An Enterprise Resource Planning Cloud computing Acceptance Study in German Speaking Europe in a Global Context

Master’s Thesis
to confer the academic degree of

Master of Science
in the Master’s Program

Wirtschaftsinformatik
Abstract

This paper is about cloud based resource planning systems and discusses the different models of the underlining cloud system. Further, it discusses positive and negative aspects of moving to a cloud based ERP system and investigates the factors culture, infrastructure, security, cost, customization and legal regulations on the decision to move to a cloud based ERP system in the German speaking region of Europe. A survey with 93 replies showed an existing trust problem in the cloud in terms of data security, privacy and transparency. Further findings express issues when a cloud ERP system is applied to different cultures.
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1. Introduction

This age is the time globalization. Companies operate in different countries to generate more profit with the effects of different wages and market prices of assets. When it comes to the question how to connect those remote offices and sites all over the world, one continuing trend is cloud computing. Cloud computing is about to affect more and more the society together with businesses. Whereas this new technology gets fast adopted in the private sector, the business sector however tends and has to be more cautious. Cloud computing enables companies and individuals to reduce their need for own computer resources on their own premises as disk space, processor power and manpower and therefore in ongoing maintaining costs. It is cheaper in acquisition and transforms the cost into monthly payable units. The number of providers of cloud computing is growing and their lineup is various. Moreover, enough there are also different models for cloud computing which, besides the big enterprises, have influence on the usage by small and middle sized enterprises.

In order to maximize their profits a growing number of small and middle sized companies started to establish software to optimize their efficient usage of the company’s resources as already implemented in big enterprises. Often seen as the core software per se in bigger businesses, Enterprise Resource Planning systems are powerful software suites to organize the company’s resources and their flows. Actually most of those software suites are installed locally at the company’s site and therefore costly in acquisition and maintenance.

Recently, the next evolutionary step might be the combination of ERP and cloud systems moving from on-site enterprise resource planning system to cloud-based ones. Every ERP cloud vendor and ERP cloud customer has to face benefits as well as drawbacks. Benefits among others are the cost reduction which the cloud brings with it. In contrast, drawbacks might be problems with data protection laws when using an ERP cloud system in different countries. Also, the cultural differences can cause resistance of change and thereby the refusal of a cloud based ERP system within the cooperation and its subcontractors. Culture can have an impact on how data security and privacy is felt and therefore might influence the decision to move into a cloud based ERP system. Also, the company size can have an impact since it might be costlier to move a big enterprise with an established ERP on premise into the cloud than a small or middle sized company. Even if a company decides to move into the cloud, there is still the factor of customization. On-
premise ERP systems are mostly high customized. The move to a cloud system comes with challenges for the customer and the vendor, when porting those customizations into the cloud. Thereby, the focus lies on public ERP clouds since private clouds are owned products and consequently on-premise solutions.

The skepticism among those who are using ERP systems is there but the academic world lacks of a scientific research about the situation, especially the benefits and drawbacks in German speaking regions of Europe. There were done similar investigations in Asia, Great Britain and Canada so far. The outcome of this study will be compared with those of the other parts of the world. Further, this master thesis aims to understand the European market regarding ERP and Cloud, especially the German speaking part of it. By giving a first overview about its reaction to new technology especially when it comes processing sensible company data. Thereby, relevant factors for their impact on ERP cloud systems is crucial. Moreover, this paper discusses the problems, barriers and threats for businesses when outsourcing their IT infrastructure, especially the ERP-System respectively the (personal) data to cloud service(s). Furthermore, this thesis points out the advantages and disadvantages for businesses using cloud services and ERP in the cloud. In particular, it investigates the importance of the factors culture, legal interests, infrastructure, cost and customization. Moreover it will analyses how those factors influence companies in German speaking regions of Europe and compares it to findings of other regions in the world.

This master thesis aims to answer which factors are influencing a company’s decision whether to move into the ERP cloud or not. Thereby, in specific, culture, infrastructure, security and law regarding data protection are interesting. Also, the characteristics of a company respectively the interviewed person may influence the answer behavior in the survey regarding this topic. Therefore, the impact of the size of a company and the demographic structure of the surveyed people as age, role, and position in the company are interesting and will be analyzed.

To answer these research questions this master thesis applies different methods. First, a literature review investigates the current situation regarding cloud computing and ERP system as well as the benefits and drawbacks. Thereby, it evaluates how the factor culture as well as infrastructure of the environment in which an enterprise is doing its business can influence the decision of outsourcing its IT or its related domains in a cloud based network.
A focus is also on the security concerns of company’s regarding the usage of cloud based ERP systems. There could be differences in how such benefits and drawbacks could affect different company sizes. It focuses on the usage and need of cloud based ERP software. Also, a comparison between the German speaking part of Europe, the Asian and the North American continent is made.

This master thesis aims to answer if there is any difference regarding cloud computing between those diverse parts in the world. Moreover, it will give an answer if there is an impact of culture, infrastructure and environment and if there are differences concerning these points between the mentioned regions. Small and middle sized enterprises as well as bigger enterprises with an already integrated ERP System either local or cloud based, or the willingness to launch one in their company, are examined and discussed.
2. Theoretical Background

This chapter gives an insight into cloud systems, Enterprise Resource Planning systems and cloud based resource planning systems and presents the theoretical background of this thesis. First, it discusses Cloud computing, its advantages and disadvantages and explains the system of an Enterprise Resource Planning. Further, the differences between a traditional Enterprise Resource Planning system and its cloud based pendant are outlined. The chapter about cloud adoption process investigates the risks and benefits of a move into the cloud. In the last part possible threats and effects including operational, security, cultural and legal restraints are studied.

2.1. Cloud computing

Cloud computing is a new group expression for the concept of sophisticated on-demand computing services. Basically, a cloud offers computing, storage and software as a service. (Buyya, Broberg, & Goscinski, 2011) The NIST Definition of Cloud computing defines Cloud computing as an on-demand network to a shared pool of configurable computing resources. These circumstances enable a service provider to provide and release the resources with minimum effort. (Mell & Grance, 2011) However, a cloud system can be based on one of three different models of clouds, which are outlined in the following.

2.1.1. Service models of clouds

First, there is the model “Software as a Service”, short SaaS. It is the model of providing the software or application for a customer on a cloud infrastructure. The customer is able to access the software or application over the network with a client interface. This interface can be a thin client (web browser) or a thick client, e.g. an installed client on the client’s side. Thereby, the cloud vendor is responsible for the maintenance, deployment and configuration of the cloud. (Lehrig, Eikerling, & Becker, 2015; Mell & Grance, 2011) This model can be seen as an alternative to a local running application. A typical example is the online word processing application Google Docs¹, where the application, in this case the word processing application, is deployed on a cloud infrastructure and only the application is accessible by the user but not the underlying infrastructure. (Vaquero et al., 2009)

¹ Google Docs is a cloud based service from the Google Company
Second, there is the model “Platform as a Service”, short PaaS. This type of cloud model offers the consumer the option to deploy its own software and application onto the platform. The consumer has no control over the underlying platform including network, servers and operation system. This form or layer of cloud systems is often used for developing, testing and deployment of custom (web-) applications by its customers. (Lehrig et al., 2015; Mell & Grance, 2011) One example is Windows Azure ² or Google App Engine³, where the operating system, runtimes, database management systems and webservers are already set up and ready to use.

The third model is named “Infrastructure as a Service”, short IaaS, which offers the consumer the most options. The consumer is able or is responsible to manage the operation system as well as the storage and can deploy and run arbitrary software. This model is often enabled by virtualization. (Mell & Grance, 2011; Vaquero et al., 2009) A broadly known example for IaaS is Amazon EC2⁴, better known as the Amazon Web Services.

Last but not least, there is a new special model type of cloud services, data as a service, short DaaS. It can whether assigned to the models SaaS or IaaS (Dillon, Wu, & Chang, 2010; Machan, 2009) and as the name let assume, its service is data. In the same principle as its “as a service” sisters, it provides the customer with data. Through the usage of RDBMS, of a cloud service the customer is avoiding expensive upfront licensing cost and pays what he actually uses. Examples are Google BigTable ⁵ or Apache HBase⁶. (Dillon et al., 2010)

2.1.2. The different types of cloud systems

According to Mell & Grance (2011), a cloud system can be divided in up to four different types of cloud services. They distinguish by usage, security and cost factors. Depending on the data aim, different cloud systems should be applied. Choosing the right cloud system is essential especially for an Enterprise Resource Planning software. As it will be elucidated later in this thesis, data and its sensibility can play an important role in the

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² Windows Azure is Microsoft’s Cloud platform
³ Google App Engine is platform provided by Google for development and deployment for Webapps
⁴ Amazon EC; https://aws.amazon.com/en/ec2/
⁵ Google BigTable is a scalable NoSQL Database Service; https://cloud.google.com/bigtable/
⁶ Apache HBase is a distributed, scalable, big data store; database, a distributed, scalable, big data store
decision process. However, a cloud system can be classified as one of the following four types.

In a **private cloud** all the provided resources as for example the servers and network structures are exclusively used by one customer. That can be compared with the simple outsourcing of the IT infrastructure. The private cloud is mainly used by enterprises which want to protect their sensible data at all costs. (Mell & Grance, 2011) In contrast, according to the Fraunhofer institute a private cloud can also be located on the own servers of an enterprise. Thereby, companies try to get all benefits of a cloud system without losing their control of their sensible data. Benefits to name are the scalability and the simple configuration via a browser interface. On the other side most of the private clouds never reach the functionality which they promise. (Fraunhofer-Gesellschaft, n.d.) Even if the private cloud claims to offer all the benefits without giving up the control of the data (Dillon et al., 2010), it cannot be considered as a real cloud at all since there are restrictions regarding factors scalability and cost saving. Examples for private cloud products are Amazon Virtual Private Cloud\(^7\), which can also be combined with the public cloud product or operated stand alone.

The second type, the **public cloud**, is mostly used by customers which try to get most out of the cloud. Thereby multiple customers using the same infrastructure, servers and the same storage lowering cost for the cloud vendor and can be passed to its customers. However, using the same storage is related with multitenancy which will be discussed in chapter 3.2.1.2. Despite this issue, the customer will get the cloud to the lowest price of all types of clouds. Everyone or every business has or can get access to the provider’s services. Advantages towards the private cloud are the shift of capital expenses to operational expenses (Lenart, 2011) and greater elasticity. More about advantages of the public cloud will be discussed in chapter 2.1.3. Prominent examples for public clouds are Office 365\(^8\) or SAP Business by Design which includes ERP and CRM. (Fraunhofer-Gesellschaft, n.d.; Mell & Grance, 2011)

The **hybrid cloud** is a mix of both, the private and the public cloud. Most services are running over the servers of the cloud vendor but critical and sensible data is processed

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\(^{7}\) Amazon Private Cloud: https://aws.amazon.com/vpc/
\(^{8}\) Office 365 is a product of the software company Microsoft. https://products.office.com/
on the on-premise servers of the enterprise. Thereby, the mastery of the separation of sensible and non-sensible data is problematic. (Fraunhofer-Gesellschaft, n.d.) In this model the costumer rents or owns physical servers and adds virtual servers on demand (Mell & Grance, 2011). Conceivable use cases for a hybrid could be the interception of a peak or the outsourcing of resource demanding processes as the analyses of huge amounts of data. As an example can again quoted Amazon’s Virtual Private Cloud.

The most special cloud model is the **community cloud**. Rarely used, it describes a cloud system used by more instances, in this case enterprises. Hybrid clouds support the cooperation of the partner during a project. (Fraunhofer-Gesellschaft, n.d.; Mell & Grance, 2011) One of the main features of community clouds are its openness, no dependencies on big third party vendors. Moreover, the community as the social structure and the economic scalability, the autonomy respectively control of the data and the quality of service are also advantages. (Marinos & Briscoe, 2009)

### 2.1.3. Advantages and disadvantages of the cloud

**Self-service** in context of cloud computing means that costumers have on demand access to the resources. The system itself can act without any human interaction and provide computing capabilities on demand. (Buyya et al., 2011; Mell & Grance, 2011) The user has access to a configuration tool, where he can configure and choose from various services, applications plus deploying them on his cloud space. (Rouse, 2015)

The **multi-tenancy** describes the advantage of the capability to serve multiple customers by one resource. The provider of cloud services uses one pool of resources, e.g. CPU-power or memory network bandwidth, to serve all its customers. This can cause transparency problems since the customer has no knowledge about the exact server location. (Mell & Grance, 2011) This problem is caused by the manner how cloud vendors are typically processing the data. Data is not stored on one server but rather distributed over more locations by an entirely virtual layer. (Khan & Malluhi, 2010) This approach enables the vendor of such a cloud system, to optimize and maximize the usage of the given resources by load balancing. (Xu, Pang, & Fu, 2013) An on-premise option can only reach that level of efficiency in using resources when using a private cloud (Dillon et al., 2010) but will suffer on the drawbacks of this model.
One of the main features of a cloud computing system and therefore the biggest advantage is **scalability**, sometimes also called rapid elasticity. Thus, this feature of cloud systems can scale, in most cases automatically, its computing power depending on customer’s needs. In the viewpoint of the customer the systems power seems to infinite. (Buyya et al., 2011; Mell & Grance, 2011) Elasticity is also defined as the degree in which a cloud system can adapt its capacities to the workload over time. Scalability means that a cloud can increase its capacities. (Lehrig et al., 2015)

Other advantages of cloud computing are the factors **metering and billing**. Due to the clouds system’s ability to scale itself for its customers need, the measuring of the customer’s consumption of services is conceivably simple. It can be metered by usage of storage, processor-usage, bandwidth and active user accounts. (Mell & Grance, 2011) The customer can, but must not pay the resource on a short term basis when needed and can release it after usage (Armbrust et al., 2009). This circumstance can have an impact on cost when it is applied right.

