

Cloud-Computing in Banking

Influential Factors, Benefits and Risks from a Decision Maker's Perspective

Completed Research Paper

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ABSTRACT

In 2008 Gartner Group listed "Cloud-Computing (CC)" in its Hype-Cycle (Gartner, 2008). Since these days, enterprises in different industries discuss the utilization of cloud-computing for their own benefit.

The banking industry traditionally is heavily dependent on information technology. Therefore, it can be assumed that cloud-computing could be of particular interesting for banks. This paper investigates the use of cloud-computing in German banks and the associated benefits and risks as senior management perceives them. Grounded in the TOE-Framework ten expert interviews with senior decision makers German banks have been conducted to evaluate the decision criteria pro and con cloud computing.

Several factors influencing the cloud-computing decision have been detected, amongst them the technology supporting infrastructure, government regulations and security and compliance requirements. Furthermore the financial benefits came up as the most important perceived benefit and government regulation (esp. privacy/security regulations) are the most important risks perceived by senior management.

Keywords

Cloud-computing, Banking Industry, TOE-Framework, Expert Interviews

INTRODUCTION

The use of Information Technology (IT) in banks is mainly driven by increasing customer demand and rising transaction volume (Lamberti and Büger, 2009). As such, banks are intensive users of IT (Berger, 2003) and consequently, IT plays an important role in the banking industry.

Many researchers report cloud-computing to be the next big-thing in IT (Sultan, 2010). If this is the case it can be expected to read more about the deployment of cloud solutions in the technology intensive banking industry. However, hardly any documented cases of CC use in German banks are published to date. This brings up the question why banks lagging behind on this technical innovation? Therefore this research has been set up to get deeper insights into the decision process which leads towards the adoption (or non-adoption) of cloud-services. We want to investigate the factors influencing the cloud-computing decision in German banks and to identify the risks and benefits of cloud-computing as perceived by the managers in charge of the cloud-computing decision.

Therefore, two research questions will be assessed:

- 1) *Which are the influential factors senior decision makers take into account when assessing the cloud-computing option?*
- 2) *What are the benefits and risk, senior decision makers associate with cloud computing?*

Ten interviews with senior experts in nine large German banks have been conducted to investigate these matters. Expert interviews have been used as research methods as they provide more grounds for deeper investigation compared to a quantitative survey. As cloud-computing is still in its infancy (specifically in large scale corporate deployment) a qualitative approach seems the right choice subject in order to identify influential factors that have not yet been detected.

The paper starts with a review of the literature on cloud-computing with a specific focus on the banking industry. This is followed by an elaboration on the individual TOE-components, followed by an explication of the research method, presentation of the results, limitations and conclusion.

FUNDAMENTALS OF CLOUD-COMPUTING

Cloud-computing (CC) is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction (Mell and Grance, 2011). This definition provided by the National Institute of Standards and Technology (NIST) is widely accepted and serves as foundation for the following research. It encapsulates six essential characteristics and three corresponding service models.

The six characteristics (see also Buyya, Broberg and Goscinski, 2011; Josyula, Orr and Page, 2012; Mell et al., 2011; Rosenberg and Meteos, 2011; Terplan and Voigt, 2011) are:

1. The **on-demand self-service** for provision and release of resources such as server time and network storage.
2. A **broadband network access** to use the capabilities over the network (e.g. internet).
3. **Resource pooling** to serve multiple consumers using a multi-tenant architecture.
4. **Location independence** so the service can be accessed regardless of the geographical base of the customer.
5. **Rapid elasticity** allowing the consumer to provision and release resources with the business needs.
6. **Measured services** allowing cloud-systems to automatically control and optimize resource use by using a metering capability at an abstraction level (e.g., storage, processing, bandwidth and active user accounts).

The three service models (commonly referred to as the SPI-stack) are

1. **Infrastructure-as-a-service** (IaaS),
2. **Platform-as-a-service** (PaaS), and,
3. **Software-as-a-service** (SaaS).

As the focus of this research is on the general *use* of CC in the German banking industry it will not be distinguished between the different service models.

