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Cloud Adoption in the Spotlight – Empirical Insights from German IT Experts

Full Paper

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Abstract

In comparison to traditional IT paradigms, cloud computing enables to obtain desired computing resources on-demand without requiring large, upfront investments and to dynamically adapt and scale these resources to varying business requirements. However, cloud computing is not a panacea. This drives the need to examine the specific reasons and requirements for cloud adoption in practice. In this paper, we take a twofold approach for this purpose. First of all, we follow an analytical approach by conducting a literature survey on existing adoption frameworks in order to analyze the complete life cycle of the adoption process and derive five hypotheses for cloud adoption. In the second step, we identify the major criteria that foster the adoption of cloud computing from the perspective of IT experts within an empirical study. The study indicates that three out of our five hypotheses prevail in practice and that the replacement of legacy systems with public cloud offerings constitutes the most prevalent use case.

Keywords

Cloud computing, migration, adoption, life cycle, empirical study.

Introduction

Today's CIOs still consider cloud computing to be among the most promising IT investment priorities (Saran, 2015). Cloud computing is anticipated to outperform traditional IT paradigms. While every organization had to maintain its own infrastructure in the past yielding large upfront investments and underutilized resources, the consolidation of IT resources in large data centers managed by a cloud provider offers major advantages. First, the cost of entry is significantly lowered by turning capital expenditure into operational expenditure. Often, a pay-per-use model is applied. Second, IT resources can be seamlessly scaled according to the needs of an organization. This provides major advantages for example for startups, allowing IT landscape scaling depending on the growth of business. Finally, cloud computing allows for new and disruptive types of applications. For example, applications running on

smartphones now become able to offload data to the cloud for further processing (e.g., the digital assistant Siri of Apple) in order to account for the limited resources and battery lifetime of the smartphones.

Despite the aforementioned advantages associated with cloud computing, several issues still exist that are currently addressed in research (e.g., security concerns, migration of on-premise legacy systems). However, research on cloud adoption is lacking an industrial perspective (Jamshidi et al., 2013). Therefore, in this paper we perform a joint analysis by, first, conducting a literature survey which is then complemented by an empirical study, in which we exploit the knowledge obtained from interviews with IT experts in order to derive the main drivers and obstacles of cloud adoption in industry.

The remainder of this paper is structured as follows: The next section gives an overview on existing migration frameworks in literature and corresponding criteria that impact cloud adoption. As a result, we derive five hypotheses which are to be reconsidered in the context of our empirical analysis. Subsequently, we describe the methodology of our empirical study and present the findings from the IT expert interviews. In this respect, we also discuss whether our hypotheses prevail in practice. The paper closes with a summary and an outlook on future work.

Literature View on Cloud Adoption

Existing research that has been conducted in the field of cloud adoption so far can be distinguished into two different research directions: *(i)* migration frameworks and *(ii)* influencing factors. While the former provides explicit guidance when cloud adoption is taken into account, the latter research works explore advantages, drawbacks, and obstacles. In the following, we first provide a brief overview of three major migration frameworks which are the most relevant to the work at hand. Afterwards, we present major influencing factors mentioned in the literature.

Migration Frameworks

Among the existing migration frameworks, we have found two different types. While the first solely focuses on the decision process itself, the latter research works take a much broader view and consider the whole lifecycle of cloud adoption resulting in all-embracing migration frameworks.

Conway and Curry (2012) propose a migration framework in the form of a lifecycle model. The model is a conjoint work by leading organizations from the industry, such as Microsoft, Intel, SAP, Chevron, Cisco, The Boston Consulting Group, Ernst & Young, and Fujitsu, the non-profit sector, and academia. For the design of the lifecycle model, a process comprising defined review stages and development activities based on the Design Science Research guidelines described by Hevner et al. (2004) was applied. The lifecycle model itself consists of four phases which in turn encompass nine different steps in the process of cloud adoption. The different phases of the model are briefly explained in the following since we partially establish the design of our empirical study on that model. The first phase (*Architect Phase)* aims at evaluating the scope of the cloud project. Steps included in this first phase comprise investigating the business goals, identifying the appropriate areas to be moved to the cloud and the impact of their migration on, e.g., cost, infrastructure, and stakeholders. This defines the implementation strategy concerning the management of the roll-out, and provides a detailed business design with regard to the requirements and the management of the new service. According to Conway and Curry (2012), the major challenge in this first phase is to select the appropriate services depending on their maturity and functionality and to engage all stakeholders at an early stage in order to prevent attempts to correct troubled services by moving them to the cloud. This phase results into our first hypothesis stated below.

