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ABSTRACT

The concept of Service-oriented Architecture (SOA) is becoming increasingly important not only in research, but also in practice. SOA has emerged as a major topic, especially in regards to the banking industry as it is one of the cutting-edge industries concerning service-orientation. SOA implementation in the German banking industry varies, with some still in the adoption phase and others already in the SOA operations phase. This has specific implications concerning the SOA Readiness as well as the SOA Maturity of German banks.

This paper details the research objective, design, and conduction of a case study in the Germany banking industry investigating the SOA Readiness and SOA Maturity of German banks. Different phases such as SOA adoption and SOA operations and the consequences of SOA during Merger & Acquisition (M&A) conduction are analyzed and evaluated. Finally, the preliminary findings are exhibited.

Keywords

SOA, SOA Governance, SOA Readiness, SOA Maturity, German Banking Industry

INTRODUCTION

The business community is affected continuously by changes in both the environment and technology, however inflexible heterogeneous systems often evolve over several years. Since it is very difficult to accomplish day-to-day business under these circumstances, the desire for a solution that is able to handle these kinds of challenges has never been larger. Only companies that are highly flexible in adapting to new conditions will survive in the long-term (Becker et al., 2003). Typically, a Service-oriented Architecture (SOA) consists of various loosely coupled services (Papazoglou, 2003; Papazoglou, 2007). The SOA paradigm facilitates that self-contained loosely coupled services can be composed and orchestrated to cross-organizational business processes (Erl, 2005). A service is a well-defined, autonomous, and easy-accessible business-unit to support reusability (Barry, 2003; Brown, 2008). SOA fulfills the demand for process orientation instead of project orientation and includes both organization and technology.

The SOA paradigm is not only an important issue in the academic world, but also in practice. The banking industry, which often adopts new technologies early, is an excellent research area concerning the implementation of SOA. This sector has a lot of complex processes that are suitable for SOA implementation. Various studies as well as the SOA Check 2008 confirm the increasing importance of SOA for the German banking industry (Martin, 2008; Schulte et al., 2007).

Due to this increasing importance, this paper gives an overview about the conducted SOA case study in the German banking industry. Different phases such as SOA adoption and SOA operations as well as the consequences of SOA during M&A conduction are analyzed and evaluated. Furthermore, the SOA Readiness and SOA Maturity of German banks with a special regard to SOA Governance is investigated. The case study aims at assigning the level of SOA implementation in German banks to the already existing SOA Maturity Model (SOAMM) (Johannsen and Goecken, 2007).

The investigated three major research questions in this case study are as follows:

1. How are SOA adoptions in the German banking industry implemented?
2. How appropriate are SOA operations in the German banking industry?
3. Which consequences does the adoption of SOA imply during M&A conduction?

On the one hand, these questions enable an understanding of how SOAs are implemented in German banks. Furthermore, this also explores why SOA is implemented, in which way, and to what extent. On the other hand these questions comprise an evaluation of the impacts a SOA would have in practice, including both competitive advantage and cost reduction. Based on the research questions the case study method was selected and a research framework has been developed as depicted in Figure 1.

The conducted case study comprises four cases in the German banking industry. The primary sources of evidence are an interview with each bank and the use of documents. However, surveys are also used as one source of evidence within the case study to affirm the research findings of the interviews.

The remaining of this paper is structured as follows. First, an introduction to SOA Governance including SOA Conformance and SOA Life Cycle Management is given pointing out the SOAMM. Second, the research objective, defining the research framework of this study, is shown. In the next chapter, the theoretical foundations of the case study method followed by a description of the case study conduction and major challenges are presented. Additionally, an outlook at the evaluation of the case study including preliminary findings is depicted. The paper closes with a conclusion and an outlook on future work.

A SOA GOVERNANCE MATURITY MODEL

Loosely coupled services play an important role in a SOA. Since "services" are independent from each other they can be offered from different providers with several Quality of Service levels (Eckert et al., 2008). For service invocation the functional property of the service has to match the functional requirements and the service has to contribute to the business objectives. Therefore, it is mandatory to have a professional control system to cope with these challenges. This control system is called SOA Governance.

SOA Governance is an extension of IT-Governance (also an extension of Corporate Governance) that is adapted to the service paradigm. SOA Governance's purpose is to enhance the efficiency and effectiveness of SOA and to reduce the complexity of management and handling of the increased number of small software artifacts, as well as improve risk management (Bieberstein et al., 2008). It comprises a number of governance domains such as organization, maturity models, roles, accountabilities, SOA Life Cycle Management, and a governance policy catalog (Niemann et al., 2008). The considered SOA Maturity Model by Johannsen and Goecken (2007) comprises SOA Conformance and SOA Life Cycle Management. SOA Conformance is assigned to the adoption phase and constitutes a requirement for the SOA Life Cycle Management that is assigned to the operations phase.

SOA Conformance contains all activities that deal with preparation of an enterprise for the SOA adoption. All perceptions of SOA, organization, processes, and technology have to be aligned to the business strategy of the enterprise. It is necessary to focus on SOA Conformance in the banking industry in order to gain practical experiences.

