually implemented cloud ERP systems and find out what were the meaningful factors and whether they changed during the process. In the implementation phase, interesting research area would be to analyze how it changed the organization or their business processes, what are the organizational and strategical implications of cloud ERP implementation.

References

- Abd Elmonem, M., Nasr, E. S., & Geith, M. 2016. Benefits and Challenges of Cloud ERP Systems- A Systematic Literature Review. *Future Computing and Informatics Journal*, 1 (1-9).
- Abeleen, J. & Hall, T., L. 2015. Nordic Shared Services and Outsourcing Pulse Survey 2015. KPMG.
[Online] Available at <https://assets.kpmg.com/content/dam/kpmg/pdf/2015/04/Nordic-Pulse-Survey-2015.pdf>.
- Ajzen, I. 1991. The theory of planned behavior. *Organizational behavior and human decision processes*, 50(2), 179-211.
- Armbrust, M., Fox, A., Griffith, R., Joseph, A. D., Katz, R. H., Konwinski, A. & Zaharia, M. 2009. Above the clouds: A Berkeley view of cloud computing (Vol. 17). *Technical Report UCB/EECS-2009-28*, EECS Department, University of California, Berkeley.
- Arnesen, S. 2013. Is a Cloud ERP Solution Right for you? *Strategic Finance*, 94, (8), 45-50.
- Arnott, D. & Pervan, G. 2008. Eight key issues for the decision support systems discipline. *Decision Support Systems*, 44(3), 657-672.
- Baker, J. 2012. The technology–organization–environment framework. *Information systems theory*, 231-245. Springer New York.
- Benlian, A., Hess, T. & Buxmann, P. 2009. Drivers of SaaS-adoption—an empirical study of different application types. *Business & Information Systems Engineering*, 1(5), 357.
- Bilderbeek, P. 2016. Top 380 SaaS Providers. [Online] Available at <http://www.themetisfiles.com/2016/01/top-380-nordic-saas-providers/>

Bradford, M. & Florin, J. 2003. Examining the role of innovation diffusion factors on the implementation success of enterprise resource planning systems. *International journal of accounting information systems*, 4(3), 205-225.

Briggs, B., Ehrenhalt, S., Gish, D., Haddad, N., Mussomeli, A., Sher, A., Katyal, V. & Perinkolam, A. 2017. The new core: Unleashing the digital potential in “heart of the business” operations. *Tech Trends 2018, Deloitte Insights*. [Online] Available at <https://www2.deloitte.com/insights/us/en/focus/tech-trends/2018/new-technology-enabled-core.html>.

Buonanno, G., Faverio, P., Pigni, F., Ravarini, A., Sciuto, D. & Tagliavini, M. 2005. Factors affecting ERP system adoption: A comparative analysis between SMEs and large companies. *Journal of Enterprise Information Management*, 18(4), 384-426.

Buyya, R., Yeo, C. S., Venugopal, S., Broberg, J. & Brandic, I. 2009. Cloud computing and emerging IT platforms: Vision, hype, and reality for delivering computing as the 5th utility. *Future Generation Computer systems*, 25(6), 599-616.

Castellina, N. 2011. SaaS and Cloud ERP Trends, Observations, and Performance 2011. *Analyst Inside*.

Ceccarelli, R. 2017 The Future of ERP Systems: Paradigm Shifts in the Software Industry. [Online] Available at <https://www.acumatica.com/blog/the-future-of-erp-systems/>.

Columbus, L. 2018. Comparing Cloud ERP Systems: Who’s Winning & Why in 2018. [Online] Available at <https://selecthub.com/enterprise-resource-planning/comparing-cloud-erp/>

Davenport, T. H. 1998. Putting the enterprise into the enterprise system. *Harvard business review*, 76(4).

Davis, F. D. 1989. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–339.

Damanpour, F. 1991. Organizational innovation: A meta-analysis of effects of determinants and moderators. *Academy of management journal*, 34(3), 555-590.

Duan, J., Faker, P., Fesak, A. & Stuart, T. 2013 Benefits and drawbacks of cloud-based versus traditional ERP systems. *Proceedings of the 2012-13 course on advanced resource planning*.

Elragal, A., & Haddara, M. 2012. The Future of ERP Systems: look backward before moving forward. *Procedia Technology*, 5, 21-30.

Elo, S. & Kyngäs, H. 2008. The qualitative content analysis process. *Journal of advanced nursing*, 62(1), 107-115.

Etlatiето Oy. 2017. Digibarometri 2017. Liikenne ja viestintäministeriö, Tekes, Teknologiateollisuus ry and Verkkoteollisuus ry. [Online] Available at http://www.digibarometri.fi/uploads/5/8/8/7/58877615/digibarometri_2017.pdf.