**Reliability** can be established by the usage of multiple redundant sites (Al-ghofaili & Al-Mashari, 2014). A multiple redundant site of a cloud means that there are N redundant nodes where the data is stored simultaneously. That creates a higher reliability which implies a higher failure safety if one node gets offline. (Kaur & Kinger, 2014) Microsoft⁹ published in 2010 a whitepaper about designing reliable cloud services. The three main goals are to minimize the impact of a failure on a customer, the numbers of affected customers and the time (minutes) which the customer cannot use the service (Adams et al., 2014). So it can be expected that there will be a failure but the question is when. Therefore, the focus must lie on the question how to handle the outfall when it happens (Winkler, 2011) to reduce the downtime to a minimum.

The cloud service can be reached over the network, e.g. the internet, and can be used on different platforms (Mell & Grance, 2011). That implies the possibility to use a service on a laptop device and on smartphones from the distance. In some cases it is not an advantage. For example in a private cloud a **Broad Network Access** would be against its own concept. The opening of a cloud which is normally well protected behind companies

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⁹ Microsoft; Software company; www.microsoft.com
firewall to devices with access to the internet, will undermine the whole security concept. In a hybrid cloud on the other hand, the broad network access is more common used and an accepted threat. (Al-ghofaili & Al-Mashari, 2014; Shabeeb, Jeyanthi, & Iyengar, 2012)

**Cost** including the better and precise charging of cost for performance is one main benefit of the cloud. With an on-premise system the company has to pay for the hardware, servers and for maintaining the IT department, even if it is not working to capacity. With the cloud all these costs change to the vendor of the cloud and the customer do not have to mind it anymore. The customer pays for what he uses. (Buyya et al., 2011; Mijač, Picek, & Stapić, 2013)

One downside of cloud computing is the **loss of control** about the data and its process. The customer has not the control where the data will be stored and how the security measurements are. There could be laws and legal restraints which are affecting the security of the data. Data privacy is one main term when it comes to cloud. (Haji, Mohd, & Abd, 2015; Sultan, 2011)

### 2.1.4. Security in the cloud system

Hoffman & Woods (2010) states that the most important challenge for cloud computing is security. The data of a company is one of the most valuable assets. Bigger companies tend to store their data in their own network. The data seems to be safer behind their firewalls than in the cloud. In the past the paradigm was that a cloud provider would provide sufficient protection of the data only for smaller companies. (Hofmann & Woods, 2010)

In the last years, the big players in the branch are upgrading their security to provide the best security for its customer. Data and its security is a core asset of those businesses and therefore a vendor invests a lot of money to protect it. A data leakage can bring a cloud provider to fall since it would lose the trust of its customers (Khan & Malluhi, 2010). Nevertheless companies trust their own security measurements more than those of cloud providers. Even in the private environment people tend to react suspicious, when it comes to clouds or internet based services where sensible data can be stored. The customers claim that a cloud is not save enough and can get hacked easily. (Pearson & Benameur, 2010) A similar paper which supports this false assumption of security when data gets stored on their
own rows is also presented another paper by Ion et al (2011). They analyzed the situation of cloud acceptance and also came to the conclusion that all terms associated with the internet are highly insecure. They also mention that users are trusting banks more than the cloud and documents are safer at home than money would be.

Subashini & Kavitha (2011) investigated the security of service delivery models in the cloud. As an example of how cloud vendors protect the data of their costumers, they explained the administrator rights in case Amazon. Amazon’s cloud product EC2 administrators do not have access to customer instances. If an administrator needs access to a host, they have to use strong keys. That speaks for the strict internal security measures in cloud systems.

Further, the communication between the customer and the cloud vendor’s service has to be safe to prevent attacks which are targeted on the network. The network security can be undermined by man-in-the-middle attacks, IP spoofing, port scanning, etc. One possible solution against those attacks is a secured end to end encryption from the customer to the cloud and between the clouds instances itself. (Shabeeb et al., 2012; Subashini & Kavitha, 2011)

The US state of cybercrime survey (2014) found that most companies cyber security programs are not sufficient prepared for security attacks. A lot of cyber-attacks never get detected or only get detected by a third party. In average over 135 security incidents per organization were detected in 2013. (Mickelberg, Schive, & Pollard, 2014) This demonstrates that most organizations are not aware they are under attack or ever got attacked. Combined with the findings above about the knowledge of managers about security in the cloud, in some cases it would be better to favor the cloud to their own weak secured network.

There are several viewpoints which have to be considered when moving to the cloud. One of them are the employees itself. Many of the data breaches are caused in the server system behind their own firewalls. In most cases the companies’ employees are responsible for security breaches (Whitman, 2003). With the movement into the cloud the risk of such a breach can be reduced and suspicious access attempts can be recorded and reported automatically. When it comes to security update of software, a cloud vendor can initiate a
full automatic security update process without the help of IT staff in contrast to the on-site premise where the owner has full control about the security patches and updates for his system. (Carlin, 2011; Infor., 2015)

Overall, the modern cloud vendor has the higher level of data center and can excel the data centers of most companies when it comes to security. With their investment in the best security measurements most companies can profit from going into the cloud in respect of security. One special example is the contract of one of the most data sensitive organizations in the world, the US Central Intelligence Agency (CIA) with the Amazon. This organization uses Amazon’s cloud product AWS. (Darrow, 2015)

Summarized, that on the example of CIA, which is in possession of national secrets, if even such an agency it is willing to go into the cloud, the security of some major cloud vendors seems to be good enough to fulfill their purposes. Cloud vendors have to be up to date, especially in security, to keep the trust of its (prominent) customers. A majority of companies have a security problem and do not even detect attacks. With the move into the cloud a security plus can be gained if the security measures and policies of a company are weak.

2.2. Enterprise Resource Planning systems

This chapter summarizes the advantages of an Enterprise Resource Planning Software, also called ERP, for companies. An ERP System can improve the warehouse management in a company. Further benefits are the improved customer focus, the reduced inventory level and the demand forecasting. (McCrea, 2011) It helps the enterprise to use resource efficient and to optimize the business processes in the company. ERP systems include the business unit’s logistics, production, purchasing department, materials management, sales department, human resource, CRM and controlling. These back office functions can be automated and optimized. Through an ERP system, companywide planning which includes all business units, becomes possible. It is even possible to expand the ERP system over other sites of the company. The sites of the company can be spread geographically all over the world and still be manageable from different places.

10 Amazon AWS is a product of Amazon and collection of several cloud services: https://aws.amazon.com
In the past, an Enterprise Resource Planning system was a domain of the larger companies. Nowadays, ERP systems get into the focus of smaller companies. Small and middle sized enterprises (SME) use those systems to get the benefits of an ERP system as automatization, the linkup of different business units and optimization of business processes. To get the best ERP product for a company, ERP systems come also with modularity. The costumer can decide which module he needs and wants to use. Drawbacks can occur during the implementation of an ERP system into a company when complex processes in a company require customization to fit for the company’s processes. Those customizations require a lot of manpower, time and costs. (T. Mahara, 2013; Singh, Manna, & Bhasin, 2013)

The actual implemented ERP systems are not in the end of their development circle and are in an ongoing development process. New trends are Mobile ERP, Cloud ERP, Social ERP and two pier ERP. Within a mobile ERP system the customer gets access to reports and information out of the ERP system regardless where they are with a mobile phone, tablet or other mobile devices. Another trend is the social ERP system, which is simply an ERP enriched with social media elements. An enterprise using a two-tier-ERP systems uses two ERP systems simultaneously on different levels in the cooperation. It is mostly used in bigger, multisite companies. (Engelstätter & Miruna, 2011; Hestermann, Anderson, & Pang, 2009; WorkWiseERPTeam, 2014)

However, the most emerging trend in the ERP sector is the cloud ERP, which is the focus of this thesis. The following chapters will give an insight into benefits, problems and threats of this trend.

2.3. ERP in the cloud

There are many factors which should be minded when enterprises are trying to adopt cloud computing application in their business. A good example is Ireland. Carcarz et al. describe Irish small and medium sized enterprises as an example for the adoption of cloud computing. They mention that the cloud computing sector is still growing. In the year 2011 it was the top technology priority worldwide and the market will grow up to 241 billion until 2017. Actual numbers for the year 2016 estimate grow of 16.5 per cent to a total of 204 billion USD (Gartner, 2016). Cloud computing saves money (cost reduction) and improves the scalability. Especially SME can profit because they are different to the bigger companies regarding e.g. budget and offers big advantages for these companies. Half of the investigated
companies in Ireland have already adopted cloud services but the adoption is not involving their daily business entirely. (Carcary, Doherty, & Conway, 2013)

Businesses have to manage a big amount of data from various departments of their company. Accounting data is a big player in terms of decision making because data of all departments of the companies flow together. Normal accounting software is usually not capable to manage and to analyze this amount of data for decision making because of their complexity and largeness. Cloud computing is a good opportunity to avoid these problems. Sharan (2013) tries to explain advantages and disadvantages of such a move of the accounting software into the cloud. Therefore, Lithuanian small and middle sized companies were investigated after their move to the cloud. Following advantages and disadvantages were found during this investigations regarding cloud based services and are described in table 1.

**Table 1: Advantages versus disadvantages**

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced costs</td>
<td>Fear of safety</td>
</tr>
<tr>
<td>Security</td>
<td>Internet failures</td>
</tr>
<tr>
<td>Respond to business</td>
<td>Control loss</td>
</tr>
<tr>
<td>Easier administration</td>
<td>Dependency</td>
</tr>
<tr>
<td>Compliance</td>
<td></td>
</tr>
<tr>
<td>Global access</td>
<td></td>
</tr>
</tbody>
</table>

Source: Christauskas & Miseviciene, 2012

Greengard mentioned that cloud computing can help developing countries. There are many problems as for example corresponding power, bandwidth, privacy and security issues. The information of this article can be used to show how the infrastructure can influence the adoption of cloud services of SME’s in different countries. (Greengard, 2010) Cloud computing can be seen as a business factor for small and middle-sized enterprises based on the increased speed of the internet. Five factors including ease of use, security and privacy are mentioned. These factors are important for the implementation of cloud services. (Gupta, Seetharaman, & Raj, 2013)
This chapter gave an introduction what challenges were determined in those investigated papers regarding a cloud adoption for businesses. Cloud computing can be seen as a catalyst for small and middle sized enterprises. The market is growing and companies have already started to integrate cloud services, even if in a reluctant way. Based on the findings of this chapter, threats and advantages have to be elaborated in the next step.

2.3.1. Possible threats with the move into a cloud based ERP system

The following part of this paper discusses, based on the findings out of the last chapter, the possible threats a company could face during the integration of a cloud based Enterprise Resource Planning system or move from a local ERP System in the cloud. First this part is will cover the operational threats, then will address the security threats when moving into a cloud based ERP system.

2.3.1.1. Operational threats

Operational threats are possible problems which can be caused by the choice of a wrong and not suitable ERP vendor. There are multiple threats which are displayed on the following.

One threat is the vendor lock-in. Vendor lock-in describes the lack of a software to cooperate with another software. This problem is mostly implied by ignoring industrial standards and is sometimes created on purpose to tie the customer to the product or product family. It gives the vendor a competitive advantage. (Toivonen, 2013) With the growing number of available ERP-cloud vendors the problem of the vendor lock-in will gain more importance. Additional difficulty for this problem is the fact that in comparison to an on-site ERP system where the enterprise has the control over its infrastructure, the move to the cloud also means to give away the control over this infrastructure (Salleh, Teoh, & Chan, 2012). The resulting necessary operations to bypass those problems created by the vendor lock-in are very time consuming and thereby expensive for the customer (Sultan, 2011). Vendor lock-in is one of the main obstacle for many customers to move in the cloud (Toivonen, 2013). Vendor lock-ins are caused by four problematic aspects which are discussed in the following.

First, there is Lack of Interoperability. It describes the problem of information exchange between different cloud systems. The interoperability enables the customer to use multiple services from different vendors and to move from one vendor to the next one in a
short time. Also, a comparison between the clouds is easier when interoperability is given. Transferred to an ERP cloud context, the interoperability enables the communication between different ERP cloud systems. For example, customers might use a to the enterprise different ERP (related) cloud systems for different use cases, or its subcontractors’ ERP systems differ from its in-house ERP system. (Hofmann & Woods, 2010; Toivonen, 2013)

Another aspect of vendor lock-in is the **Lack of Portability**, which hinders a lot of enterprises to move its components and services from one vendor to another one. If a vendor lacks, portability gets difficult for companies to move from one vendor to another one. (Mell & Grance, 2011; Opara-Martins, Sahandi, & Tian, 2014)

Third, the **Lack of Standardization** is caused by the lack of standardized description languages of cloud services. This circumstance makes it difficult for web engines to discover it. (Noor, Sheng, & Bouguettaya, 2014) Similar to portability, cloud vendors fear that through standardization could animate customers to migrate to competitor. Lacking in standardization can have a negative impact if the cloud has to interact with other systems. In the case of a cloud based ERP system such a design fault can lead to refusal of the system. (Opara-Martins et al., 2014)

The last aspect regards **Data Privacy Issues**. Peng & Gala state that cloud vendors which offer ERP systems often lack in data transparency. That means the customer does not know exactly where its data goes and where it will be stored. They are also concerned about the exact location of the servers of the vendor. (Peng & Gala, 2014) Different countries have different laws to protect data and the United States are known for lower data protection laws as it will discussed later in this thesis in chapter 2.3.2.