Hypothesis M1: Not every kind of service is suitable to be moved to the cloud.

The second phase (*Engage Phase*) embraces the two steps of selecting the most appropriate service provider who meets the requirements identified in the first phase and negotiating the terms and conditions of service usage. The authors state that organizations mostly fail in the end if they compromise on some functionality or requirements in this phase. In the third phase (*Operate Phase)*, managing the operational roll-out as well as the supply chain are the two major steps which have to be considered. For the operational roll-out, a project team that manages the transition of the identified services to the cloud has to be set up while the integration of the new cloud services into the existing IT management structure is in the focus of supply chain management. Conway and Curry (2012) recommend planning the option of

switching back to an in-house solution in order to reduce the risk of a failed transition. The last phase (*Refresh Phase)* deals with revisiting the cloud service requirements to counter the risks from changes within the market or the supplier organization and to initiate a new cloud project cycle if adaptations or new arrangements are necessary. Among the organizations analyzed by Conway and Curry (2012) those having a clear vision of future cloud service enhancements had greater success in that phase.

Robrecht et al. (2012) describe another migration framework that is similar to the lifecycle model proposed by Conway and Curry (2012). The migration framework also comprises four different phases and, in contrast to Conway and Curry, accounts for responsibilities. The four phases have been derived from the Interact-Serve-Propose-Agree-Realize (ISPAR) model defined by Maglio et al. (2009). Each phase is characterized by a certain set of decisions. In order to formalize the responsibilities, the authors present a so-called RACI (Responsible, Accountable, Consulted, and Informed) matrix that maps the decisive activities within each phase to the responsible processes of the IT Infrastructure Library (ITIL) framework. According to the RACI matrix, the actual decisions whether to move certain services to the cloud or not take place in the *first phase of the lifecycle* and the Service Portfolio Management process of the ITIL phase Service Strategy is considered to be mainly responsible for these decisions. The following second hypothesis can be derived from that first phase.

Hypothesis M2: Enterprises decide on a per-service-basis, if they move to the cloud or not.

In the *second lifecycle phase* of the migration framework proposed by Robrecht et al. (2012), appropriate cloud providers and services are selected and the related decisions mainly correspond to the processes of the two ITIL phases Service Strategy and Service Design. The *last two phases in the lifecycle* model deal with the startup of the service and runtime management. In this respect, Robrecht et al. point out that although responsibilities are shifted to the cloud provider, processes of the ITIL phases Service Transition and Service Operation are still relevant for internal IT providers.

A third migration framework has been developed by *Jamshidi et al. (2013)* which serves as a reference model for moving legacy systems to the cloud. The model was created based on a literature review comprising 23 studies that were published between the years 2010 and 2013. Similar to the two frameworks introduced before, the reference model also distinguishes four different phases, denoted as processes. In contrast to the former works presented so far, three of the processes are sequential whereas the fourth process embraces crosscutting concerns and thus, represents an umbrella process. In addition, Jamshidi et al. identified four distinct *migration types*. The simplest migration type is to *replace legacy systems by using cloud services*, which requires extracting and exporting the existing data to the cloud. The second type incorporates a *partial migration of system components*, eventually resulting in a hybrid cloud scenario. The third option is *migrating the entire application stack* where the application stack is simply moved to a virtual machine without modifications. The last migration type denoted *cloudification*, i.e. an application is transformed into its cloud counterpart through cloud service composition. Overall, the literature review conducted by Jamshidi et al. (2013) underlines our third hypothesis.

Hypothesis M3: Among the migration types cloudification prevails.