THEORETICAL BASIS AND RESEARCH MODEL

The TOE-Framework of Tornatzky and Fleischer (1990) serves as foundation of this research. It analyzes the influencing factors regarding the implementation of innovation in enterprises from three different perspectives (Baker, 2012; Oliveira and Martins, 2011):

The **technological** perspective describes the internal and external technologies which are relevant to the firm. This includes technologies that are already in use as well as technologies that are available at the market and not currently in use.

The **organizational** perspective describes the characteristics and resources of the company. This includes the formal and informal structure, communication processes, size of the enterprise and the amount of slack resources.

The **environmental** context explains external factors. They influence the adoption decision of an IS-Innovation within a company. This includes the industry structure, government regulations and the technology support infrastructure (e.g. the technology-provider).

The generic TOE-Framework has been adapted to specifically investigate the use of CC in banks. Therefore the factors of the TOE-Framework have been extended with additional factors grounded in theoretical consideration. The TOE-Framework supports this approach because of its generic character (Zhu and Kraemer, 2005) which makes it well suitable for qualitative social research methods. The three adapted dimensions and their respective constructs are explained in the following.

Technological perspective

With reference to information logistics, **availability** can be described as a result of a logistics-process, which provides the right information, in the right quality, on the right time, to a specific consumer (Hoog, 2005; Pfohl, 2009). Relating to the CC paradigm, availability describes the cloud-computing services which are available on the market and meet the banks quality expectations. The quality of a CC-Service is the subjective ratio between the result and the previously defined benefit (Stolpmann, 2007).

The **characteristic** of a cloud-service is defined by the ratio between benefits and risks of a technological innovation (Chau and Tam, 1997).

Organizational perspective

Company size is a commonly used factor for the investigation of technological innovation in an organizational perspective (see Duan, Deng and Corbitt, 2010; Nebdal et al., 2011; Wolf, 2010; Wolf, Beck and König, 2012). The German banking market is largely fragmented: Out of the approx. 2,000 registered banks in Germany ~90% belong to two large banking groups (savings banks and cooperative banks). These banks traditionally do not have own data centers but use shared data services within the group. As such, the decision whether to use CC-Service is not being made by a single bank but the whole conglomerate. Therefore this research focused on large banks which have the power and authority to decide on the use of CC for themselves. Consequently, company-size was investigated in this research paper as a potential influencing factor for the use of CC in banks.

The relationship between the adoption of innovation (Duan et al., 2010) and outsourcing (Nedbal et al., 2011) as well as the accompanying management support is a broad field of discussion. **Management support** is an important factor for successful implementation (Gaulke, 2004; Kammerer, Amberg and Lang, 2012). Also the decision for an implementation project is made on the management level of an enterprise (Hugenberg, 2010). Therefore, management support was used as factor influencing the adoption of CC in banks.

If a bank decides to use CC-Services the operational level has to implement these. For the implementation the innovation readiness of a company plays an important role. Literature indicates that the expertise of employees and the technological prerequisites are important for the adoption of a technological innovation within a company (Thong, 1999; Wolf, 2010; Zhu, Xu and Dedrick, 2003). Wolf (2010) noticed that the Grid-Technology (which can be regarded as the ancestor of CC) competence extends the physical part by a human factor. Together these describe the operational readiness of a company for the use of a technological innovation. In this research the organizational readiness to implement CC-Services is represented by the **cloud-computing competence** construct.

The determinants of transaction costs (Williamson, 1981) are the frequency of the transaction, the specificity of the asset to transfer and the uncertainty of the transaction (Sjurts and Stieglitz, 2004). Based on transaction cost theory it is assumed that **financial resources** play an important role for the adoption of an innovation (Zhu et al., 2003).

Environmental perspective

The externally induced influencing factors consist of the industry structure, the technology support infrastructure and the government regulations.

The **industry structure** is composed of the divisions and the relationships between enterprises in the same business sector (Porter, 1980). Furthermore Porter defines an industry as a combination of enterprises with similar products. In this research the structure of the financial sector serves as the industry structure.