### 2.3.1.2. Security threats

The following section describes the problems regarding possible security threats, which could have an influence on adopting an ERP cloud system.

The first threat is the **Threat of Multitenancy**, which is a cloud characteristic of providing services of one cloud instance to multiple users at the same time (Al-ghofaili & Al-Mashari, 2014). There are two main reasons for an ERP cloud service provider to use this concept. First, since the provider has only one product to develop and to maintain there is a huge advantage in much lower development effort. The customers are using the same
product instance but with different data-pools. Second, because the customers are using the same hardware the resources are used more efficient. (Mijač et al., 2013)

However, the nature of multitenancy causes a huge risk regarding data security. Since one instance of an ERP system is used for multiple customers, this can also mean the same usage of a database for different, maybe even competing, companies. A data-leak between the customers would be disastrous and has to be avoided at all costs. (Hashizume, Rosado, Fernández-Medina, & Fernandez, 2013)

Summarized, if the concept of multitenancy would be used as a substitute to the traditional form of an ERP System, one server-instance with one database instance serves multiple customers. The biggest threat would be a data leakage from one instance to another one running on the same server. That means sensible data of one customers could be obtained by its competitor. In order to minimize those risks ERP cloud providers have to establish a policy, which requires a separated dataset for each customer. (Hashizume et al., 2013)

Another threat concerns issues with Data Security. Thereby, data security is the process of securing and protecting data of a company or individual against unauthorized access, disclosure and use (Peng & Gala, 2014). In the context of cloud computing the provider of such a service is responsible for the data security of stored data and data progress. Furthermore, the backup of the data is a critical aspect of data security especially when this process is done by a third party. (Hashizume et al., 2013)

In course of the option of a provided API by the cloud vendors a new data security problem could occur. For one, the interface would be used by many customers at the same time. Another threat for data security is the circumstance that the cloud ERP software and dataset of the different customers are stored on the same server. This makes it to a high valued target for attacks from outside the environment. (Faasen, Seymour, & Schulerz, 2012)

Also, from view of the cloud vendor and consequently its customers another threat can be recognized. The vendor and its employees has more or less access to the data of the customers. Threats are dissatisfied employees who could steal or manipulate data based on their will when no proper protection and safety measures are in place. (Faasen et al., 2012)
Therefore one sub problem is to investigate if security concerns of an enterprises has an affect for the decision of an enterprise to use a cloud based service regarding Enterprise Resource Planning System.

2.3.2. The cultural and social effects of an ERP migration into the cloud

Findings about cloud computing acceptance shows that the acceptance differs among different cultures, especially between China and the United States. Investigations of those two cultures by adopting Hofstede’s cultural dimension model shows that the two countries differ in management style and decision making strategies. (Zhao, Scheruhn, & Von Rosing, 2014) Based on those findings, this chapter gives a closer insight of the impact of culture on the decision to adopt new ICT, also known as information and communication technology. It outlines major findings among several papers and distinguishes between the two major levels of culture, the national and the organizational one.

2.3.2.1. National culture

The national culture can be seen as a set of norms, beliefs and customs in a population. Hofstede established six dimensions of national culture, namely power distance, individualism, masculinity, uncertainty avoidance, long term orientation and indulgence. (Hofstede, 1983)

The literature reflects different viewpoints for cloud services and their usage. One paper tries to prove that culture has an important influence on the implementation and use of information technology. Moreover, the authors Leidner and Kayworth analyze if culture influences IT in a more direct or indirect manner. During their research they identified six groups as most suitable: (1) Culture and IS development; (2) culture, IT adoption and diffusion; (3) culture, IT usage and outcomes; (4) culture, IT management and strategy; (5) IT influence on culture and (6) IT culture. Culture has to be seen and discussed on various levels such as national, organizational and also in a group of both. However, culture is a difficult measurable variable. For example, there are cultural values which can have influence on IT. For aspects of national culture the approaches of Hofstede such as individualism versus collectivism and so forth can be applied. On the organizational level there are the aspects of Cooke and Lafferty as well as Hofstede. The authors try to create a link between the IT on one hand and culture in any shape or form on the other hand. In addition, they analyzed the impacts of culture on IT and reverse, which is shown in the following figure 1. The figure shows how national and organizational values have impact on
different IT Issues in different IT fields. The authors conclude, that IT has almost no impact on culture but culture especially the values of a culture have an impact on use, adoption and outcomes of IT. (Leidner & Kayworth, 2006)

Figure 1: Cultural values and IT

Source: Leidner & Kayworth, 2006

The authors Kappos and Rivard (2008) came in their paper to similar results. This paper gives detailed description on how culture influences information systems and their adoption. They mention, that culture has an important influence on initiatives which belongs to information systems and culture moderates the relationship between the characteristics of the IS, the acceptance and resistance. (Kappos & Rivard, 2008)

Another very interesting topic about the adoption of IT, particularly the adoption and usage of tablets in the United States versus Taiwan is described by Chen (2013). In this paper the focus is on the usage regarding categories of age, location and situation. Therefore the approach of Hofstede's dimensions can be used and applied. For example, Taiwanese are sharing their tablet with their family because of the collective culture. In the United States it is completely different situation depending on the highly individualistic culture. They use mobile devices mostly individually. (Y.-F. Chen, 2013) When those cultural identities in factor sharing of devices are transferred to the ERP cloud, there could be a difference when
it comes to adopting such a system. In a culture, where sharing is more common the adoption of the usage of shared resources could be established more easily.

As already mentioned in the chapter about security, different cultures react differently when it comes to security concerns. Ion et al. (2011) found that India and Switzerland have a diverse approach when using a cloud system. In the Indian society privacy has less importance than in Switzerland where privacy is deeply rooted. The authors think that there is no one-size-fits-all solution when it comes to the cloud.

Transferred to the concept of a cloud ERP system, national cultural impacts occur especially the development process of it. Particularly in groups with members out of different cultural backgrounds, the national culture must be considered in the developing process of cloud ERP systems as well as in the implementation process into a company. Cultures within sharing cultures as the Asian countries, e.g. in India (Ion et al., 2011) and Taiwan (Y.-F. Chen, 2013), are different to Western Countries (Y.-F. Chen, 2013; Ion et al., 2011) and use cloud systems differently. When developing a Cloud based ERP software such circumstances have to be considered.

2.3.2.2. Organizational culture and resistance to change

In contrast to the international culture the organizational culture, often also called corporate culture, appears within companies’ borders. Organizational culture can be observed in three levels. The first level, the level of artifacts, can be observed in the behavior of people, particularly what can be seen, heard and felt in a company. The second level describes the espoused values which a company stands for. The last level, the deepest of those three, is the most difficult to measure. It is about tacit assumptions and reflecting the assumptions and thoughts of the employees itself. (Schein, 1999)

Therefore, organizational culture impacts decision made by the employees of a company. As it is for every other change in an organizational culture, the change of or to a new form of ERP system can cause resistance to change. One of the most affected department in this case could be the IT department. It will fear the outsourcing of infrastructure and manpower (Awad & Batta, 2014). Resistance to change, sourced from own beliefs (3rd level by Schein) of one or more individuals within a company, can influence change and rises resistance to change within the company’s boundaries.
Another aspect can be the assets which companies, especially in larger ones. In most of the cases such a company has already invested in their local, on-premise Enterprise Systems including ERP systems. If the company shows fear of data leaks of their sensible data and critical significance of their system in addition those circumstances can lead to a high resistance against a possible move to the cloud. To counteract resistance to change flexible processes within a company can raise the adoption rate, e.g. the change to a cloud based ERP system.

As already mentioned above cost reduction by outsourcing services as the ERP system into the cloud can cause anxieties among the workforce, especially the IT department. There will be and must be a change in the methodology and structure. Resistance of change can occur among the whole workforce. Most critical the management level can reject a change to a cloud based ERP system. (T. N. Mahara, 2013; Moller & Chaudhry, 2012)

Summarized, due to the findings in those papers, it can be said that cultural differences seems to have an impact on adoption ITC as well as on cloud adopting. Especially very critical processes regarding an adoption of an ERP system deployed in the cloud can rise such resistance within companies can be difficult to observe. Also, for the service provider the slow but ongoing trend of cloud software means a big change in business models. Nevertheless, ERP Service Provider, which adjust their products and services in direction of the cloud, will strengthen it market positions. (Karabek, Kleinert and Pohl) For example the big player on the market, SAP, was able to exceed its profit expectations because among others of the big growth in cloud services (SAP, 2015).

2.3.3. Data regulations and laws

The following chapter discusses the factors data protection and data security which are regulated in laws. Those laws can differ depending on which country is observed (D. Chen & Zhao, 2012). This patchwork rug of different national laws in a world makes it different for global acting companies to operate especially when it comes to personal data. For example, the physical location of a cloud ERP provider’s data center can be a huge issue since national or local laws of a country can prevent a company to transfer (personal) data outside of the country where the data’s origin is (Schubert & Adisa, 2011). Those constraints
are important factors, especially when different sites of one company are located in different countries with different data protection laws. Even big countries as the United States of America are facing these problems. These different national laws make it difficult for companies to offer their services state wide with full compliance (Felici & Pearson, 2015). Also, in Europe the European Data Protection directive restricts the transport of data between EU and NON-EU countries (European Parliament & European Commission, 1995). Therefore, Felici and Pearson (2015) recommend to set up binding corporate rules or model contracts to bypass those laws and get access to the data (Felici & Pearson, 2015) and smooth the way to operate and transfer data between national borders.

Another indication that data protection has a huge importance, especially in the European area, is the actual sentence spoken by the EuGH in Europe. In the last years the Safe Harbor agreement between the EU and the United States of America enabled companies to elude the data protection laws in both areas. On the 6th October of 2015 the Court of Justice of the European Union declared that Safe Harbor agreement is invalid. That means that (personal) data, which origins are in European Union are no longer allowed to transfer and store data in data centers in the United States. This complicates the data exchange between these countries. Social media Platforms, search engines and companies which business models build on the data of their users, have to deal again with problems in transporting data over the ocean. It is now harder to bypass strong data protection and data privacy laws. (Court of Justice, 2015) Without this rule/law those companies will face new issues regarding the laws in the countries of data origin. This new development could cause a massive movement within companies which daily business relies on data. (European Parliament & European Commission, 1995) Big cloud ERP provider which are serving customers in the US and the EU could get affected by those regulation circumstances especially when dealing with personal data as employee data.

The United Sates has no comprehensive and consolidated law for data protection. It is a mix of sectoral laws and state laws. The protection for personal data is low to not existing. There are now rights to access data or to protect it from transferring out of the country. Processing of data in the cloud is allowed and there are now regulations for personal data.
In Austria, as a country which is in the focus of this thesis, the Federal Act concerning the Protection of Personal Data, the DSG 2000, regulates data protection in Austria which restricts the storage and transfer of personal data. Besides, there is also the Telecommunications act which is the Austrian implementation of the European Data Protection Directive. (DSG, 2000) There are several restrictions in transferring personal data abroad into not EU countries. The Austrian law has no specific laws that are regulating data protection in a cloud environment. The data controller, the instance who has control over the data and the process of it has to adopt and implement adequate security measures for the protection of (personal) data. However, there are no specific security standards defined. (Hebenstreit & Funk-Leisch, 2015)

Similar to Austria, Germany has also a Federal Data Protection Act, called the “Bundesdatenschutzgesetz” which implements the EU Data Protection Directive. As in contrast with Austria, there is a guidance from 2011, which defines data protection in the cloud. International transfer of personal data has to be lawful and appropriate technical measures have to be established to ensure that data is stored secure, transparent and safe (BDSG, 2003; Hladjk, 2015).

Switzerland, as no member of the EU, has its own Federal Act on Data Protection from 1992. Moreover, every Swiss canton has its own data protection statutes. It is allowed to store personal data in the cloud but there is no specific statutory provision for the term cloud. (Gordon & Reinle, 2015)

As it can be seen, different areas in the world have different legal restraints regarding data protection and data security. Investigated countries which are members of the European Union have much stricter laws to protect personal data. Dealing with personal, enterprise and sensible data, when processed in a cloud system with servers outside of the country where the data has its origin, is dedicated.

2.3.4. Scaling and infrastructure of cloud ERP systems

As it is with every system in a growing Enterprise, scalability is another point on the checklist when the decision about the right ERP systems has to be made. An on-premise ERP system is deployed on one or more servers of a company. Those servers have limited processing power and relies on the infrastructure of the company. An immature
infrastructure can cause slowdowns which can cost time and might lower the employee satisfaction. Worse than that, a downtime would be truly catastrophic because of an overload of the infrastructure. (Gargeya & Brady, 2005)

Next to the hardware and infrastructure problems, an ERP system could also have software limitations when it comes to scalability. There can be a restriction in supported size of datasets of the database management system or bottlenecks in the ERP system itself. Cloud based ERP system promises to be the solution for those problems. As already mentioned above, one of the benefits is the apparently infinite scalability respectively performance of the system. No new investments into the infrastructure of the company has to be made when moving into a cloud based ERP system (Subashini & Kavitha, 2011).