Other research works on migration frameworks solely focus on the decision-making process and thus, on the first phase of the lifecycle in comparison to the former approaches. Matros et al. (2009) propose a formalized decision model which incorporates aspects such as the amount of data to be transmitted in terms of transmission costs, as well as, the resource utilization in terms of, e.g., computing power and stored data. Greenwood et al. (2010) provide a toolkit which divides this process into four different stages. While the first stage, denoted as technology suitability analysis, considers cloud adoption from a technical perspective, the remaining stages take an organizational perspective with regard to cost modeling, the impact on stakeholders, and the modeling of responsibilities. The research works by Matros et al. (2009) and Greenwood et al. (2010) underline that not only guidance throughout the different phases in the lifecycle of cloud adoption is necessary but also in-depth knowledge of the factors influencing the decision in the first phase is required. Therefore, we also analyzed the influencing factors on cloud adoption mentioned in the scientific literature. Selected results of that analysis are presented in the next section.

Influencing Factors

For the purpose of analyzing the factors influencing the decision of cloud adoption, we conducted a literature review. To determine the impact of a paper we considered e.g., the number of citations (at least

35 citations), the significance of the authors and the impact of the conference or journal. Hence, we identified 18 relevant papers and 9 influencing factors, e.g. relative advantage or complexity. In the following we identified the factors "relative advantage" and "complexity" that are defined according to Rogers (1995) as: *Relative advantage* can be defined as "the level to which an advantage is perceived as better than the idea it supersedes" and *complexity* as "the degree to which an innovation is perceived as relatively difficult to understand and use". Table 1 summarizes the results of our analysis.

Influencing Factor	Impact	Source
Suitability of the application	The amount of changes required for migration and the importance of the IT resources negatively affect cloud adoption.	Armbrust et al. (2010), Beserra (2012), Nuseibeh (2011)
Relative advantage	In cloud adoption, the relative advantage over legacy-systems is measured in terms of, e.g., cost savings, features, scalability, time-savings, or increased collaboration.	Beserra (2012), Hajjat (2010), Johnson (2012), Low (2011), Morgan (2013), Nuseibeh (2011), Truong (2010), Yeboah-Boateng (2014), Zardari (2011)
Complexity	Complexity in cloud adoption, e.g., migration decisions involving multiple, possibly conflicting factors, the variety of available cloud services and models as well as the effort of migration tasks	Beserra (2012), Hajjat (2010), Khajeh-Hosseini (2010), Low (2011), Menzel (2012), Morgan (2013), Nuseibeh (2011), Saripalli (2011), Truong (2010)
Security concerns	Security concerns mostly exist with regard to data confidentiality, failures in large-scale distributed systems, and auditability.	Armbrust et al. (2010), Avram (2014), Beserra (2012), Carcary (2014), Hajjat (2010), Johnson (2012), Kim (2009), Menzel (2012), Morgan (2013), Nuseibeh (2011), Ren (2012), Saripalli (2011), Truong (2010), Yeboah-Boateng (2014), Zardari (2011)
Availability, reliability, connectivity, and response time	Some business-critical applications require high availability, reliability, world-wide uniform access, and a low response time.	Armbrust et al. (2010), Avram (2014), Beserra (2012), Hajjat (2010), Johnson (2012), Khajeh-Hosseini (2010), Kim (2009), Menzel (2012), Morgan (2013), Saripalli (2011), Truong (2010), Yeboah-Boateng (2014), Zardari (2011)
Lock-in effects and interoperability	Today's cloud services still lack standardized interfaces. Hence, the interoperability between different cloud providers may be considered as an obstacle.	Armbrust et al. (2010), Carcary (2014), Khajeh-Hosseini (2010), Nuseibeh (2011), Yeboah-Boateng (2014)
Control over IT resources	With the adoption of cloud computing, responsibilities are shifted to the cloud provider. Enterprises fearing loss of control.	Beserra (2012), Carcary (2014), Johnson (2012), Morgan (2013) Nuseibeh (2011), Saripalli (2011), Yeboah-Boateng (2014)
Compliance	Compliance can be considered in terms of legal concerns or adherence to internal rules of an organization.	Avram (2014), Beserra (2012), Carcary (2014), Johnson (2012), Kim (2009), Morgan (2013), Yeboah-Boateng (2014), Zardari (2011)
Trialability	Cloud systems can be evaluated in, e.g., pilot studies, prior to full adoption.	Morgan (2013)