The **technology supporting infrastructure** is a prerequisite for the use of technological innovations in an enterprise. As part of the environmental perspective the cloud-computing service providers and inherently the infrastructure they provide for their services are in focus.

Government regulations heavily influence the CC decision in banks. German banks need to obey to strict regulations specifically regarding outsourcing arrangements (Wolf, Vykoukal and Beck, 2009; Wolf, 2010) and data security, as well as data privacy (Wolf, 2010).

Based on the TOE-Framework of Tornatzky and Fleischer (1990) as described by Baker (2012) and extended by the previously discussed theoretical and practical findings the following framework to structure the CC decision factors for the German banking industry was composed:

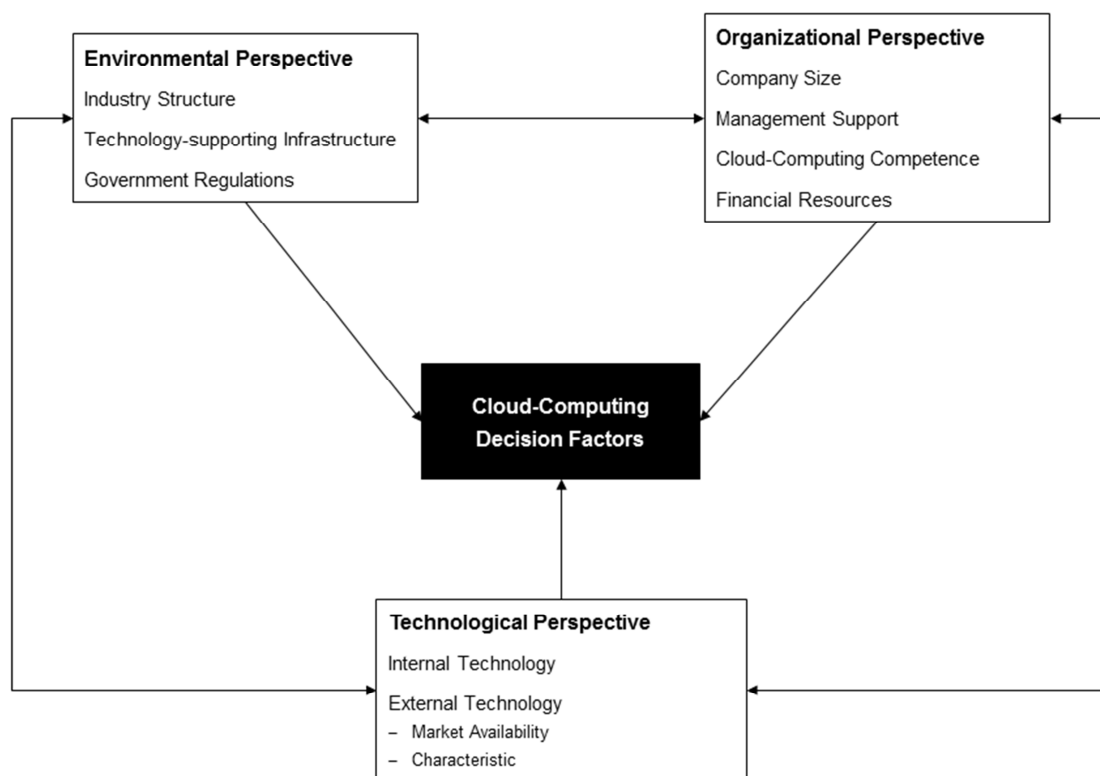


Figure 1. Framework of Cloud-Computing Decision Factors

EXPERT INTERVIEWS

Ten expert interviews with senior decision makers from nine large German banks have been conducted. The interview partners were selected on a targeted basis (Flick, 2009) exemplary for the German banking sector (Mayer, 2008). The sample structure has been defined based on four criteria:

Criteria	Requirement
Location of the bank	Germany
Location of IT-organization	Based in Germany (important due to regulatory requirements)
Cloud-computing knowledge	Given (pre-checked by telephone call)
Role	Cloud-computing decision maker or major part of the decision making process (e.g. prepares the decision)

Table 1. Sample structure criteria

Based on the described CC decision framework an interview guideline was created. The interview guideline contains 16 open questions grouped by the three perspectives of the research model. After each interview the guideline was revised and new aspects have been integrated as necessary.