Those external infrastructure and software problems can cause vast costs because of possible downtimes of the whole ERP system, which can be seen as the heart of an Enterprise Resource Planning system. Already minor problems as slowdowns can impact the costs over time. User which are dealing with such unbalanced systems every day tend to have a lower work satisfaction and may cause secondary problems as increased turnover. These are not directly linked but hidden costs of an improper working ERP system. (T. Mahara, 2013)

Further, more directly linked to a slow ERP system, is the cost factor time because the employee needs to invest more time in processing its task.

### 2.3.5. Costs

This chapter discusses the different cost reductions which can occur with the change to a cloud based enterprise resource planning software. Cloud vendors can offer its services for a lower price through their ability to scale their products and infrastructure on demand. They offer packages to fit their customers’ needs and thus in theory enables the customer to get the right “package” for the right price. The rigid costs for an on-premise enterprise resource planning system get replaced by flexible monthly calculable costs. Reductions in total costs of ownership, reduced initial costs or startup-costs together with lower IT-costs are elucidated in this chapter. (Lechesa, Seymour, & Schuler, 2012; Sun, Zhang, Guo, Sun, & Su, 2008)

A big cost object is **the total cost of ownership (TCO)**. A traditional, on-premise Enterprise Resource Planning system creates a huge amount of costs in a company. That
includes costs for the hardware, software, professional external services and internal IT costs (Vimalkumar, Rajamani, & Jayasubramanian, 2012). In contrast to the on-premise ERP system the vendor takes the costs for hardware, infrastructure and all operational costs in a cloud based ERP system (Lewandowski, Salako, & Garcia-Perez, 2013). The comparison of an on-premise ERP systems with cloud based one came up with the result that the hardware costs of the cloud based ERP system are far lower since less or no servers are needed on-premise (Elragal & El Kommos, 2012). For one, less servers mean less administration costs which results in less IT-staff and less IT costs. Further, for an on-premise ERP system, besides software costs for the ERP system itself, there might be also costs for the operating system and the databank management system. However, these additional software costs are already included in the monthly rent for a cloud based ERP system. (Elragal & El Kommos, 2012)

A cloud based software can help to reduce startup costs of a company. Especially small and middle sized companies can profit of lower initial costs. Due to its business model most cloud based ERP systems come with a monthly description. Contrary to the on-premise solution, a cloud based ERP systems enables the company to split the cost over time. The on-premise solution is mostly a big one-time expense. (Epicor, n.d.) Also, license costs can make a huge difference in costs. Elragal and Kommos (2012) compared the license model of a cloud based and an on-premise enterprise resource planning system. Thereby, the license for one on-premise product is more costly than the cloud based one, even after the period of one decade. In this context, further costs as upgrade and customizing costs are not included this breakdown. (Elragal & El Kommos, 2012)

Lewandowski et al (2013) state that also expensive and time consuming upgrade costs are no longer relevant. In an on-premise ERP system a jump from one version to another version can imply a long lead time. For one, most customers have several customizations in their ERP system which have to be ported to the new version. Also, new requirements for the IT environment will emerge and has to be met with new versions. The responsibility and costs for those problems can move from the customers to the cloud vendor when the customer moves to a cloud based ERP system. Thereby, upgrade costs can be avoided, reduced or split into smaller amounts and added to the monthly fees for the customer. (Lewandowski et al., 2013)
However, an implementation of a cloud based system does not mean a reduction in IT-staff. There will still be a need for configuration of the workplaces and the maintenance of the internet connectivity (Salleh et al., 2012). The outsourcing of the ERP system and the necessary infrastructure can enable the IT department to concentrate on main IT objectives in order to support the main business processes of a company (Lenart, 2011). Nevertheless, outsourcing can rise resistance of change because an IT staff employee could see a potential threat for his job position which were discussed in chapter 8.3 of this thesis.

2.3.6. Customizability of cloud based ERP systems

Heretofore, common on-premise enterprise resource planning systems, which a company can acquire from a provider, are typically customized by the provider to support the customer’s needs. Besides periodic license payments, the customization of the enterprise resource planning software can be a huge source of revenue for the vendor. Consultants and software developer are working together to adapt the standard ERP product.

Mijac et al (2013) state in their article that the new type of enterprise resource system, which will be hosted completely in the cloud, has to be customized to a greater or lesser extent. Provider, who tries to enter this new market, has to challenge new issues regarding the customization of the products. In order to serve a greater amount of customers with one product, provider of ERP systems are trying to standardize their product. With this standardization comes a big issue. Customers, especially those who already used a similar product install on their sites, expect the same customization of the ERP system. (Mijač et al., 2013)

The complexity level of an enterprise resource planning system has a big impact on the need to customize the system for a customer. The high complexity and specialization of the software can rocket the need to customize the product and lowers the number of potential tenants on the other hand. This implicates that simpler SaaS systems attract more customers and generate a lower need for customization. (Sun 2008) Figure 2 shows the differences in high specialized marked versus the mass market. The mass market show lower configuration and customization requirements than the specialized market where very few customers are. That also shows that a SaaS offering for specialized and complex industries is the better solution.
Sun et al. (2008) state different needs among potential customers, which can differ in industry focus, customer behavior, culture, product offers, regulation differences and operation differences. The ideal case for a cloud ERP vendor is one standardized solution, which every customer uses. However, this is never the case in an enterprise environment and configuration is mostly necessary. **Configuration** describes thereby the process of adding boxes and fields or changing the description name. The changes can be performed by setting parameters of changing parameters. These options are usually predefined. (Sun et al., 2008)

**Customization** on the other hand can require source code changes because of its complexity. The standard software is not set to serve the needs of the costumer and changes in its functionality has to perform (Sun et al., 2008). If customization of the software is needed, cost rise significantly. With different versions of the ERP software for distinct customers the complexity for versioning control increases. With different versions of the software the maintaining cost are rising because every difference needs to be treated in different way. Cloud Software upgrades have to regard these changes which drive the costs. (Mijač et al., 2013)

Sun et al. (2008) provides a model to categorize the complexity and configuration competency level of an ERP cloud product. Its five stages show the possibility to customize and configure the product. The entry level offers no customize or configuration support and implies no variance level support. This approach uses well designed functionalities. It
focuses on a special type of customers which is fully supplied through this standard software. The other extreme is the “world class” level. Hereby, the software can or must be customized in every detail because of the complexity of business processes of the customer. Also, new applications can be developed and added to the standard product. This high level of customization leads to a very high level of variance support.

Common, on-premise enterprise resource planning software is usually highly customized as well and can be categorized in the top levels of Sun’s complexity model. This highly customization aggravates the upgrade of a software because the individual customization are tied to a specific version and are a unique version of the software. These circumstances can lead to a denial for upgrading the software because it can be expensive to take the customization to the next version of the standard software. At this point a major benefit of cloud based enterprise resource planning software can be identified since it get upgraded by the vendor, the efforts and costs for the customers internal IT are minimal. The ERP vendor upgrades its packages and the customer can access the improved version without losing the customization. (Peng & Gala 2014)

Not only the ERP software itself has to be customized, also an openness to other, 3rd party software, is demanded. Especially special on-premise software of a company can raise the level of difficulty to integrate a cloud based ERP. Customers in niches who have very special, unusual processes in their business are running into obstacles and limitation of basic cloud ERP functionalities. Although cloud vendors often provide their customers with plug-ins to bridge that gap, customizations can knock out these benefits. An option to avoid an incompatibility is the disposal of an API by the vendor to provide an interface for the software. Such an API creates an abstraction of the 3rd party software and the cloud ERP. The vendor of the cloud can update the software more easily. (Faasen et al., 2012) A conceivable implementation could be a web service. A web service can provide 3rd party access to the main functionalities of the ERP system on abstracted layer (Subashini & Kavitha, 2011) with minimized risks for the ERP system.

How well an ERP system functionalities are matching a company’s processes can be described as the “functionality fit”. Regarding to Fasen et al. (2012), that scale was the least dominate factor which gets considered when reviewing cloud ERP products. There are other points which have more impact on the decision which get considered when moving in the
cloud. The most important one, as the result of interviews with several companies, was the lack of flexibility of cloud vendors to adapt their software. Also, when they customize it, they will offer it to all the other customers which would lead to loss of competitive advantage of the demanding customer in first place.

Summarized, it is a challenge for ERP cloud vendors and their customers to move from an on-premise ERP into the ERP cloud. When it comes to customization the benefits for a cloud vendor decline since the ERP cloud vendor wants to sell its standardized product. To avoid most customizations, the ERP cloud product could be made highly configurable, what means the ERP system can be adapted to the business processes during setup without any code changes (Kimberling, 2009). Another approach is the usage of the SaaS model, which is easily customizable. The customization can be made on three layers: The user interface, the business layer and the data layer (Jiang, Zhang, & Liu, 2010). Anyway, if the standard ERP cloud product does not fit for every company, the vendor has to provide its customers with enough configurational options as well with customization services to get on the customers radar.
3. Research Methodology

In the following chapter, the chosen methods of investigation of the hypothesis of this research paper are outlined. In general, there are three possible approaches in order to investigate the data for a scientific resolution of the problem of this paper. Every approach has its own advantages and disadvantages regarding the factors costs, time and complexity of elicitation of the data. Due to the nature of the topic enterprises must be involved in this research. The scope of inclusion of those enterprises depends on the chosen research approach.

3.1. Qualitative versus quantitative research approach

The qualitative research approach would give the option of acquiring data in a controllable environment. In every desired geographical region, one to two qualified companies would be selected for a case study. These companies have to be willing to implement an enterprise resource planning system deployed in cloud service in their business environment. During the case study the outcomes, advantages and problems would be obtained and recorded. Various criteria would have to be developed beforehand, e.g. how to measure the implementation process. This research approach was abandoned because of the lack of trial companies and the possibility to collect data through a quantitative research approach.

In contrast to the qualitative approach, a quantitative approach would gather the most data and would show how companies act with new technology especially in combination of enterprise resource planning systems and cloud services. With a sample of the population, a reasonable set of data would be gathered and could get analyzed. As a research instrument, the surveys or interviews would be considerable. This approach cannot come up with the analysis of problems and benefits during the implementation process of companies because it can only give only an actual view on the situation of this present day. Also it could gather answers on well prepared questions about considerations and the current situation in companies.

As a third option, the mixed approach would be considerable. It combines both approaches. A possible research design with this approach would be a qualitative investigation in one area, for example the United States, and to do a quantitative in another
region. It can monitor the process of implementation of a cloud based survey. In addition, it could gather enough data to do quantitative analysis. This approach requires a lot of resources since two types of researches have to be prepared and conducted. A qualitative approach, to monitor one or more companies, requires time and cannot be done remotely. Since of those circumstances and due the lack of time and monetary resources, this approach was abandoned.

During the process of creation and research for the topic of this thesis, an opportunity to conduct the quantitative research in the German speaking region of Europe came up. The PSI AG, and its subsidiary company PSI CNI GmbH came up with an offer to support this thesis. The company gave the allowance to contact their customers anonymously. After pondering over possible contact channels the direct contact via email to executives of the targeted company was chosen. Moreover, connections of advising people for this research were consulted to establish a contact to qualified companies. A survey was chosen as the research instrument to obtain quantitative data in several criteria which will be evaluated. Beside the survey an interview with companies was envisaged but never executed based on the lack of resources.

3.2. Survey

The aim of the survey was to reach a big group of enterprises with specific attributes. They were located and quickly reviewed. The biggest obstacle was to acquire the right pool of possible candidates. Fortunately, the pool of appropriate companies offered through the company PSI AG, a software company with its main business area in Enterprise Resource Planning, is containing those candidates. The companies of the pool belong to different industries and are characterized by a different firm size. The surveyed people of those companies have different job positions, but most are from the IT-sector or are decision maker at least from the middle management level.

3.3. Description of the survey

The surveys should be accessible on the internet and might be available in English and German. The web survey sometimes also called Computer-Assisted Web Interview was considered as the right type of method (Sarstedt & Mooi, 2014). Since the survey is accessible anonymously via internet, a high degree of honest answers can be expected (Kiesler & Sproull, 1986; Sarstedt & Mooi, 2014). Another benefit of using such an online
survey tool is the low collection costs for the data (Sarstedt & Mooi, 2014). As the survey tool for the descriptive research method the online software application tool “Google Forms”\(^{11}\) was applied. With the help of this tool the creation of a survey is uncomplicated and fast. The tool also collects the data and displays the results graphically, which is a nice-to-have. Used tools for the analysis of the data will be Microsoft Excel and the statistics program SPSS. Problems to face will be the responding rate and time of involved companies.

Due to restrictions of the cooperation company and view of the response rates, the questionnaire was designed to be short in length (Sheekan, 2001). It was possible to hold the survey short without losing necessary data. Every questionee got the same set of standardized questions with the same possible answers. There are only three extra questions for those, who are currently not using any kind of Enterprise resource Planning software.

The first part of the survey is about the demographic data from the company and the questionee. The middle part was designed to let the interviewed people assess specific topics regarding enterprise resource planning systems and cloud systems. The questions are scaled by a 7-point semantic differential scale since those are widely used in market research (Sarstedt & Mooi, 2014). Both ends of the scale are marked with an opposing pair of conceptualities. The third and last part of the survey is dominated by two comprehensive combined ranking and order questions. The questionees were forced to rate specific aspects of enterprise resource planning systems and cloud systems. The questions are a spreadsheet with question as the row labels and the ranking scales as the column labels. The Google Forms tool enables to only allow one answer for each row and column to get a ranking.