Fershtman, C. & Gandal, N. 2012. Migration to the cloud ecosystem: Ushering in a new generation of platform competition.

GP. Bullhound. 2016. Enterprise software – Revolutionising the modern workplace. [Online] Available at <http://www.gpbullhound.com/wp-content/uploads/2016/11/GP-Bullhound-Research-Enterprise-Software-2016.pdf>.

Grabot, B., Mayère, A. & Bazet, I. 2008. ERP systems and organizational change: a socio-technical insight. Springer Science & Business Media.

Guay, M., Chandra, R. & Montgomery, N. 2017. Market Guiden for Product-Centric Cloud ERP solutions. [Online] Available at <http://dquest.com/wp-content/uploads/2017/08/Gartner-Market-Guide-Product-Centric-Cloud-ERP.pdf>

Haaramo, E. 2015. Top six enterprise IT priorities in the Nordics. [Online] Available at <http://www.computerweekly.com/news/4500247028/Top-six-enterprise-IT-priorities-in-the-Nordics>

Haaramo, E. 2017. What are Amazon Web Services' Nordic plans? [Online] Available at <http://www.computerweekly.com/news/450423147/What-are-Amazon-Web-Services-Nordic-plans>

Hirsjärvi, S. & Hurme, H. 2008. Tutkimushaastattelu: teemahaastattelun teoria ja käytäntö. Helsinki, Yliopistopaino.

Hirsjärvi, S., Remes, P. & Sajavaara, P. 2004. Tutki ja kirjoita. 10th ed. Helsinki, Tammi

Jeyaraj, A., Rottman, J. W. & Lacity, M. C. 2006. A review of the predictors, linkages, and biases in IT innovation adoption research. *Journal of information technology*, 21 (1), 1-23.

Johansson, B., & Ruivo, P. 2013. Exploring factors for adopting ERP as SaaS. *Procedia Technology*, 9, 94-99.

Karahanna, E., Straub, D. W. & Chervany, N. L. 1999. Information technology adoption across time: a cross-sectional comparison of pre-adoption and post-adoption beliefs. *MIS quarterly*, 183-213.

Klaus, H., Rosemann, M. & Gable, G. G. 2000. What is ERP?. *Information systems frontiers*, 2 (2), 141-162.

Laukkanen, S., Sarpola, S. & Hallikainen, P. 2007. Enterprise size matters: objectives and constraints of ERP adoption. *Journal of enterprise information management*, 20(3), 319-334.

Lechesa, M., Seymour, L. & Schuler, J. 2012. ERP Software as Service (SaaS): factors affecting adoption in South Africa. *Re-conceptualizing Enterprise Information Systems*, 152-167.

Levy, Y. & Ellis, T. J. 2006. A systems approach to conduct an effective literature review in support of information systems research. *Informing Science*, 9.

Lin, H.F. & Lin, S.M. 2008. “Determinants of e-business diffusion: a test of the technology diffusion perspective”, *Technovation*, 28, 135-45.

Lind, B. & Back, A. 2015. Classifying systemic differences between software as a service- and on-premise-enterprise resource planning. *Journal of Enterprise Information Management*, 28(6), 808-837.

Low, C., Chen, Y. & Wu, M. 2011. Understanding the determinants of cloud computing adoption. *Industrial management & data systems*, 111(7), 1006-1023.

Mangiuc, D. M. 2011. ENTERPRISE 2.0 - IS THE MARKET READY? *Accounting and Management Information Systems*, 10(4), 516.

Markus, M. L., & Tanis, C. 2000. The enterprise systems experience—from adoption to success. *Framing the domains of IT research: Glimpsing the future through the past*, 173, 207-173.

Marnewick, C. & Labuschagne, L. 2005. A conceptual model for enterprise resource planning (ERP). *Information management & computer security*, 13(2), 144-155.

Marston, S., Li, Z., Bandyopadhyay, S., Zhang, J. & Ghalsasi, A. 2011. Cloud computing—The business perspective. *Decision support systems*, 51(1), 176-189.

Mell, P., & Grance, T. (2011). The NIST definition of cloud computing.

Martinez, J. 2017. 5 Enterprise Resource Planning (ERP) Trends to Know in 2017. [Online] Available at <http://uk.pcmag.com/netsuite/87899/feature/5-enterprise-resource-planning-erp-trends-to-know-in-2017>.

Metsämuuronen, J. 2003. Tutkimuksen tekemisen perusteet ihmistieteissä. 2nd ed. Jyväskylä, Gummerus Kirjapaino Oy.