The interviews took around 60 minutes each. Nine of ten interviews were conducted face-to-face, one was done by phone. All interviews were digitally recorded.

Respondent	Role	Type of bank
R1	Head of IT	Specialized bank
R2	Head of IT	Specialized bank
R3	Head of IT	Universal bank
R4	IT-Management	Universal bank
R5	Head of IT-Control	Universal bank
R6	Head of IT	Universal bank
R7	Key-Account Manager	Universal bank
R8	Strategic IT-Management	Universal bank
R9	Domain Architect	Universal bank
R10	IT-Projects and Governance	Universal bank

Table 2. Interview partner and selection criteria

EMPIRICAL RESULTS OF THE INTERVIEWS

In order to ensure a systematically and rule-guided analysis of the qualitative data collected during the interviews, qualitative content analysis (Meuser and Nagel, 1991) has been employed.

Practitioner's definition of cloud-computing

Within the first interviews it became apparent that the interview partners do not share a common conception of cloud-computing. Almost all interviewees mentioned that the differentiation between 'outsourcing' and 'cloud-computing' is rather blurred. The cloud computing concept many of the respondents had encompassed IT-delivery models like ASP, web services, administration- and infrastructure-services. In the same vein, the interviewees cited scalability, service-management, service-level-agreements and virtualization as major characteristics of cloud-computing. Furthermore, many of the interviewees' conceptions of cloud-computing have been limited to the use of virtualization-technology. The conceptions of cloud-computing ranged from an "unknown data and server location" to "external service-delivery of a provider over the internet to a shared use of resources or ubiquitous computing." These different points of view resulted in a broad and heterogeneous understanding of the cloud-computing phenomenon. This deficiency was also observed by Lampe et al. (2012).

Factors influencing the CC Decision in German banks

In this section the topics brought up by the interviewees are reflected. In the subsequent section these results are discussed and related to the research model.

Data- and provider location

The location where data is being stored and where the provider resides was unanimously mentioned as a major factor influencing cloud-computing decision-making. The location of data and provider determines the applicable legal framework for data privacy and data security. In this regard, the respondents were afraid of an unknown data location which is an essential CC characteristic. In particular data-center locations in countries where local authority is allowed to access data from German citizen are critical for German banks since this type of data access violates German data privacy laws.

To address this problem many non-European CC providers comply with the *safe harbor principles*. These providers commit themselves to act in accordance to the European data protection guidelines. Data analysis shows that CC responsible in German banks evaluate the save harbor principles as not satisfactory. Most respondents would only consider data- and provider-location within the European Union or the European Economic Area (EEA). Some interviewees even accept only physical locations in Germany.

Government regulations

All interview partners agreed that government regulations is the most important factor for the use of cloud-computing in German banks. The interviewees specifically put an emphasis on the regulations that govern the jurisdiction of the provider- (and as such the data-) location. Overall, different kind of regulations heavily impacts the decision processes in the German banking industry. The bank is fully responsible of any provider does not comply with regulatory requirements. Consequently, the provider needs to obey to the same regulations as the bank. Furthermore, it is the bank's responsibility to secure that the provider complies with these regulations. Therefore, German banks are extremely sensible not to violate regulations due to CC arrangements.

Security- and compliance requirements of German banks

Security- and compliance requirements are an essential part of the regulations imposed on German banks. Therefore security requirements, in particular data-security and data-protection requirements, are amongst the most important factors influencing the cloud-computing decision. For instance, German banks have to ensure compliance against market manipulation and data-usage for transactions performed by their own employees as well as by the employees of the provider. Furthermore, they have to know the administrators on the provider side, to ensure reliability during a crisis situation and to establish backup plans. In addition, they have to provide evidence of recover ability, maintenance of the banking secrecy and protection against third party access. Last not least, Banks as CC customers need the ability to evaluate all safety measures established by the provider.