A pre-test by experts with IT background was conducted to detect possible fatal mistakes, as misinterpreted and ambiguity, before the final release. Eight people were chosen and had to fill out the survey printed on paper. The tester had to think loud and had to comment the questions. Their thoughts and their questions including the explanations where recorded. Also, a follow up interview with the subjects was accomplished. All gained insights were considered and added to the final survey. To reach more participants, to overcome possible language barriers and to be prepared for a possible survey in the United States, the survey was also translated to English. (Sarstedt & Mooi, 2014)

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\(^{11}\) Google Form, a free online survey tool offered by Google: https://www.google.com/forms/about/
3.4. Selection of the survey participant pool

The focus of the survey is on companies in the countries Austria, Germany and Switzerland, which forms the German speaking part of Europe. Due to the cooperation with the company PSI AG, particularly its subsidiary PSI CNI GmbH, it was simple to get a reasonable pool of participants in this specific area. Moreover, due to its business of selling Enterprise Resource Planning systems, a tendency that the participants will already own and use an ERP system became apparent. The focus is on companies in the countries Austria, Germany and Switzerland, which form the German speaking part of Europe. The PSI AG serves companies from different sizes and out of different industries. Thus, this group of companies forms a representative sample. Further data acquiring attempts out of other sources were reflected but due to time and cost problems rejected.

3.5. The structure of the survey

Overall, 23 questions were created, three half-open, one open question and 19 closed questions. The half-open questions enable the interviewed person to add an additional answer in an empty textbox, when the given ones are not applicable. The open question was designed to have no default answers. Thereby, it offers an open, empty textbox to enter an answer. The closed questions offered given questions and could be expanded with own answers.

First, the introduction of the survey covers and collects data about general demographic and geographic data about the company and the interviewed person. The job role and the size of the company are two examples in this part of the survey.

Second, questions about the actual ERP situation are asked. This part is a flexible, responsive one and an advantage for web based surveys (Sarstedt & Mooi, 2014). If the interviewed person answers with no, than a different branch opens, and asks additional questions while not applicable questions are skipped. To enable this complex flow, three pages where created and key-questions were assigned with logic. The interviewed person only sees the questions which are applicable for him.

The third section includes questions about IT-Security, Data Protection, Infrastructure and Costs. It consists of 7-point semantic differential scale questions. These
questions ask the interviewed person about his opinions regarding the topics which are discussed in the theoretical section. One topic is about the security situation in and outside of the company. Later, the section asks about the costs of ERP models and the overall infrastructure situation of the company. Some questions can be bundled and lead to the answer of the hypotheses. One question is an optional one and asks about the annual budget for IT-security.

The last section concerns the rating of PRO and CON reasons. Thereby, it is about factors which have the most impact on the move to cloud based enterprise resource planning systems. Therefore, a ranking system is created which forces the interview person to rank several factors. The two questions are built as a table with a logic only allowing one answer for each row and column.

3.6. Description of the analysis process of data

After collecting the data with the Google Forms tool, the data was exported to a csv-file. This file form can be imported to the Statistic Program SPSS Statistics. SPSS Statistics is a very powerful and comfortable tool. It is very widespread and acknowledged and therefore state of the art. The version number used for this work is 21 from the year 2012. The current version would be number 23 but access to this version was not given. A first attempt to open the csv-file in Microsoft Excel\textsuperscript{12} and SPSS was a failure because of coding problems. There might be indifferences between the Google Forms Tool and Microsoft Excel. A correction of this problem was done by hand in SPSS.

Cleaning of data
After the import to SPSS Statistics the collected data was corrected in the following way:

- **Coding errors:** Due to a different coding set of Google Forms and SPSS Statistics, several misinterpreted characters had to be corrected. Mostly special characters were affected. For example “€”, Ä, ü and so on.

- **Different currencies:** Due to the different currencies in the surveyed countries, correction regarding the currency had to be made. The exchange rate from the 15\textsuperscript{th} of March, 2016 was used to calculate the foreign currencies into Euro and was rounded to thousands.

\textsuperscript{12} Microsoft Excel: https://products.office.com/en/excel
• Variable names: Due the peculiarly naming of the variable names composed from the full question. Therefore better and shorter names were defined.
• Outliers: Outliers, which stand out of the mass, are deleted to get
• Suspicious Response patterns
• Missing data: Missing values were found mostly with the answer about the annual budget. Missing values were marked with 0 when not stated or with 1 when not known by the interviewed person.

3.7. Accomplishment of the survey

After the pre-test, the final survey, particularly the web links to the German and English version of the survey, were sent to the marketing department of the PSI AG. Also, an introduction and a short biography about the author was added for the email. The marketing department of the PSI AG combined those links with the provided information to create a company conform email and sent it to over 360 customer companies. Due to uninfluenceable circumstances the survey was sometimes sent to different contact persons in the same company. Since the survey was of anonymous nature, it was not possible to detect them and to sort those out. In general, such problems can occur also in other settings where the pool of attendants is not in ambit of the author.

There were 380 companies contacted and 93 surveys received. That results in a rate of return of 24.5 per cent what can be considered as a respectable number of returns. When considering an alpha error of 0.10 the sample size is sufficient for a population above 10.000 members. (Bartlett, Kotrlik, & Higgins, 2001)

Due to the recommendation of the head of marketing, the email was sent in the time before Christmas. The plan hidden agenda was to achieve more returns because the company was sending less marketing related emails in this time of the year. The final email was sent on the 4th of December in 2015. During the following two weeks 14 emails regarding problems with the web survey were received. The following table illustrates the problems and how they were solved.
Table 2: Problems occurred during survey

<table>
<thead>
<tr>
<th>Quant.</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Access problem (e.g. proxy restrictions)</td>
<td>Transmitting of the survey as a pdf-document</td>
</tr>
<tr>
<td>3</td>
<td>Unable to answer the final ranking questions in section 4.</td>
<td>1. Exact instruction how to answer the last two questions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. If there was still a problem, transmitting of the survey as a pdf-document</td>
</tr>
<tr>
<td>1</td>
<td>Complaints about missing industry</td>
<td>1. Added “Verarbeitende Industrie” industry on 07\textsuperscript{th} of December 2015 in German survey</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Impact on survey was observed, and through the data cleaning eliminated.</td>
</tr>
<tr>
<td>1</td>
<td>Concerns about the survey tool</td>
<td>Transmitting the survey into a pdf-document</td>
</tr>
<tr>
<td>1</td>
<td>Refusal to answer the survey because of secrecy</td>
<td>No solution</td>
</tr>
</tbody>
</table>

Source: Own illustration

Although, a second contact to the participant was relinquished, 88 full completed surveys were achieved via web. Five surveys were received via email as a pdf-document, since they were sent out to particular participants upon reported access problems. Four of the received pdf-files were filled correctly and were added manual in the end of the survey period. Altogether, **92 usable dataset** were received. The following table 3 shows the chronological timetable of the survey period in a summary.
**Table 3: Timetable**

<table>
<thead>
<tr>
<th>Date</th>
<th>Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>13.11.2015</td>
<td>Pretest of the survey</td>
</tr>
<tr>
<td>20.11.2015</td>
<td>Completed Survey was sent to PSI AG</td>
</tr>
<tr>
<td>02.12.2015</td>
<td>Received that the email with the survey is ready to send from PSI AG</td>
</tr>
<tr>
<td>04.12.2015</td>
<td>Survey was sent to the pool of potential participant</td>
</tr>
<tr>
<td>04-21.12.2015</td>
<td>Survey period, answering email of participants experiencing problems</td>
</tr>
<tr>
<td>10.12.2015</td>
<td>Reflection with responsible coworkers of marketing department in Berlin</td>
</tr>
<tr>
<td>21.12.2015</td>
<td>Collecting data from survey</td>
</tr>
</tbody>
</table>

Source: Own illustration

The following table 4 shows the received survey graded to the size weighted by employees and compared to the official data of Austria (Chamber of Commerce Austria - WKO, 2014), Germany (Federal Statistical Office and the statistical Offices of the Länder, 2015) and Switzerland.

**Table 4: Investigated countries**

<table>
<thead>
<tr>
<th>Country</th>
<th>Employees groups</th>
<th>Total of country</th>
<th>Total in survey</th>
<th>% of basic population</th>
</tr>
</thead>
<tbody>
<tr>
<td>DE</td>
<td>10-49</td>
<td>268.263</td>
<td>5</td>
<td>1.863e-5</td>
</tr>
<tr>
<td></td>
<td>50-249</td>
<td>57.712</td>
<td>26</td>
<td>4.505e-4</td>
</tr>
<tr>
<td></td>
<td>&gt;=250</td>
<td>13.112</td>
<td>40</td>
<td>3.050e-3</td>
</tr>
<tr>
<td>AT</td>
<td>10-49</td>
<td>25.447</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>50-249</td>
<td>4.925</td>
<td>4</td>
<td>8.122e-4</td>
</tr>
<tr>
<td></td>
<td>&gt;=250</td>
<td>1.088</td>
<td>3</td>
<td>2.757e-3</td>
</tr>
<tr>
<td>CH</td>
<td>10-49</td>
<td>-</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>50-249</td>
<td>-</td>
<td>6</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>&gt;=250</td>
<td>-</td>
<td>1</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: Own illustration
3.8. Hypothesis

In order to answer the research questions and its sub problems, hypothesis have to be constructed before analyzing the results of the survey. Therefore, differentiations between the participating companies respectively the participants themselves are interesting. In specific, the influence of these differences on their answers in the survey. However, also the impact on the decision to move to a cloud based ERP system. Therefore, I state following hypotheses, which are tested in chapter 4:

**H1.** Participants over 50 years rate questions regarding IT-Security different than participants under 50 years.
   H1a. Regarding question Data stored in-house.
   H1b. Regarding question about Security against cyber-attacks in clouds.
   H1c. Regarding question about Global rise in security threats.
   H1d. Regarding question about Security measurements against attacks in clouds.

**H2.** Participants over 50 years rate questions regarding Data Privacy different than participants under 50 years.
   H2a. Regarding question about Protection against data loss in clouds.
   H2b. Regarding question about Impact of data protection laws.

**H3.** Participants over 50 years rate questions regarding IT-Infrastructure different than participants under 50 years.

**H4.** Participants over 50 years rate questions regarding better mobile access different than participants under 50 years.

**H5.** Participants over 50 years rate questions regarding costs reduction different than participants under 50 years.

**H6.** Participants within an IT role rate questions regarding IT-Security different than Non-IT role participants.
   H6a. Regarding question Data stored in-house.
   H6b. Regarding question about Security against cyber-attacks in clouds.
   H6c. Regarding question about Global rise in security threats.
   H6d. Regarding question about Security measurements against attacks in clouds.

**H7.** Participants within an IT role rate questions regarding Data Privacy different than Non-IT role participants.
   H7a. Regarding question about Protection against data loss in clouds.
   H7b. Regarding question about Impact of data protection laws.
H8. Participants within an IT role rate questions regarding IT-Infrastructure different than Non-IT role participants.

H9. Participants within an IT role rate questions regarding better mobile access different than Non-IT role participants.

H10. Participants within an IT role rate questions regarding cost reduction different than Non-IT role participants.

H11. Participants within a Management role rate questions regarding IT-Security different than participants without management background.

H11a. Regarding question Data stored in-house.


H11c. Regarding question about Global rise in security threats.

H11d. Regarding question about Security measurements against attacks in clouds.

H12. Participants within a Management role rate questions regarding Data Privacy different than participants without management background.

H12a. Regarding question about Protection against data loss in clouds.

H12b. Regarding question about Impact of data protection laws.

H13. Participants within a Management role rate questions regarding IT-Infrastructure different than participants without management background.

H14. Participants within a Management role rate questions regarding better mobile access different than participants without management background.

H15. Participants within a Management role rate questions regarding cost reduction different than participants without management background.

H16. Participants within a SME rate questions regarding IT-Security different than participants of larger enterprises.

H16a. Regarding question Data stored in-house.

H16b. Regarding question about Security against cyber-attacks in clouds.

H16c. Regarding question about Global rise in security threats.

H16d. Regarding question about Security measurements against attacks in clouds.

H17. Participants within a SME rate questions regarding Data Privacy different than participants of larger enterprises.

H17a. Regarding question about Protection against data loss in clouds.

H17b. Regarding question about Impact of data protection laws.

H18. Participants within a SME rate questions regarding IT-Infrastructure different than participants of larger enterprises.
H19. Participants within a SME rate questions regarding better mobile access different than participants of larger enterprises.

H20. Participants within a SME rate questions regarding cost reduction different than participants of larger enterprises.

H21. There will be a significance among the Participants when ranking factor for a move to cloud based ERP systems.

H22. There will be a significance among the Participants when ranking factor against a move to cloud based ERP systems.
4. Results and Interpretation

In this chapter, relevant demographic data and individual dimensions are illustrated graphical and discussed. Since the survey used scaling as well as rating questions, the number one “1” was the most agreeable or positive option to choose and the number seven “7” the most disagreeable or negative option. Therefore, the scaling of the output is reverse.

4.1. Demographic data

Figure 3 shows the distribution of the size of participated companies in employee numbers. From the participated 93 companies, over 33 companies, respectively 35 per cent, have more than 500 employees. The majority of participating companies can be declared as small and middle sized enterprises, in particular. 54 companies (58.8 per cent) can be classified as SME’s.

Figure 3: Company size by employees

Source: Own illustration
Whereas SME’s represent the biggest group in this survey, very small enterprises with under ten employees are underrepresented. It seems that in this survey represented companies are similar to the distribution in Germany, Austria and Switzerland. Further, I assume that the low rate of very small enterprises are caused by the nature of the pool of candidates since the pool consists out of customer of an ERP providing company. However, overall this distribution allows to conduct t-tests to analyze differences between large enterprises and SME’s, since both groups are large enough.