Metsämuuronen, J. 2008. Laadullisen tutkimuksen perusteet. 3rd ed. Jyväskylä, Gummerus Kirjapaino Oy.

Moore, C. 2017. ERP Trends for 2017. [Online] Available at <https://us.hitachi-solutions.com/blog/erp-trends-2017/>.

Navaneethakrishnan, C. M. 2013. A Comparative Study of Cloud based ERP systems with Traditional ERP and Analysis of Cloud ERP implementation. *International Journal of Engineering and Computer Science*, 2(9), 2866-2869.

Nylander, J. 2014. Amazon: 'Nordic customers are among the most innovative users of cloud computing in the world'. *The Swedish Wire*. [Online] Available at <http://www.swedishwire.com/business/19451-amazon-nordic-customers-are-among-the-most-innovative-users-of-cloud-computing-in-the-world>

Okoli, C. & Schabram, K. 2010. A guide to conducting a systematic literature review of information systems research.

Oliveira, T. & Martins, M. F. 2011. Literature review of information technology adoption models at firm level. *The electronic journal information systems evaluation*, 14(1), 110-121.

Oliver, D., Whymark, G. & Romm, C. 2005. Researching ERP adoption: an internet-based grounded theory approach. *Online Information Review*, 29(6), 585-603.

Pan, M. J. & Jang, W. Y. 2008. Determinants of the adoption of enterprise resource planning within the technology-organization-environment framework: Taiwan's communications industry. *Journal of Computer Information Systems*, 48(3), 94-102.

Peng, G. C. A. & Gala, C. 2014. Cloud ERP: a new dilemma to modern organizations? *Journal of Computer Information Systems*, 54(4), 22-30.

Radar. 2017. The benefits of Cloud maturity. Cloud Maturity Index 2017. [Online] Available at <http://pages.tieto.com/Cloud-Maturity-Index-2017.html>.

Ram, J., Corkindale, D. & Wu, M. L. 2013. Enterprise resource planning adoption: Structural equation modeling analysis of antecedents. *Journal of Computer Information Systems*, 54(1), 53-65.

Robert, K. 2011. Is ERP's Future in the Clouds? *Business Finance*.

Robinson, L. 2011. The cloud: bringing permanent changes to business. *Financial Executive*, 27(10), 71-73.

Robson, C. 2002. Real World Research: A resource for social scientists and practitioner-researchers. 2nd Ed. Oxford, Blackwell.

Rogers, E., M. 1995. Diffusion of Innovations. 4th ed. New York, Free Press.

Rousseau, D. M., Manning, J. & Denyer, D. 2008. Evidence in Management and Organizational Science: Assembling the Field's Full Weight of Scientific Knowledge Through Syntheses. [Online] Available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1309606.

Rowley, J. & Slack, F. 2004. Conducting a literature review. *Management research news*, 27(6), 31-39.

Salleh, S. M., Teoh, S. Y. & Chan, C. 2012. Cloud Enterprise Systems: A Review of Literature and Its Adoption. *PACIS*, (76).

Saran, C. 2017. Can cloud-based ERP buy you business agility? [Online] Available at <http://www.computerweekly.com/feature/Can-cloud-based-ERP-buy-you-business-agility>.

Saunders, M., Lewis, P. & Thornhill, A. 2009. *Research Methods for Business Students*. 4th ed. Harlow, Pearson Education.

Schubert, P. & Adisa, F. 2011. *Cloud computing for standard erp systems: reference framework and research agenda*. Inst. für Wirtschafts-und Verwaltungsinformatik.

Seethamraju, R. 2014. Adoption of Software as a Service (SaaS) Enterprise Resource Planning (ERP) Systems in Small and Medium Sized Enterprises (SMEs). *Inf Syst Front*, 17, 475-492.

Shirish, C.S. & Teo, T.S.H. 2010. E-government, e-business, and national economic Performance. *Communications of the Association for Information Systems*, 26, 267-86.

TechTarget. 2017. 2017 IT priorities survey – Nordics. [Online] Available at <http://www.computerweekly.com/ehandbook/2017-IT-Priorities-in-the-Nordics>.

Tornatzky, L. G., Fleischer, M., & Chakrabarti, A. K. 1990. *Processes of technological innovation*. Lexington books.

Tuomi, J. & Sarajärvi, A. 2009. *Laadullinen tutkimus ja sisällönanalyysi*. 5th ed. Helsinki, Tammi.

Uwizeyemungu, S. & Raymond, L. 2012. Impact of an ERP system's capabilities upon the realisation of its business value: a resource-based perspective. *Information Technology and Management*, 13 (2), 69-90.