Type and business criticality of the system to be used in a CC context

The respondents showed different views regarding potential differences between using a core banking system or a support system in a CC context. Analysis shows that the statements differ between refusing outsourcing arrangements of core banking systems to reports on already outsourced core banking system as ASP solution. Approximate 75% of the interview partners regard support systems as more likely to be "CCed" by German banks than core banking systems.

Analysis also reveals that the degree of sensitiveness of data processed on the systems and the business-criticality of the systems are more important factors regarding CC arrangements than the type of the system. Systems processing data with lower security requirements and systems that are less business critical are seen more likely as appropriate for CC outsourcing. Latter ones are seen in particular suitable to gather first experience in CC.

Classification of data sensitivity processed on the system

As discussed above, the type of the system seems to be less important for German banks than the classification of the data processed on the system. The kind of data processed determines which governmental regulations and data security requirements have to be applied in the cloud. The result is that in German banks outsourcing processes are carefully examined and applied restrictively. Hence, especially systems processing no sensitive data are suitable for CC.

Differentiation and competitive advantages by the IT-System

If there would be offers for good and cost-efficient products for which no differentiation to competitors is required, CC is seen as a valid alternative. In contrast, if differentiation is required or a market position depends on a certain system, in-house development is favored by the respondents due to faster time-to-market expectations.

Business strategy and business model of the bank

The business strategy and the business model of the bank also impact CC decision-making. Highly specialized businesses and a great range of business models in the banking industry combined with individual requirements obstacle the use of CC. The correlation between complexity of the business model and the use of CC for other businesses is also mentioned by Wu, Cegielski and Hall (2012). Furthermore they found, that formal and rule guided enterprises are more likely to follow new trends like cloud-computing as to lead them. Our data supports this finding.

Management support for cloud-computing

Since CC must be part of the IT strategy, management support is necessary. Data analysis reveals that the interest in CC of the management differs between the banks. Some of the respondents mentioned that their management is generally interested in CC. However, other interviewees stated that a lack of knowledge regarding CC among the management is a reason for non-satisfactory management support.

Availability and workload of the bank's employees

Restricted availability and high workload of the bank's employees, challenges imposed by the heterogeneous IT landscapes of German banks as well as the call for ubiquitous computing was also found to positively influence the cloud-computing decision. Furthermore, staff reduction targets can be a driver for cloud-computing in banks.

On the other hand, a lack of resources and the know-how of available resources in German banks inhibit the adoption of CC. This situation also explains the desire of banks for long term partnerships with providers who can provide qualified staff in sufficient quantity.

Internal resistances against the outsourcing

The respondents did not agree on internal resistance against cloud-computing. One of the interviewees stated that resistance against change is more important than technical problems and that they "make up to 80% of the project effort". In contrast, another respondent mentioned internal resistances as a general problem of change in enterprises and not as a special CC problem. The interviewees also stated that internal resistances are dependent on the acting employees as well as external effects (e.g. the change from laptops to thin-client computers). One of the interviewees argued that internal resistances will decline due to the use of private-cloud solutions.

Qualification of employees and enthusiasm for new technologies

Outsourcing-like methods like CC allow banks to use the expertise of the provider's employees for their own business. Especially in non-core business divisions banks find it hard to keep employees know-how up to date. Also the enthusiasm of employees for the introduction of new technology could be a driver for CC. The recognition of a new technology, which decides about an adoption could in the case of subjective unhappiness with the solution leads to negative influence on the cloud-computing decision.

External cultural factors

During the investigation it became apparent that external cultural factors and subjective perceptions influence the CC decision. Another point was the different language between the bank and the provider. However, this phenomenon obviously depends on the geographic outreach of the bank. One interview partner for example -a large German bank- did not agree with the statement that cultural factors influence the cloud-computing decision, because of the cultural diversity within the bank.

Cost pressure as financial factor

Costs are a hugely important factor for the CC decision. The pressure to offer competitively priced products to their customers leads banks to focus on standardization and therefore enables CC. Bank's competitiveness depends on detailed analyses of the cost structures of their products and services. As such, CC could be a possibility to reduce the operative costs. Particularly in areas where a differentiation from the competitors is not needed.