Table 5 displays the regional distribution of the investigated headquarters of the companies in Europe. Two of them are located outside of the targeted area of this survey. Although, this could have importance in an intended comparison in this thesis, the number for a reputable conclusion is too low. Also, even if HQ is outlining, facilities and interviewed people can still be in regional area.

<table>
<thead>
<tr>
<th>Location of HQs</th>
<th>Frequency</th>
<th>Percentage</th>
<th>Cumulated percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>71</td>
<td>77,2</td>
<td>77,2</td>
</tr>
<tr>
<td>Luxemburg</td>
<td>2</td>
<td>2,1</td>
<td>79,3</td>
</tr>
<tr>
<td>Austria</td>
<td>7</td>
<td>7,6</td>
<td>87,0</td>
</tr>
<tr>
<td>Switzerland</td>
<td>10</td>
<td>10,9</td>
<td>97,8</td>
</tr>
<tr>
<td>United States of America</td>
<td>2</td>
<td>2,2</td>
<td>100,0</td>
</tr>
<tr>
<td>Sum</td>
<td>92</td>
<td>100,0</td>
<td></td>
</tr>
</tbody>
</table>

Source: Own source

The next unexpected entries are two replies from Luxemburg. On a request to the PSI AG, those are companies located on the border to Germany with German as the cooperate language and most employees are commuter from Germany. In further statistical analysis, Luxemburg will be counted to the German speaking region of Europe.

Figure 4 presents the graphical distribution of the participants’ age. Thereby, the biggest group of participants are older than 50 years. That implies that participants with most experience were questioned. This circumstance can have an impact, if the participant is a decision masker. Often older people are mistakenly labeled to be more resistant to change because of insecurities towards new technologies. (Ion et al., 2011; Kunze, Boehm, Bruch,
Kunze, & Boehm, 2014) However, to analyze possible impact of the age distribution in this survey, t-test are conducted for several survey questions.

**Figure 4: Age of participants**

![Age Distribution](image)

Source: Own illustration

Table 6 shows how the roles of the participants are distributed. In this survey a half opened question was asked where the interviewed person had to state his or her role in the company. A short list with a few IT-related roles was already given. The role ‘IT manager’ was the most abstract one and was meant to stand as umbrella term for IT roles in middle management. The survey was designed to get answered by IT roles within the targeted companies. Since the question was designed to be half-open, the given questions are diverse and ambivalent. As part of the data cleaning process, the answers got abstracted. The final data contains only the abstract umbrella terms for the given answers.
As it can be seen above a lot of IT Manager (42.6 per cent) and people from the middle Management (19.6 per cent) participated in this survey. Therefore, there is also a potential to divide the sample into Management and Non-Management groups. IT participants are represented (57.6 per cent) against non-IT roles (42.4 per cent). The distinction between the groups respectively the impact of the role of the participants on their answers is also tested through t-tests later on.

### 4.2. Security, infrastructure, mobile access

This chapter describes and displays the results from the questionnaire. Each question is observed from different viewpoints regarding different groups (e.g. IT/Non-IT, age, management, size of company, annual IT security budget, et cetera).

#### 4.2.1. Data stored in-house

The following histogram shows how the own security measurements of the investigated companies are trusted by the interviewed people. A scale with seven Likert items was chosen. The mean is 2.32 what implies that the security measurements of most of the companies were rated as good. Moreover, 23 per cent agreed completely that the security
measurements of its company are good enough to keep its data in-house, followed by 47.3 per cent which agree almost completely with this statement.

**Figure 5: Answers regarding security measurements by own company**

![Bar chart showing frequency of security measurements ratings]

**Source:** Own illustration

Figure 5 displays the answers regarding rating of the security measurements of the companies for the whole sample. Thereby, the frequency is drawn on the y-axis and the rating security measurements can be seen on the x-axis and is reverse scaled (1 is very accurate and 7 means not accurate). The distribution curve is not perfect bell shaped and shifted to the left. That means that the answers are not normal distributed and the answers tend to be positive and agree with the statement that the company’s security measurements can protect the data best.

In order to analyze a possible impact of the participants’ job roles in the company, the sample was divided into **IT versus non-IT**. This separation in groups is interesting since
people with now IT background might answer this question differently. A t-test between the two groups showed no significance at an alpha level of 0.10 ($t = -0.197; p = 0.844 < \alpha = 0.10$). Therefore, $H_{13a}$ cannot be supported.

The sample was now divided into management versus non-management groups, since manager may have another insight into the company than other employees might have. Therefore there might be different answers among these two groups. However, a t-test between showed no significance at an alpha level of 0.10 ($t = -0.672; p = 0.503 > \alpha=0.10$). So, $H_{18a}$ cannot be supported.

Another interesting division is between people older than 50 years in age and the younger ones. For one, people under 50 years have another relationship to IT especially IT security. A common stereotype says that there might be a difference. Nevertheless, t-test between these two groups showed no significance at an alpha level of 0.10 ($t = -0.108; p = 0.914 > \alpha=0.10$). Therefore $H_{1a}$ cannot be supported.

In the context of security measurements, a distinction between small and middle sized companies versus large companies with more than 500 employees may be interesting as well. For one thing, through their company size, they might have different resources and budgets regarding security measurements. Regardless a t-test between these two groups showed no significance at an alpha level of 0.10 ($t = -0.884; p = 0.379 > \alpha=0.10$). Therefore, $H_{11a}$ cannot be supported.

4.2.2. Security against cyber-attacks in clouds

The following histogram, displayed in figure 6, presents the interviewers perceived fear by cyber-attacks in the investigated companies. A scale with seven Likert items was chosen. The mean of 2.93 is implying a moderate level of fear of a cyber-attack by most of the companies. Moreover, 15.4 per cent agreed completely that their company is fearing a security attack, followed by 30.8 per cent, which answered that a cyberattack is likely to occur. Thereby, the frequency is drawn on the y-axis and fear of cyber-attacks can be seen on the x-axis and is reverse scaled (1 is very accurate and 7 means not accurate). The distribution curve is not perfect bell shaped and shifted to the left. That means that the answers are not normal distributed and the answers tend to be positive and mean that companies are fearing cyber-attacks.
Figure 6: Answers regarding fear of cyber-attacks on company

Source: Own illustration

Regarding security of cyber-attacks, an investigation of IT versus non-TI seems interesting for the same reasons mentioned earlier regarding security measurements. However, a two-tailed t-test between these two groups showed no significance at an alpha level of 0.10 (t = 0.520; p = 0.605 > α=0.10). Therefore, $H_6b$ cannot be supported.

The sample was now divided into management versus non-management groups since there might be a different point of view on the company and background among the management group and their counterpart. These two groups are interesting because there may be different answers among these two groups. Despite a t-test between these two groups showed no significance at an alpha level of 0.10 (t = -1.268; p = 0.208 > α=0.10). Therefore, $H_{11b}$ cannot be supported.

Further, the sample was again divided into people older than 50 years and the younger ones. This division is interesting since the stereotype of resistance to change, which
was discussed earlier in this thesis, might have an impact in this survey. Regardless, a t-test between these two groups with the variable age showed no significance at an alpha level of 0.10 (t = 0.180; p = 0. 857 > α = 0.10) and a significance was not measurable. Therefore, H1b cannot be supported.

The last test is regarding the company size. Therefore the sample was divided into small and middle sized companies and large companies with more than 500 employees. These two groups are interesting because I suppose that there are different answers among these two groups. A t-test between these two groups showed significance at an alpha level of 0.10 (t = 2.279; p = 0.026 < α=0.10). That could mean that larger companies, with more than 500 employees, are fearing cyber-attacks at a higher rate than lower small and middle sized companies. Therefore, H16b can be supported. Possible reasons are discussed in Chapter 5.

4.2.3. Global rise in security threats

The following histogram in figure 7 shows if the interviewed people agree on a global rise in security threats. A scale with seven Likert items was chosen. The frequency is drawn on the y-axis and fear of cyber-attacks can be seen on the x-axis and is reverse scaled (1 is very accurate and 7 means not accurate). The distribution curve is not perfect bell shaped and shifted to the left. That means that the answers are not normal distributed and the answers tend to be positive, so companies are fearing cyber-attacks. The mean is 1.57 implying that the majority of investigated people agree on a global rise in security threats. Furthermore, 50.4 per cent, more than half of the sample, agreed completely on a rise in security threats, followed by 35.2 per cent saying that there is likely a rise in threats.
In the following step, the two groups of IT and non-IT were investigated separately to gain better knowledge. These two groups are interesting since there might be a difference in rating global security threats among employees with IT and without IT background. An IT employee will be, particular through his daily work, more aware about threats in the global world and assess this topic differently. A two-tailed t-test between these two groups showed significance at an alpha level of 0.10 (t = 2.098; p = 0.039 < α = 0.10). Considering the means between these two groups, it might be possible that members of the IT role are rating the global security situation more threatening as their non-IT colleagues. This circumstance could occur since IT employees have more technical insight on actual events in the IT world. Therefore, H6c can be supported.

The sample was also divided into management and non-management groups. This distinction is made because the management level might be more informed about global security threats than the opposite group. Thus a t-test between the two groups showed significance at an alpha level of 0.10 (t = 1.959; p = 0.053 < α = 0.10). Considering the means between these two groups, it might be possible that members of the management role
are rating the global security situation more threatening. This circumstance could occur since manager have to monitor possible threats for the company. Therefore, H11c can be supported.

Moreover a differentiation between people older than 50 years and the younger ones seems again reasonable. For one, there is the stereotype that with rising age the insecurity with new IS technology might rise. A t-test between these two groups showed high significance at an alpha level of 0.10 (t = 2.995; p = 0.004 < α=0.10). Considering the means between these two groups, it might be possible that people over the age 50 are rating the global security situation more threatening. Therefore, H1c can be supported.

Also, the sample was analyzed regarding size and therefore differentiated between small and middle sized companies and large companies, meaning more than 500 employees. The two groups are interesting since there might be different assesses on IT-security threats between these two groups. However, a t-test between these two groups detected no significant difference at an alpha level of 0.10 (t = 1.339; p = 0.185 > α = 0.10). Therefore, H16c cannot be supported.

4.2.4. Security measurements against attacks in clouds

The histogram in figure 8 displays how interviewed people of the investigated companies’ security are assessing and trusting measurements against cyber or hacker attacks of big cloud vendors like Amazon. Therefore, a scale with seven Likert items was chosen. The mean is 3.84 what implies that the security measurements of most of the companies were rated as average. Thereby, the frequency is drawn on the y-axis and rating of security measurements can be seen on the x-axis and is reverse scaled (1 is best and 7 worst rated). The bell shape means that the answers are normal distributed.

For a more exact result, the sample was divided into IT versus non-IT, management versus non-management, people of age 50 + versus younger ones and SME’s versus large companies. All subgroups were examined for a difference. Only a two-tailed t-test for the two IT versus non-IT group showed significance at an alpha level of 0.10 (t=-0.100; p=1.662 < α=0.10). That implies that members of an IT-role rate the security of clouds differently as the members of the group without IT background. H6d can be supported.
As it can be seen on the basis of the means in table 7, members in the group with IT backgrounds rate IT security measurements in clouds better.

- A significance test on a divided sample into management and non-management groups showed no significance at an alpha level of 0.10 ($t = -0.793; p = 0.430 > \alpha = 0.10$). Therefore, $H1d$ cannot be supported.

- The divided sample into people older than 50 years and the younger ones showed no significance when performing a t-test at an alpha level of 0.10 ($t = -0.277; p = 0.783 > \alpha = 0.10$). Therefore, $H1d$ cannot be supported.
When the sample was divided into small and middle sized companies and large companies with more than 500 employees, the A t-test between these two groups showed no significance at an alpha level of 0.10 (t = -0.191; p = 0.846 > α=0.10).

Therefore, **H16d** cannot be supported

### 4.2.5. Protection against data loss in clouds

The histogram displayed in figure 9 shows how security measurements against cyber or hacker attacks of big cloud vendors like Amazon are trusted by the interviewed people of the investigated companies. A scale with seven Likert items was chosen. The mean is 3.05 what implies that the security measurements against data loss of most of the companies were rated more positive. Thereby, the frequency is drawn on the y-axis and the rating of protection measurements against data loss in clouds can be seen on the x-axis and is reverse scaled (1 is best and 7 worst rated). The distribution curve is not perfect bell shaped and shifted to the left. That means again that the answers are not normal distributed and the answers tend to be positive.

**Figure 9: Answers regarding security measurements against data loss in clouds**

![Histogram showing security measurements against data loss in clouds](Source: Own illustration)
To get adequate results the sample was split in several different complementary groups. Similar to the comparisons above in this thesis, the formed groups are IT and non-TI, management versus non-management, people of age 50+ versus younger ones, and SME’s versus large companies. All subgroups were examined for a difference. The following points display the results:

- A two-tailed t-test between the IT and Non-IT group showed no significance at an alpha level of 0.10 ($t = -0.593; p = 0.536 < \alpha=0.10$). Therefore, $H7a$ cannot be supported.

- A significance test on a divided sample into management and non-management groups showed no significance at an alpha level of 0.10 ($t = -0.230; p = 0.819 < \alpha=0.10$). Therefore, $H12a$ cannot be supported.