Table 1. Factors affecting cloud adoption in the scientific literature

From the results of our analysis of influencing factors, we derive two additional hypotheses. The first follows from multiple categories mentioned in the table above. The description of the category s*uitability of the application* states that the willingness for cloud adoption decreases with an increasing significance of the IT resources to be migrated. The significance of applications can also be expressed by the term *business-critical application*. Basically, an application can be considered to be business-critical with regard to the application itself and/or the data being processed. The former refers to applications where a

failure affects the existence of a company (Liver and Kaufmann, 2013). In the latter, data is either directly sold to customers or used for product creation (Soliman and Youssef, 2003). Concerning data-related issues, Armbrust et al. (2010) already emphasized that there is a widespread perception that sensitive business data will never be moved to the cloud. Moreover, they also mention performance unpredictability as one of the ten major cloud obstacles. In case of business-critical applications with sensitive data and high performance requirements, companies may hesitate to move these applications to the cloud. By shifting the responsibility to a cloud provider, companies face a loss of control over such issues. This also applies to legal concerns. Data could be moved unnoticed to different data center locations leading, e.g., to a lower level of data privacy. Given all the issues mentioned before, the *relative advantage* of moving a business-critical application to the cloud must outweigh the associated risks. According to Avram (2014), cloud adoption should be a well-informed decision. This results into our first hypothesis that is derived from our analysis of influence factors.

Hypothesis F1: Applications that impact key competencies will not be migrated into the cloud.

Our analysis on migration frameworks revealed that there exist no common guidelines so far on how to best support the process of cloud adoption. Furthermore, multiple, possibly conflicting influencing factors exist and yet have to be taken into account. This complexity raises the need for developing adequate frameworks which facilitate decision-making (Saripalli, 2011). Moreover, this complexity suggests that companies will rather tend to adopt cloud services in the long run in order to overweigh the decision and migration effort linked to temporary usage. Although cloud providers may also offer the opportunity for a short-term evaluation of their cloud offerings, prior to full cloud adoption, such a temporary usage is part of the decision process and thus, considered different from temporary cloud adoption. Having successfully finished such a *trialability* phase, applications for long-term usage are very much likely to be successfully migrated to the cloud, too. Otherwise, companies will probably refrain from using cloud services. Finally, companies are facing lock-in effects which will also make the temporary usage of a certain cloud provider more difficult. Therefore our second hypothesis derived from our analysis of the influencing factors refers to the duration of cloud usage.

Hypothesis F2: Applications that are migrated for a long-term usage prevail.

Empirical Study of Cloud Adoption

For our empirical study, we conducted five interviews with IT experts from different organizations. As selection criteria, we chose interview partners on the executive level with authority or insight into cloud operations among organizations that exhibit a lifetime of more than 10 years and that use cloud computing for their internal business tasks. All interviews were conducted via phone and recorded at the same time for transcription. The interview lasted about 45 minutes. The interviews were performed using a questionnaire in an oral and semi-structured way in order to be able to adaptively react to the received answers which were not predefined in advance allowing for new conclusions. In doing so, we closely followed the features of an expert interview (Bähring et al., 2008).

The questionnaire was structured as follows. At the beginning, it contained some general questions about the business corporation (e.g., industrial sector, number of employees) and the role of the interviewee in the company (e.g., position, responsibilities). This was followed by general questions on cloud computing (e.g., the role of cloud computing w.r.t. the business strategy). The main part of the questionnaire comprised questions about the first cloud project. This part was structured based on the stages in the migration framework proposed by Conway and Curry (2012). That model was chosen since it constitutes a conjoint work of leading organizations from the industry, the non-profit sector, and academia, and thus, can be considered as the most mature one. However, to cover all stages of the migration process of the first cloud project in the questionnaire, we had to extend the model by Conway and Curry (2012). In addition to the four migration phases in this model, our study also aimed to account for aborted cloud migrations and temporary usage scenarios. Therefore, we extended the existing migration model and added an *Abort phase* in order to retrieve the reasons for aborting the migration process and a *Termination phase* in order to account for completed cloud projects with temporary usage. Each stage of the project in the questionnaire dealt with the benefits, obstacles, and conditions from both, a technical and an organizational perspective. The questionnaire finished with questions on future cloud projects (e.g., services to be moved next and their perceived suitability).