The focus on costs was also mentioned in the investigation of Gröh, Gewalt and Stuska (2012). They found that a company is willing to use a service with a lower quality (e.g. the second best service offered on the market) if a 20% reduction of the costs is possible.

Size of the bank

For small banks it is extremely difficult to keep up-to-date with technological innovations due to lack of resources, short innovation cycles and increasing technological complexity. Therefore, some interviewees see CC as interesting for smaller banks specifically as "lower investment costs are a main advantage". "Larger banks have the resources for an in-house development of the most IT areas". However, it was generally acknowledged that cost-effects from standardization are higher in large banks.

Size of the service provider

Another finding was that large providers are perceived to be more flexible than smaller ones. On the other hand, large banks have more influence over small providers and their services (e.g. for individual needs). However, banks tend to prefer larger providers because of reliability considerations for long-term service provisioning. The size of the provider is assumed to represent financial strength to manage crises and external shocks.

In general the provider size has to fit to the size of the bank. The bank has to be an important and interesting customer for the provider. That makes it possible that the bank has influence on provider decisions and the offered services.

Image and banking expertise of the provider

Thorough banking expertise of the CC-Provider is preferred and often requested by the banks. It is crucial to understand the banks' business needs, especially in a Software-as-a-Service context. Also the image of the provider was mentioned by the respondents as a factor influencing the CC decision. It builds trust into the provider especially for handling sensitive data.

Certificates and provider references

Certificates are important for the banks and demanded. They document the awareness of and compliance to given standards and requirements. Especially security-certificates are important. However, the quality of the certificate and its implementation remains important.

External references decrease the uncertainty regarding provider promises and allow inspection of provider capabilities upfront. They shorten the decision-making process in banks, make them transparent and the decision-makers can refer in their decision to these. The provider should have references in the finance sector and running projects in banks, which supports relevant experience.

Available cloud-computing solutions for banks

The offerings on the market are seen differentiated by the experts. This leads to a subjective and difficult to interpret assessment regarding the best Cloud-Service for a bank. In accordance to their respective definitions of CC they mentioned web-services, application service provider with standard services but no services for special bank business as available solutions.

A second differentiating factor is the number of Cloud-Providers available on the market. There are providers available for industry sectors without security requirements as needed by the banks, as well as specialized finance-IT providers with higher security arrangements targeting banks as their clients. A further differentiation can be made between flexible providers with standard services and specialized expensive providers with inflexible and unfavorable offerings (e.g. long-term contracts and by the provider prescribed services).

Unclear and inflexible software licenses

Because the current software license models are usually focused on an internal IT, they often prevent outsourcing activities like cloud-computing. Many license-models are not yet ready for CC what leads to an unclear and uncertain use of software-licenses on different devices and remote devices. The models are not ready to be use in a virtualized environment or the virtualization is not a part of the pricing-model. This issue negatively influences the CC decision in banks if software licenses are affected.

Competitor's use of cloud-computing

If a competitor already uses CC our interview partners did not feel pressure to adopt it for their own institution. The so called bandwagon-effect (Wolf, 2010) does not take place. In this case competitors are seen as references for the exchange of experiences, insight of the technology-migration and as drivers for new ideas through positive experiences. On this line of argument, the usage of cloud-computing through a competitor can be a motivating factor positively influencing the CC decision of German banks.

SUMMARY OF THE FACTORS INFLUENCING THE CC DECISION

Figure 2 displays the CC decision model including the insights gained through the interviews. The model was updated (in comparison to the initial model - see figure 1) so that falsified factors were deleted and validated factors accepted. Furthermore some factors were revised based on the comments in the interviews.

In the **organizational perspective** *management support* was added and together with the *size of the company* empirically validated. The financial factor was revised after the investigation as general *cost pressure*. The *security- and compliance-requirements* and the *business strategy and business model* factors were added as important components. The CC competence of the bank's employees was revised and re-defined through the *availability* of CC solutions on the market, *internal resistances* against outsourcing/CC and the *cloud-computing enthusiasm*.