- The divided sample into people older than 50 years and the younger ones showed no significance when performing a t-test at an alpha level of 0.10 ($t = -0.230; p = 0.819 < \alpha=0.10$). Therefore, $H2a$ cannot be supported.

- When the sample was divided into small and middle sized companies and large companies with more than 500 employees, a t-test between these two groups showed no significance at an alpha level of 0.10 ($t = -0.034; p = 0.973 > \alpha=0.10$). Therefore, $H17a$ cannot be supported.

4.2.6. Impact of data protection laws

The following histogram in figure 10 shows the impact of laws which are regulating the dealing with data especially personal data. Those regulations can influence the decision of moving into the cloud to use an ERP system there. A scale with seven Likert items was chosen. The mean is 3.4 what implies nothing in this case. The frequency is drawn on the y-axis and the rating of the impact of data protection laws to the decision to move into ERP clouds can be seen on the x-axis and is reverse scaled (1 is best and 7 worst rated). The distribution curve is not perfect bell shaped and lifted. That means that the answers are not normal distributed and the answers tend to be extreme positive and negative. The problem with this questions that the answers were both very positive and negative but less average questions. Therefore an analysis of different groups are done in the next step.
Figure 10: Answers regarding impact of data protection laws

Source: Own illustration

To prove the hypothesis the sample was split in several different complementary groups. Similar to the comparisons above, the formed groups are IT and non-TI, management versus non-management, people of age 50+ versus younger ones, and SME’s versus large companies. All subgroups were examined for a difference.

- A two-tailed t-test between the IT and Non-IT group showed no significance at an alpha level of 0.10 ($t = -0.351;\ p = 0.937 > \alpha=0,10$). Therefore, $H_{7b}$ cannot be supported.

- A significance test on a divided sample into management and non-management groups showed no significance at an alpha level of 0.10 ($t = -0.117;\ p = 0.907 > \alpha=0,10$). Therefore, $H_{12b}$ cannot be supported.

- The sample divided into people older than 50 years and the younger ones showed no significance when performing a t-test at an alpha level of 0.10 ($t = -0.128;\ p = 0.898 > \alpha=0,10$). Therefore, $H_{2b}$ cannot be supported.

- When the sample was divided into small and middle sized companies and large companies with more than 500 employees, the t-test between these two groups
showed no significance at an alpha level of 0.10 (t = -0.033; p = 0.974 > α=0,10). Therefore, H17b cannot be supported.

4.2.7. Quality of infrastructure

The following histogram in figure 11 shows how quality of infrastructure of the companies was rated by their employees. A scale with seven Likert items was chosen. The mean is 2.99 what implies that the security measurements against data loss of most of the companies were rated as average. The figure displays the answers regarding how infrastructure would influence the decision to and ERP cloud system for the whole sample. Thereby, the frequency is drawn on the y-axis and the rating of the impact of data protection laws to the decision to move into ERP clouds can be seen on the x-axis and is reverse scaled (1 is not and 7 means a lot). The distribution curve is not perfect bell shaped and shifted to the left. That means that the answers are not normal distributed and the answers tend to be positive.

Now the sample was split in several different complementary groups. Similar to the comparisons above in this thesis, the formed groups are IT and non-TI, management versus non-management, people of age 50+ versus younger ones, and SME’s versus large companies. All subgroups were examined for a difference. The following points display the results:

- A two-tailed t-test between the IT and Non-IT group showed no significance at an alpha level of 0.10 (t = 0.690; p = 0.492 > α=0,10). Therefore, H8 cannot be supported.
- A significance test on a divided sample into management and non-management groups showed no significance at an alpha level of 0.10 (t = 0.397; p = 0.693 > α=0,10). Therefore, H13 cannot be supported.
- The divided sample into people older than 50 years and the younger ones showed no significance when performing a t-test at an alpha level of 0.10 (t = -0.071; p = 0.943 > α=0,10). Therefore, H3 cannot be supported.
- When the sample was divided into small and middle sized companies and large companies with more than 500 employees, the A t-test between these two groups showed no significance at an alpha level of 0.10 (t = -0.055; p = 0.957 > α=0,10). Therefore, H18 cannot be supported.
4.2.8. Mobile access as reason to move to the ERP-cloud

The following histogram shows how likely mobile access would be a motivator to move into the ERP-cloud. A scale with seven Likert items was chosen. The mean is 3.54, what implies that mobile access is rated as a minor factor for the decision to move into the ERP-cloud.

To get better results the sample was now divided into Management and non-management groups. These two groups are interesting because I suppose that there are different answers among these two groups. A t-test between these two groups showed high significance at an alpha level of 0.10 ($t = -2.379; p = -0.023 < \alpha=0.10$). The findings show

![Histogram showing mobile access as reason to move to the ERP-cloud](image-url)
that people in the management role tend to rate mobile access to the ERP cloud as less important than people without management background. Therefore, \textbf{H14} can be supported.

Other tests were performed on different complementary groups. Similar to the comparisons above in this thesis, the formed groups are IT and non-TI, people of age 50+ versus younger ones and SME’s versus large companies. All subgroups were examined for a difference. The following points display the results:

- A two-tailed t-test between the IT and Non-IT group showed no significance at an alpha level of 0.10 (t = -0.591; p = 0.556 > α=0,10). Therefore, \textbf{H9} cannot be supported.

- The divided sample into people older than 50 years and the younger ones showed no significance when performing a t-test at an alpha level of 0.10 (t = -2.524; p = 0.013 < α=0,10). The findings show that people older than 50 years tend to rate mobile access to the ERP cloud as less important. Therefore, \textbf{H4} cannot be supported.

- When the sample was divided into small and middle sized companies and large companies with more than 500 employees, the A t-test between these two groups showed no significance at an alpha level of 0.10 (t = 0.393; p = 0.695 > α=0,10). Therefore, \textbf{H19} cannot be supported.

In a final test the sample was divided into Companies with cloud consideration versus companies without cloud considerations. These two groups are interesting in this case because I suppose that that there are different answers among these two groups. A t-test between these two groups showed significance at an alpha level of 0.10 (t = -2.157; p = 0.045 < α=0,10). The findings suggest that companies with cloud considerations rate mobile device support more important.

Figure 12 displays the answers how a mobile access would influence the decision to and ERP cloud system for the whole sample. Thereby, the frequency is drawn on the y-axis and the rating of the impact of data protection laws to the decision to move into ERP clouds can be seen on the x-axis and is scaled reverse (1 very important and 7 not important). The distribution curve is not perfect bell shaped and shifted to the right. That means that the answers are not normal distributed and the answers tend to be negative.
4.2.9. IT cost reduction by outsourcing

The following histogram in figure 13 shows how likely mobile access would be a motivator to move into the ERP-cloud. A scale with seven Likert items was chosen. The mean is 4.43 what implies that IT cost reduction by outsourcing of the ERP system into the cloud is rated as a minor factor for the decision to move into the ERP-cloud. The frequency is drawn on the y-axis and the rating the importance of possible IT reductions to the decision to move into ERP clouds can be seen on the x-axis and is reverse scaled (1 very important and 7 not important). The distribution curve is bell shaped. That means that the answers are normal distributed.

Source: Own illustration
The sample was divided into Companies with cloud consideration versus companies without cloud considerations. These two groups are interesting in this case because I suppose that there are different answers among these two groups. A t-test between these two groups showed significance at an alpha level of 0.10 (t = -2.318; p = 0.031 < α=0.10). The findings might show that companies with cloud considerations rate factor of IT cost reduction more important.

To get better results the sample was split in several different complementary groups. Similar to the comparisons above, the formed groups are IT and non-TI, management versus non-management, people of age 50+ versus younger ones, and SME’s versus large companies. All subgroups were examined for a difference.

- A two-tailed t-test between the IT and non-IT group showed no significance at an alpha level of 0.10 (t = -0.187; p = 0.852 > α=0.10). Therefore, H10 cannot be supported.
- A significance test on a divided sample into management and non-management groups showed no significance at an alpha level of 0.10 (t = -0.790; p = 0.434 > α=0.10). Therefore, H15 cannot be supported.
The divided sample into people older than 50 years and the younger ones showed no significance when performing a t-test at an alpha level of 0.10 (t = -1.864; p = 0.066 < α=0,10). The findings show that people older than 50 years tend to rate IT cost reduction by outsourcing of the ERP cloud as less important as their younger colleagues. Therefore, H5 cannot be supported.

When the sample was divided into small and middle sized companies and large companies with more than 500 employees, the t-test between these two groups showed no significance at an alpha level of 0.10 (t = -0.335; p = 0.739 > α=0,10). Therefore, H20 cannot be supported.

4.2.10. Reasons for and against the ERP-cloud

The most complex questions in this survey is about the most influencing factors for moving to the cloud ERP or not. The questions were designed to get a ranking among seven factors, which speak for the move to a cloud and seven factors against the cloud. They were designed to be obligatory questions and thereby answered by every participants. The factor were chosen due to the insights gained in the theoretical section.

For the analysis, the Friedman test was chosen, since the ranking of the factor for and against the decision to move to an ERP cloud was ranked on an ordinal scale. The ANOVA test, which is similar and basis of the Friedman test, was therefore not applicable. The Friedman-tests an enhancement of the Wilcoxon-Signed-Rank-Test and can be used for more than two factors. (Conover & Iman, 1981; Friedman, 1940) In preparation to conduct this test, the ranking fields where defined as statistic scales.

For the test a null hypothesis was formulated and the test was run against it. Thereby, H0 says, that every median of each factor is equal. For each questions the test showed that H0 has to be rejected. Therefore it can be assumed that the ranking scores of the factors are not equal distributed and a tendency could be measured. The test of the factors to not move into the cloud revealed a significant result at an alpha level of 0,05 (χ²=100,742; p=0,000 < α=0,05). The test of the factors to move into the cloud also revealed a significant result at an alpha level of 0,05 (χ²=31,085; p=0,000 < α=0,05). Therefore, the null hypothesis has to be rejected. Both tests can be seen in table 7 and table 8 and H21 and H22 can be supported.
In order to measure the tendency, a simple mean analysis was implemented to show a significance. Due the ordinal ranking from 1 as the most important factor to 7 as the least important factor, the output of the mean-analysis is displayed in table 8 and 9.

<table>
<thead>
<tr>
<th>Factor name</th>
<th>Mean Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor mobile use of ERP</td>
<td>3,87</td>
</tr>
<tr>
<td>Factors auto update upgrade</td>
<td>3,51</td>
</tr>
<tr>
<td>Factor performance scaling</td>
<td>3,83</td>
</tr>
<tr>
<td>Factor better data protection</td>
<td>4,97</td>
</tr>
<tr>
<td>Factor lower hardware costs</td>
<td>3,63</td>
</tr>
<tr>
<td>Factor lower startup costs</td>
<td>4,41</td>
</tr>
<tr>
<td>Factor lower IT follow up costs</td>
<td>3,78</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Factor name</th>
<th>Mean Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor data protection</td>
<td>2,91</td>
</tr>
<tr>
<td>Factor low commitment of management</td>
<td>4,93</td>
</tr>
<tr>
<td>Factor law regarding data protection</td>
<td>3,42</td>
</tr>
<tr>
<td>Factor bad configurability</td>
<td>3,53</td>
</tr>
<tr>
<td>Factor bad infrastructure</td>
<td>5,05</td>
</tr>
<tr>
<td>Factor transparency data storage</td>
<td>3,24</td>
</tr>
<tr>
<td>Factor higher migration costs</td>
<td>4,90</td>
</tr>
</tbody>
</table>

Source: Own illustration / Output SPSS based on own data

As it can be seen in the tables 8 and 9, the answers from the survey show that the PRO-factor with the lowest mean rank is the automatically upgrade and update factor of cloud ERP systems. Followed by lower hardware cost and lower IT follow up costs, it seems that cost factors could have an influence on the choice of moving into the cloud. Lower startup costs and the possibility to access the ERP cloud with mobile devices has a lower significance. Surprisingly the factor of better data protection was ranked as the least influencing factor. Compared with the findings of the opinion to data protection and security in this survey, it seems that the interviewed people disagree with the PRO factor of better data protection and therefore ranking it lower. This circumstance can also be seen in the ranking of the CON factors.
The findings about the con factors reveal a tendency toward lower data security as the main reason for refusal of a cloud based ERP system. Also, the transparency, where the data is stored and the federal laws in the country, where the ERP cloud vendor is operating, can influence the decision to move into the cloud adversely. Higher migration costs, the infrastructure of the companies and a possible low commitment of the management are a minor part. The following figures 14 and 15 give an overview on how the PRO- and CON-factors where ranked, using the summarized means as the data source. Each bar displays the summary of means of each factor. The lower the mean the higher the rank.
Figure 14: Ranking of PRO-factors

Source: Own illustration

Figure 15: Ranking of CON-factors

Source: Own illustration
5. Discussion

In this chapter the findings of the theoretical part and the results of the analysis of the survey are discussed. The theoretical is be the basis for the answers regarding the sub problems. With the findings of the survey, the answers are more precise. The results show that there are impacts from different factors that are probably unique for the German area of Europe. This area is known to be strict in topics as data protection, which can be recognized in the federal laws regarding data and its protection in this group of countries. Further, the results shows that companies tend to store their data in house, since they are recognizing a global rise in security threats. It seems, especially after conducting the literature, that businesses are trusting their own “firewall” more than established cloud vendors. A closer look on the findings show surprisingly circumstances, that the suspicion against the big player as Google and Amazon, especially their data protection and security measurements against hacker is lower than expected. Companies, especially the asked people, tend to trust the security measurements of cloud provider in general. Still, the ranking question showed a tendency to rejecting a cloud ERP system because of the risk of data loss. This is contrary to the trust level they showed in the question about the trust in cloud provider regarding security. Even under the factors which are speaking for a cloud based ERP system, this factor was ranked as the least attractive one. This implies that there is still not enough trust for an ERP system in the cloud. This factor is also supported by the second rating question about the factors against a cloud based ERP system. The probably higher risk of data loss and the uncertainty where the data is stored, also called transparency of data, was ranked very high. Summarized, data protection is still the main issue when it comes to processing sensible- and personal data in the cloud. An ERP system is processing sensible data in most of the time.