System of Categories

The transcripts of the interviews consisted of 10 pages on average and were analyzed using a qualitative content analysis (Gläser and Laudel, 2009, Mayring, 2010). Basically, the qualitative content analysis constitutes a systematic method in which techniques for content analysis are applied in order to retrieve a system of categories from a given text material. According to Mayring (2010), three basic techniques for content analysis can be distinguished: summarizing, structuring, and explication. The *summarizing technique* makes use of abstractions in order to obtain a representation of some text material by a single statement. The *technique of structuring* aims at identifying a structure within the material and to arrange it according to the deduced categories. In case the meaning of some parts in the text material is not clear, the *explication technique* serves to collect more data from the context with the aim to clarify these parts. As result of our empirical study, we obtained a system of categories over three levels. Table 2 depicts an excerpt of our system of categories, which will be discussed in detail in the following.

1st Level Categories	2nd Level Categories
Business trend	Popularity, market pressure
Service immaturity	Feature set, teething problems
Preparation	Identity management, connectivity, bandwidth
Pilot cloud applications	Communication services, small user group, small investment
Requirements	Generation by users, service selection
User acceptance	Customization, off-the-shelf solution
Deployment model	Private cloud, hybrid cloud, public cloud
Qualified applications	General server and application hosting, storage, communication and collaboration services, customer relationship management, customer service, enterprise resource planning, mobile device management, office applications, content management
Organizational issues	Legal compliance, provider dependency, subsidiaries
Technical issues	Provider feedback, archiving, interconnection
Organizational reasons	Productivity, cost, service levels, secure resource sharing, infrastructure
Technical reasons	Maintenance, automatic backups, security standards
General advantages	service quality, availability, geo-redundant storage, scalability, being up-to-date
General disadvantages	Data transfer cost, industrial espionage

Table 2. Factors affecting cloud adoption in practice

Overall, our system of categories comprises 14 factors on the upper level that affect companies in the process of cloud adoption. As described, our questionnaire explicitly differentiated between the technical and the organizational perspective. While performing the interviews, some statements of the interviewees could be directly assigned to one of these perspectives as stated by the interviewee. Other categories have been derived within the scope of the qualitative content analysis. Table 2 also lists categories of *Qualified applications*, i.e., the services that were named by the interviewees to be suitable for the cloud. These services were either part of a former cloud project or were part of the future plans of the company.

Business trend: When being asked for reasons of cloud adoption, one answer appeared constantly that "cloud computing is a business trend". Companies consider cloud computing as a necessity to be competitive in the future. Customers implicitly require or explicitly request cloud computing which puts companies under pressure to adopt it. For example, one interviewee mentioned that "office from the cloud is an investment into our future". Overall, cloud computing is perceived as a disruptive technology.

Service immaturity: From the first cloud adoption projects, the considered companies learned that most of the cloud services are immature in comparison to on-premise offers. Mostly, the on-premise version existed before and the newer cloud services carry teething problems. The interviewees all agreed that these problems will eventually be fixed. One interviewee suggested keeping on-premise operations until these problems are finally fixed. Furthermore, an extension of the feature set happens far more regularly when it comes to cloud services, which potentially raises the risk of failures.

Preparation: An important factor for a smooth transition to the cloud is the amount of preparation preceding the actual migration. In the interviews, especially identity management for federation of on-premise applications with the cloud as well as high connectivity and sufficient available bandwidth at the business locations were mentioned as important success factors.