In the **environmental perspective** *industry structure* has been added which represents the pressure through the use of cloud-computing by competitors. The *technology supporting infrastructure* which represents the CC provider is specified through the data and provider location, the availability of cloud-computing provider for banks and the expertise of the provider. The expertise is further specified by the banking expertise and the image of the provider and certificates and references. *Government regulations* have been verified as powerful influential factor (as expected). The *unclear and inflexible software-licenses* and the *external cultural influences* are additionally added to the framework.

In the **technological perspective** the *internal technology* and its differentiation between a core-banking and a support-system as type of system to be outsourced was inadequate and revised. Instead the following arguments were included to support the internal technology factor: business criticality, classification of data sensitivity processed on the system and the differentiation and competitive advantages through the system itself. The *external technology* is represented by the market availability of cloud-computing services for banks and the characteristic of the new technology.

The adapted model is depicted in figure 2 below.

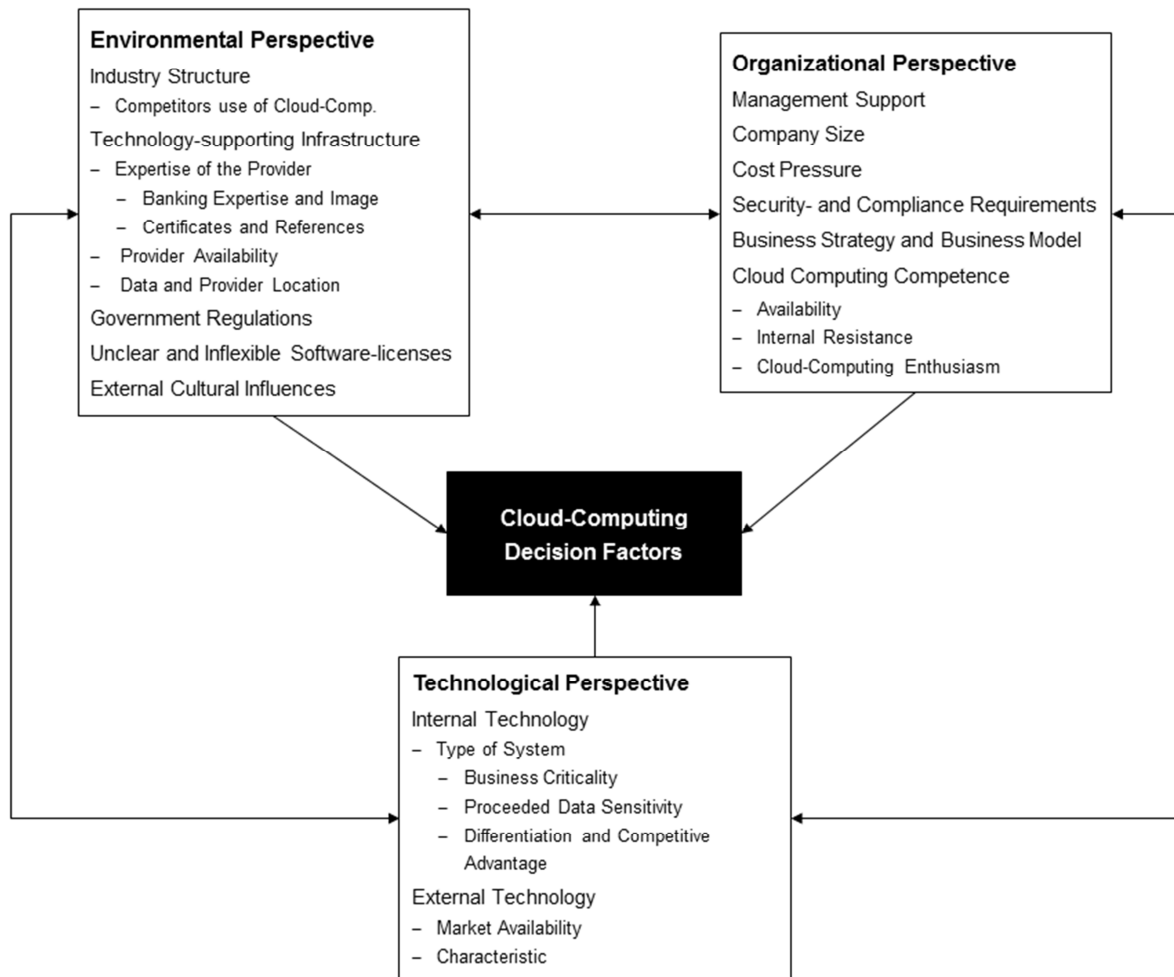


Figure 2. Empirical Results of Framework of CC Decision Factors

PERCEIVED RISKS AND BENEFITS

With reference to the second research question -the perceived benefits and risks of CC- all interviews contained questions on the risks and benefits of CC (derived from the literature). Interviewees were confronted with the benefits/risk and asked to elaborate on them. Based on their comments, the benefits/risks were grouped as follows (see Table 3):

Benefits/risks with more than 50% of the interviewees are marked grey/bold. If less than half of the interviewees agreed, the cells are marked white/italics. This means that if one interview partner mentioned a risk/benefit and a second one disagreed with it, the ratio is 50% and the risk/benefit was not interpreted as an unambiguous result of the empirical investigation. In general the results documented in table 3 should be seen as a first insight into possible risks and benefits of the use of CC in German banks.

Benefits	Risks
Higher availability	Performance failure and poor performance
Independence of the employees and reduction of workload	Inappropriate Software-license and pricing models
Financial benefits	Limited and standardized functionality
Scalability	Loss of unique selling propositions
Faster Time-to-Market (in standard services)	Strategic dependence from the provider
Central administration and data storage (Private-Cloud)	Lack of strategic flexibility
Higher technical flexibility	Security risks through bank and provider employees
Better controllability of the IT	Data and Server location uncertainty