Data protection laws in the country where the servers of a Cloud-ERP vendor are located can have influence on the decision whether to move or not to move into the cloud. There might be consideration among the companies to prefer, if necessary, the vendor with harder data protection laws. As already mentioned in this thesis, the United States of America has weaker data protection laws. Companies which are eager to move into the ERP cloud, with the headquarters located in Europe, might not choose an ERP cloud vendor with datacenters in the USA since of those uncertainties. To get a more exact result about vendors with servers in the US, a special dataset that covers those constellations is needed. Therefore,
it seems that an ERP cloud vendor with server sites in the United States is at a disadvantage and laws, especially legal restraints can have a huge impact on ERP cloud adoption.

Quality of the infrastructure was rated very well by most of the surveyed companies. The ulterior motive of this question was that companies with a lower quality of infrastructure would rather move to a cloud based ERP system to avoid downtimes and lower speed respectively reaction time of their system. However, the results showed no significance between companies which have already considered to move into the cloud towards the companies without any considerations. Therefore, the fear of a possible bottleneck because of the lack of not enough bandwidth is a minor one. Although, the comparison of the means showed a slightly tendency of companies which rate the quality of their own infrastructure lower had already done consideration to move into the cloud. That does not implicate that a lower infrastructure encourages a change but still is a factor for change. The ranking question also reflected this circumstance since it was ranked as the last factor why a company would reject the move to a cloud based ERP system. Since the question about infrastructure was oriented on the speed and liability of the internet connection of the company, there are no data obtained about the intern infrastructure of the companies’ IT system.

The research about factor costs showed that the outsourcing is seen more critical from invested people older than 50 years. That can imply that older people are fearing IT outsourcing more than younger ones. There might also occur resistance to change among people which are responsible for an existing on-site ERP system and fearing the risk of a job loss. The ranking question however showed that lower hardware cost and lower follow up cost are playing a positive role in the decision whether to move into the cloud or not. Startup cost are ranked lower as factors for a move to a cloud based ERP system. This can be explained by the special composition of the pool of surveyed companies. Those companies have already established an ERP system and the willingness to change is driven by factors than the startup costs.

When we take a closer look on the percentage of investigated companies, which had already done consideration to move to an ERP cloud, there are two factors where a difference to the rest of the sample is significant. When considered the means of the answers of both groups, the group with consideration of moving, tend to rate the option of use mobile devise and the option to access the ERP system from such devices better. Another factor which is
rated higher is the factor of IT cost reduction through outsourcing benefits. Since the results are significant, a tendency to reduce costs and to get access to new ways to access the ERP system are noticeable.

The findings in the literature about culture shows that a culture can have an impact and it must considered when establishing an ERP cloud system among different sites and offices in different countries with different cultures. Especially in “sharing” cultures as the Asian countries, where data privacy has a lower priority, there might be a different approach to cloud services and cloud based ERP systems. The German speaking region tends to have more doubts when it comes to data privacy, when interpreted the literature and survey results. This must also be considered when programming and launching such a system.

The last discussed point is the factor customization of cloud based ERP systems. As the traditional on-premise ERP systems, a cloud version must be at least highly configurable to meet the customer’s needs. Standardized, inflexible ERP cloud system will only fit for small or very specific ERP systems. It cannot be expected that companies are going to adapt their business processes to the cloud ERP system. For very specialized companies and enterprises with complex business processes, a SaaS solution is advisable. Also, the result of the survey when negative factors got ranked, the customization is ranked on the fourth position. Nevertheless it cannot be said if a cloud based ERP system causes more customization cost than traditional ERP systems.

Comparison with similar findings

During my research I found similar papers to the topic of this thesis. Peng & Chao (2014) investigated an IT consulting company in India. Thereby, 16 IT-consultants were interviewed to similar questions to the questionnaire of this thesis. Their findings confirm my theoretical findings about benefits and disadvantages. They also stated, that new topics as the data security can have a negative impact on the decision to move to a cloud based ERP system, mostly caused through lack of experience of the deciding managers. (Peng & Gala, 2014) As there are benefits for both forms of ERP systems they researcher recommend a hybrid solution. I support this recommendation as my findings came to similar results.
6. Conclusion and limitations

This thesis has shown different aspects of an Enterprise Resource Planning system. It has discussed benefits and disadvantages when an ERP system gets deployed into the cloud. It has investigated the impact of those factors which were first found during a literature research. The investigation of an actual sample was done through a survey which was conducted in December 2015 by the author. The theoretical findings combined with the survey show, that those observed factors have an impact on companies with already implemented on-site ERP systems.

Theoretical implications

Even with a high respond rate on the survey and over 90 respondents, in some cases a significance was not measurable. Therefore a future study has to conduct a bigger pool to get significant result. Another aspect was the type of pool in this survey. The pool existed out of customers of an ERP developer and provider. Therefore, the pool was almost completely filled with companies which already had implemented an ERP system. Future studies should therefor focus on the companies, which are in the process to decide for a suitable enterprise resource planning system but do not have deployed an ERP system. To get a comparison with other regions, suitable pools in other regions have to be found and surveyed.

Managerial Implications

If a company has to decide whether to move into the cloud with their ERP system or has to implement an ERP system into their company, they should gather enough information of both types of systems. Both come with their advantages and disadvantages but lack of experience should not lead to wrong decision. Older misconception that the cloud is unsafe in factor data security and data protection is out to date. There is still a risk, but the risk of an attack of the own on-premise infrastructure is more likely. New options to access the cloud via mobile devices can be a threat for security but can also enrich the possibilities. Monitoring the actual numbers can be a factor for the management to give cloud a change. As always in the business world an outsourcing process of such a major system can have the biggest impact when a decision has to be made. The IT department as well as the management have to be convinced that an ERP outsourcing is not a reason for downsizing, it is more an “ease” from the ERP system and enables them to focus on the real goals and contribute value to the company assets.
Limitations

First of all, it has to be stated that through the limitations of suitable sample of other countries e.g. United States of America, it is was not possible to compare the outcome of the survey with primary data from other countries or areas. Another limitation which occurred was the circumstance that the sample existed mostly out of customers from an ERP provider which has no own cloud ERP in its product portfolio. Other reflections occurred during the evaluation of the results. For one, the survey companies could have thought that the supporting company is planning a cloud based ERP system and were trying to influence the outcome of the survey negative or positive.

The survey was conducted not always by the management or decision maker of the companies. Moreover it is difficult to estimate what exact position and what roles the answering person has in the companies. It might have been better to interview such person because it would have given more room to adapt and react to the actual situation in the company and how is answering the questions.

As already mentioned was the pool unilateral but still provided the thesis enough information to give a first insight of the intricacies of the German speaking region. Further investigations might get more detailed in type of questions and/or the targeted pool.
7. Acknowledgements

First, I want to say thank you to my two professors Prof. Dr. Friedrich Roithmayr and Prof. Dr. Kevin Elder. Prof. Dr. Elder from the Georgia College and State University gave me the first impetus for my thesis. During a year abroad at this university, I was allowed to attend to one of his research classes. There the foundation was made for this thesis. During the following period of research he was my mentor and supported me. Back in Austria Prof. Roithmayr from the Johannes Kepler University supported me and leaded my research in Austria.

Second I want to give thanks to Nane Malek, MSc who supported me in desperate times and brought me back on the way. She also lectured my thesis to give it the finishing touch and make it readable.

At last I want to say thank to my environment that is eager on my submission and propelled me to the completion of this master’s thesis.
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Appendix I: Questions surveys

Page 1:

Thank you for participation! You are answering a survey which purpose is to evaluate the usage of outsourced Enterprise Resource Planning Systems in the Cloud (SaaS). The outcome will be used in a Master’s Thesis.

a) Where is your company located?
   - Austria
   - Canada
   - Germany
   - Switzerland
   - United States of America

b) What is your actual job title?
   - IT-manager
   - Network-Administrator
   - Software Engineer
   - Software Architect

c) How old are you? (in years)
   - <25
   - 25-30
   - 30-35
   - 40-45
   - 45-50
   - >50

d) How many employees are employed in your company?
   - 1-10
   - 10-50
   - 50-100
   - 100-250
   - 250-500

e) What is your company’s main industry?
   - Media/Entertainment
   - Internet/Computer technology/Telecommunication
   - Education/Community service
   - Textile industry
   - Marketing/Market research
   - Government
   - Energy
   - Agriculture/Food/Restaurant/Drink and tobacco
   - Automotive
   - Law
   - Medicine/Pharmaceutical/Care
   - Construction
   - Shipping/Cargo

Page 2:

Questions regarding ERP situation in your company.
a) Is your company using an ERP System in your company?
   Yes → continuing with page 4
   No

Page 3:

b) Which kind of ERP System does your company use?
   Cloud based ERP/SaaS
   Traditional ERP System (local)
   Others:

c) Can you name the ERP product(s) in your company?
   Short own formulated answer

d) Are there already considerations of moving to a cloud based ERP System?
   Yes
   No

Page 4: (only if Page2/a) NO)

Reasons for not using an ERP System.

a) Please name the three most important reasons for declining an ERP System in the company?
   (Please choose the three most important ones)
   Migration costs
   No added value
   Higher follow up costs
   Size of the company
   Couldn’t find the right vendor yet
   Employees will reject change
   Actual solution is good enough

Page 5:

Questions regarding IT-Security, Data protection and Infrastructure

a) Do you think it is better to keep sensible data in-house because your company can protect it best on its own.
   Very accurate 1 2 3 4 5 6 7 Not accurate

b) How would you rate the security measures against cyber-attacks and data loss by big companies like Amazon and Google?
   Very good 1 2 3 4 5 6 7 Very poor

c) Can you name the roughly amount of your annual budget for cyber security? (USD)
   Amount in USD (not mandatory)

d) Would you rather choose cloud based ERP System with lower implementation cost over a more expensive traditional ERP system?
   Very likely 1 2 3 4 5 6 7 Not likely

e) Would laws, which are undermining data protection, affect your decision to move into the cloud?
   Very influencing 1 2 3 4 5 6 7 Not influencing

f) Is your company fearing any threats regarding cyber-attacks and criminal data loss?
   Very afraid 1 2 3 4 5 6 7 Not afraid
g) Do think that there is a rise in security threats?
Most likely 1 2 3 4 5 6 7 Not likely

h) How would you rate the infrastructure (speed, liability of your internet connection?)
Very Good 1 2 3 4 5 6 7 Very Bad

i) Would you prefer the advantage to use a cloud based ERP system on every device and from everywhere?
Strongly agree 1 2 3 4 5 6 7 Don’t agree

j) Which cloud service provider with ERP products do you know?
SAP Cloud
Oracle ERP Cloud
Sage
Microsoft Dynamics
...

k) Do you think there potential to reduce costs in the IT-department because of the outsourcing effect of moving the ERP into the cloud?
High potential 1 2 3 4 5 6 7 Low potential

Page 6:
ERP Cloud Vendors

a) Rating of PRO-Reasons
(Please rate how the following point would influence you in the decision to choose the right ERP-Cloud System for your company.)
(one answer per column and row)

<table>
<thead>
<tr>
<th></th>
<th>1 (high</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7 (low priority)</th>
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</thead>
<tbody>
<tr>
<td>Lower hardware investments</td>
<td>X</td>
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<td></td>
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<tr>
<td>Low startup costs</td>
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<td>X</td>
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<tr>
<td>Less internal costs (follow up costs)</td>
<td>X</td>
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<td>Same performance at every size of the company</td>
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<td>X</td>
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<tr>
<td>Scalability</td>
<td></td>
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<td>X</td>
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<tr>
<td>Automatic Upgrades and Updates (incl customization)</td>
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<td></td>
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<td>X</td>
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<tr>
<td>Access from everywhere</td>
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<td>X</td>
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</tbody>
</table>
Page 7:

**a) Rating of CON-reasons**

(Please rate how the following point would influence you in the decision to choose not an ERP-Cloud System for your company)

(one answer per column and row)

<table>
<thead>
<tr>
<th></th>
<th>1 (highest prio)</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7 (lowest prio)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transparency of data storage (in which countries are the servers)</td>
<td>X</td>
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<tr>
<td>Data security (How is the data protected)</td>
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<tr>
<td>No top level management support</td>
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<tr>
<td>Data protection laws in the country of an ERP-Cloud vendor</td>
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<td>X</td>
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<tr>
<td>Low infrastructure where the company is located</td>
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<td>X</td>
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<tr>
<td>Higher customization costs</td>
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<td>X</td>
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<tr>
<td>Low capabilities to customize the ERP system</td>
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<td>X</td>
</tr>
</tbody>
</table>
Appendix II: Sworn declaration

I hereby declare under oath that the submitted Master’s Thesis has been written solely by me without any third-party assistance, information other than provided sources or aids have not been used and those used have been fully documented. Sources for literal, paraphrased and cited quotes have been accurately credited.

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