Pilot cloud applications: Communication services were mentioned as appropriate first cloud projects. E-mail services, for example, rely on standards such that the migration process becomes rather simple. This leads to the fact that the overall risk of adopting corresponding services from the cloud is very low. In addition, two further characteristics of communication services were mentioned making them more suitable for cloud adoption. First of all, a user-by-user-migration can take place so that only a small number of users is affected in the beginning to account for failures. Second, the initial investments are very low compared to other types of applications.

Requirements: In general, certain requirements must be fulfilled when choosing a cloud service. Our study revealed that these requirements are defined by the users of the service, since they are best aware of their necessities and might have already identified shortcomings of the current legacy application to be replaced by the cloud service. The final selection of the cloud service, however, is conducted by the IT department based on technical and organizational criteria including the definition of the mandatory features and the assessment of the cost-benefit-ratio.

User acceptance: Based on our results, the acceptance of cloud services by users depends on the fact whether customized or off-the-shelf cloud services are utilized. While customization may be prone to errors and more expensive, off-the-shelf solutions might not fulfill all the users' needs and the users might need some time to get acquainted with the new services. One interviewee asserted that especially older employees have difficulties in adopting new cloud services. In contrast, most of the younger employees have already got acquainted with cloud services outside daily business experience through, e.g., social media platforms. Here, customization can help to speed-up user acceptance.

Deployment models: Within the scope of our study, public cloud deployments were the most common deployment model. Hybrid cloud deployment scenarios were mostly only used during the migration of on-premise systems to the cloud. After the successful migration, the on-premise systems were shut down due to operating costs, thereby turning the operation scenario into a public cloud scenario. As expected, private cloud deployments were conducted for applications processing high sensitive data.

Organizational issues: The first factor in this category is legal compliance, e.g., regarding privacy. One interviewee mentioned that the safe harbor privacy principles stopped the introduction of a cloud service due to unclear legal implications. Another factor represents the dependency on the cloud provider. In case that a service exhibits failures the business enterprise depends on the cloud provider to fix these issues. If a service becomes unreliable a company might also want to change the cloud provider. For this purpose, the existence of an exit strategy was mentioned as a mandatory requirement.

Technical issues: On a technical level, three major issues were mentioned. The first major issue is the lack of feedback of the provider when settings are changed by the user. The interviewees had the experience that there is no immediate response when settings are changed. Instead, the changes somehow propagate through the system for minutes to hours until they are eventually active. Archiving was mentioned as second major issue. Legal requirements force companies to archive documents for a certain period of time requiring processes in order to archive documents from cloud services. A last major issue is the interconnection of different cloud services. A central identity management was named several times and one participant mentioned the fear of security vulnerabilities introduced by the interconnection.

Organizational reasons: The interviewees mentioned several benefits to be expected with the adoption of cloud computing. The most mentioned benefit was productivity. The companies expected an increase in sales, a higher production rate, and streamlined workflows. Also, the costs were often mentioned. The

investments that have to made for cloud computing were perceived to be small in comparison to services operating in-house. The participants especially stressed that the service levels in the cloud are much higher than they could actually provide. One interviewee described the cloud as neutral ground. Generally speaking, it enables the sharing of resources in a secure fashion. The last reason that was mentioned is the small amount of own infrastructure required for using cloud computing.

Technical reasons: On the technical side, interviewees mentioned the reduced maintenance effort. Most cloud services provide a Web interface where all administrative settings can be made. Automatic backups were mentioned by another participant. Finally, security standards were perceived to be higher than the usage of on-premise solutions. All interviewees considered cloud adoption as a gain in security.

General advantages: One interviewee mentioned that the service quality is higher than it could ever be provided in-house. We assume that this holds true for all small and medium enterprises, as they typically do not staff positions twenty-four-seven. Availability was mentioned several times. Since cloud providers are usually running different data centers at several locations worldwide, the availability is very high. Furthermore, geo-redundant storage of backups provides an additional level of safety. In addition, scalability was mentioned several times, especially that new users can be easily added without requiring great investments and that only those resources necessary are provisioned at each point in time preventing unused resources. Finally, multiple participants mentioned being always up-to-date is a general advantage of cloud services. In general, cloud services do not rely on release cycles like classic software. Cloud services are continuously updated with users sharing the new version at the same time.