Venkatesh, V., Morris, M. G., Davis, G. B. & Davis, F. D. 2003. User Acceptance of Information Technology: Toward a Unified View. *MIS Quarterly*. 27 (3), 425–478.

Verville, J., Palanisamy, R., Bernadas, C., & Halington, A. 2007. ERP acquisition planning: A critical dimension for making the right choice. *Long Range Planning*, 40(1), 45-63.

Webster, J. & Watson, R. T. 2002. Analyzing the past to prepare for the future: Writing a literature review. *MIS quarterly*.

Whitehead, N. 2017. Cloud Innovation is Core to Digital Business Transformation. [Online] Available at <https://blogs.oracle.com/analyticscloud/cloud-innovation-core-to-digital-business-transformation>.

Yin, R. K. (2003). Case study research: Design and methods. 3rd ed. Thousand Oaks, CA, Sage.

Youseff, L., Butrico, M. & Da Silva, D. 2008. Toward a unified ontology of cloud computing. *Grid Computing Environment Workshop*. 8 (1-10).

Zhu, K., Kraemer, K.L., Xu, S. & Dedrick, J. 2004. Information technology payoff in e-business environments: an international perspective on value creation of e-business in the financial services industry. *Journal of Management Information Systems*, 21, 17-54.

Appendix 1. Sources of the factors in the literature

1. Davenport 1998
2. Markus & Tannis 2000
3. Oliver, Whymark & Romm 2005
4. Pan & Jang 2008
5. Elragal & Haddara 2012
6. Buonanno, Faverio, Ravarini, Sciuto & Tagliavini 2005
7. Laukkanen et al 2007
8. Ram, Corkindale & Wu 2013
9. Peng & Gala 2014
10. Castellina 2011
11. Johansson & Ruivo 2013
12. Salleh et al. 2012
13. Marston et al. 2011
14. Seethamraju 2014
15. Lechesa et. al 2012
16. Adisa & Schubert 2011
17. Abd Elmonem, Nasr & Geith 2016
18. Navaneethakrishnan 2013
19. Robinson 2011
20. Duan, Faker, Fesak and Stuart 2013
21. Benlian & Buxmann 2009
22. Arnesen 2013

Appendix 2. Themes covered in the customer interviews

- Current licensing and subscription model of the ERP systems
- Experiences from the previous adoption and implementation of ERP systems
- Relationship with vendors (responsibilities, quality, experiences, schedules)
- Upgrades and version management
- Real-time visibility and reporting
- Current business processes and possible usage of best practices
- Free word

Appendix 3. The half-structured theme interview

General background of the interviewee

- What is your position in the company?
- How much experience you have about ERP systems? How long you have been working with them?
- Do you have experience of any kind about cloud computing? If yes, for how long and what kind of experience?
- What is your expertise field in consulting of ERP system?
- What are the typical industry/industries of your customers you are working with?

Theme 1. Cloud solutions and SaaS service model

- Are the customers you are working with interested about cloud based applications in general?
- In general, what are the most suitable applications to be delivered as a service in your opinion?
- In your opinion what do you think customers mostly are looking forward when adopting cloud based solutions, meaning SaaS solutions?
- Do you think that in the future more and more ERP systems are delivered as a service?
- Do you think that roles of the IT personnel in the customer's organization change when they implement SaaS based solutions?
- Do you think that the role of consultant changes in the customer organization when customer implements SaaS based solutions?

Theme 2. SaaS delivered ERP systems and meaningful factors in the adoption

- In your opinion, what are the most valuable/important factors to adopt SaaS delivered ERP system?
- In your opinion, what are the biggest disadvantages of SaaS delivered ERP system?
- Do you think implementation of the system will be easier with SaaS model?
- Do you think that integrations to other systems becomes easier or more difficult to handle with SaaS ERP system?
- Do you see any major differences between SaaS based ERP compared to traditional one?

Theme 3. Customers' adoption process and the ERP market in the Nordics

- What determines adoption decision of ERP system in a Nordic company?
- What do you see as the future trends, particularly related to ERP system market in the Nordic?
- What you think are the most valuable/important factors in customer perspective for adoption ERP systems in a SaaS delivery model?
- What you think are the biggest threats/concerns in customer perspective for adoption ERP systems in a SaaS delivery model?

- Do you think that some generalization can be done about customers who are willing to adopt SaaS delivered ERP system in terms of company size, industry or location of the customer?
- Do you think there are any recommendations to be given for customers to enhance their possibility of success when choosing new ERP system?

Free word

- Is there something additional you would like to raise related to ERP systems and adoption of these systems or something else?