Contractually determined service quality (SLA)	Dependence of the security implementation by the provider
Focus on core business and higher innovation capacity	Third party access
Possibility to use technology and know-how from the Provider	Concerns about the data sensitivity
<i>Security advantages through Cloud-Computing</i>	Violation of government requirements
<i>Personal benefits</i>	Loss of benefits
	Loss of image
	<i>Performance issues</i>
	<i>Contractual risks</i>
	<i>Availability risks</i>
	<i>Insufficient client separation</i>
	<i>Financial risks</i>

Table 3. Benefits and Risks of CC as perceived by interviewees

It appears that the benefits of CC are largely in line with those reported in an outsourcing context. The risks however, indicate a strong focus on data privacy and data security concerns. These findings are coherent with the applicable literature on outsourcing as well as CC.

LIMITATIONS

The study was conducted in the German banking industry. Due to the impact of regulatory requirements it cannot directly transfer to other jurisdictions. Furthermore only two out of nine questioned banks are already using cloud-computing solutions (as per the NIST definition of CC). This leads to widely subjective assessments about cloud-computing and hypothetical answers regarding the perceived risks and benefits by the other interviewees.

Finally, as this is an explorative study it can only guide further researches but the findings themselves cannot claim generalizability.

CONCLUSION

As expected, government regulations are a major factor influencing the cloud-computing decision in the German banking sector. They present the key influential factor and are highly interdependent with other factors like security- and compliance requirements and the data- and provider-location.

The major reasons for the use of cloud-computing are the perceived financial benefits. Financial considerations, not strategic aspects seem to be the main driver for a decision towards CC.

The major reasons against for the use of CC prove to be security concerns. Especially the provider and data location, third party access and disloyal provider employees and the security implementation on provider side are important.

In summary it has been shown that cost pressure is the major beneficial driver which comes as no surprise given the close nature of CC and outsourcing. On the hindering side, regulation and specifically data-security and -privacy are to be mentioned. Summarizing the outcomes of the interview a clear path towards CC adoption cannot yet be seen in the German

banking industry. Our interview partners only deployed low scale and not security/privacy sensitive solutions. Also the widespread use of public or hybrid clouds remains to be seen.

Even though Gartner put CC on its 2008 hype cycle, clearly a big impact on the banking industry cannot yet be documented - if the NIST definition is applied.

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