General disadvantages: The first disadvantage named by the interview participants is the high data volume. On the one hand, cloud services are built for managing high volumes of data. On the other hand, uplink traffic is often billed by cloud providers. Therefore, very high amounts of data might turn cloud computing uneconomical since that amount of data is traditionally only shared within the company network only. The last disadvantage is the risk of industrial espionage. As data is generally outsourced to a cloud provider, the risk of industrial espionage cannot be completely ruled out according to one interviewee. Large cloud providers might be especially attractive targets, as a single security flaw might open doors to spy out multiple companies.

Revisiting our Hypotheses

As part of our literature research, we compiled some first hypotheses to be reconsidered within the scope of our empirical study. Concerning *Hypothesis M1*, we assumed that not every kind of service is suitable to be moved to the cloud. Although the results of our study revealed that some applications are more suited than others and that the decision to adopt cloud computing depends on the specific requirements of a company, we could not find any evidence that there is any application which is not suitable for cloud migration. In contrast, some interviewees explicitly stated that all applications are suited in general. Therefore, Hypothesis M1 could not be confirmed.

Our second *Hypothesis M2* claimed that the decision of a company to move to the cloud is made on a per-service basis. The results of our study support this hypothesis. The requirements to fulfill certain tasks by using a cloud service are obtained from the end users. Based on the requirements, the decision to select a certain cloud service among the services offered in the market is finally made by the IT department. Hence, the decision is made on a per-service basis confirming our hypothesis.

Regarding the migration types, we expected that cloudification prevails (*Hypothesis M3*). However, our findings are in contrast to that assumption. Replacement of legacy systems by cloud offers was the dominant migration type we encountered which leads to discarding Hypothesis M3.

Our literature research on influencing factors indicated that applications affecting key competencies of companies will not be migrated to the cloud (*Hypothesis F1*). Within the scope of our empirical study, we could not find any evidence supporting this hypothesis. On the contrary, one interviewee explicitly stated that he expects his organization to be completely cloud-based by 2020.

The interview participants highlighted cloud projects intended for a permanent usage of cloud services. No company had either initiated nor was planning a temporary use of cloud services endorsing *Hypothesis F2*, i.e., that applications migrated for long-term usage prevail on the temporal dimension.

Conclusion

Today, moving to the cloud seems very promising due to low upfront investments, optimal resource utilization, unlimited scalability, and new types of applications. However, companies planning to move to the cloud often face several pitfalls. So far, an industrial perspective of cloud adoption has rather been poorly considered in research. Therefore, we have performed a joint analysis in this paper by conducting an initial literature survey on cloud adoption which is complemented by an empirical study. In our study, we exploited the knowledge of IT experts within the scope of semi-structured interviews in order to derive the main drivers and obstacles of cloud adoption in industry. By applying a qualitative content analysis, we obtained a system of categories summarizing the experience of companies regarding cloud adoption. The results revealed that companies are influenced by multiple, partially conflicting factors in the decision process of cloud adoption of which many have already been attributed to cloud computing by researchers so far. However, some of these factors are considered differently in practice. For example, all interviewees considered the security standards of cloud services to outperform on-premise solutions. In contrast, security is often considered as a major obstacle in literature. Besides well-known factors, also new factors were introduced within our empirical study. To the best of our knowledge, service immaturity and user acceptance, for example, have not been mentioned in research so far. Companies still regard cloud computing as something that is evolving. Cloud services are perceived to be immature compared to on-premise solutions and pilot cloud projects are best to be started with applications that affect only a small user group and demand low investments. Within the results of our study, a single use case was dominant: the permanent usage of public cloud services with a migration strategy that replaces legacy applications with publicly available cloud offers. Overall, our study revealed that companies consider cloud computing as a business trend where adoption is indispensable in order to successfully compete in the market. For the future, we found that the companies consider more applications for cloud migration. In the next years, the growth of cloud computing will continue as more companies take their step into the cloud. This will also keep the interest in exploring the factors which affect companies in cloud adoption and to work on frameworks supporting the decision and migration process.

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