After ensuring SOA Conformance, the enterprise is ready to establish a SOA Life Cycle Management. All of the included services have to be checked in periodic intervals in order to ensure they help to enhance business value. Therefore services often have to be modified or replaced by other services or have to be removed without substitution (Bell, 2008). This set of tasks constitutes the SOA Life Cycle Management including the following five different core domains (Johannsen and Goecken, 2007):

- Strategic Alignment
- Value Enhancement
- Resource Management
- Risk Management
- Performance Management

These so-called "Focus Areas" support the enterprise in order to reach business goals and increase the transparency. Since this is crucial, these items are adapted to the proposed framework in order to show the "Status Quo" of SOA Life Cycle Management implementations in the German banking industry. One deviation from this procedure is the replacement of "Risk Management" by 'Security' since it exhibits higher relevance for banking industries as noticed in the pilot case of our study.

With regard to SOA Governance it is possible to assign SOA Readiness and SOA Maturity of an enterprise to a maturity level. The appropriate models for this purpose are so-called maturity models. Although there are various approaches for ranking the SOA Maturity of an enterprise the primary focus is on the SOA Maturity Model (SOAMM), as depicted in Table 1, since it is the only one deduced from SOA Governance that distinguishes between SOA Conformance and SOA Life Cycle

Management. The SOAMM includes five different maturity levels. Additionally, this model is separated in three sections that include technology, processes, and organization. Before level 2 can be reached the enterprise has to implement SOA Conformance in each of the three sections. In order to reach level 3, 4, or 5 SOA Life Cycle Management has to be implemented in the organization, following processes, and afterwards technology. In order to check if this assumption is close to reality or just theory, it was decided to use SOAMM as the most appropriate model for the study. With the help of this model the SOA Maturity level can be determined.

Maturity Level	Technology	Processes	Organization
1 SOA-Initial Knowledge build up on an individual basis.	SOA knowledge build-up is in progress.	SOA knowledge available via individual competence and engagement of experts.	No SOA specific organizational occurrence.
2 SOA-Managed Strategic SOA direction defined.	**SOA Conformance** SOA Readiness Check executed • SOA Conformance (current/future) checked • SOA planned	**SOA Conformance** Modeling of business processes with service components implemented. First reusable processes implemented on a project basis.	**SOA Conformance** • Strategic implications (SWOT) of a SOA implementation are analyzed (SOA Readiness). • Responsibilities for planning and integration are assigned. • Alignment (requirements, prioritization) with business areas is established.
3 SOA-Defined Management of processes and operational processes standardized.	**SOA Conformance** SOA implemented	**SOA Conformance** Modeling, documentation, and implementation of business processes based on SOA components across business areas and organizational units.	**SOA Life Cycle Management** Responsibilities assigned for • Governance • Operations and maintenance • Planning and development • Purchasing and sourcing • Monitoring of service supply/delivery (e.g. based on SLAs)
4 SOA-Quantitatively Managed Performance monitored and managed.	**SOA Conformance** • Monitoring • Performance measurement	**SOA Life Cycle Management** SOA framework and service components are systematically and proactively managed across individual service life cycles.	**SOA Life Cycle Management** Performance metrics defined. Business processes and service components monitored (e.g. performance, alignment, risk, and compliance).
5 SOA-Optimizing Continuous improvement process.	**SOA Life Cycle Management** SOA (performance, alignment, risk, compliance) integrated into continuously improvement process.	**SOA Life Cycle Management** Systematic approach established for identifying new requirements and detecting gaps (with respect to service components and their interrelationship within and across business processes).	**SOA Life Cycle Management** Responsibilities and accountability measures assigned and defined.

Table 1. SOA Maturity Model (Johannsen and Goecken, 2007)

RESEARCH OBJECTIVE

The research objective comprises three parts of SOA implementation as SOA adoption, SOA operations, and SOA during M&A conduction. These three parts are mostly derived from SOA Governance issues and describe the research framework as depicted in Figure 1. This framework serves as a foundation for the questions that have been used for the personal interviews.

The first objective "SOA adoption" is divided into three subtopics with the first one focusing on the conformance of SOA adoption. This includes the company's organizational structure and adjustments of responsibilities. Also the progress of process documentation, process analysis, and process optimization are investigated along with the maturity of technology. The second subtopic called "Realization" highlights possible motivations for and against a SOA adoption. This includes reasons for SOA adoptions as well as the degree of SOA experiences a bank has acquired on its own and the influences of external consultants. For this reason, the degree of standardization is investigated describing this ratio. Furthermore, roadmaps for the SOA adoption in order to guarantee the compliance of SOA governance principles are investigated and practical challenges within several SOA implementation phases as well as the problem solving issues are explored. The degree of standardization representing the ratio between the self-developed SOA solutions in the IT departments of an

enterprise and the parts that are bought from external IT providers is embedded in the third subtopic focusing on SOA implementation. This subtopic also includes the determination of the procurement of external services.
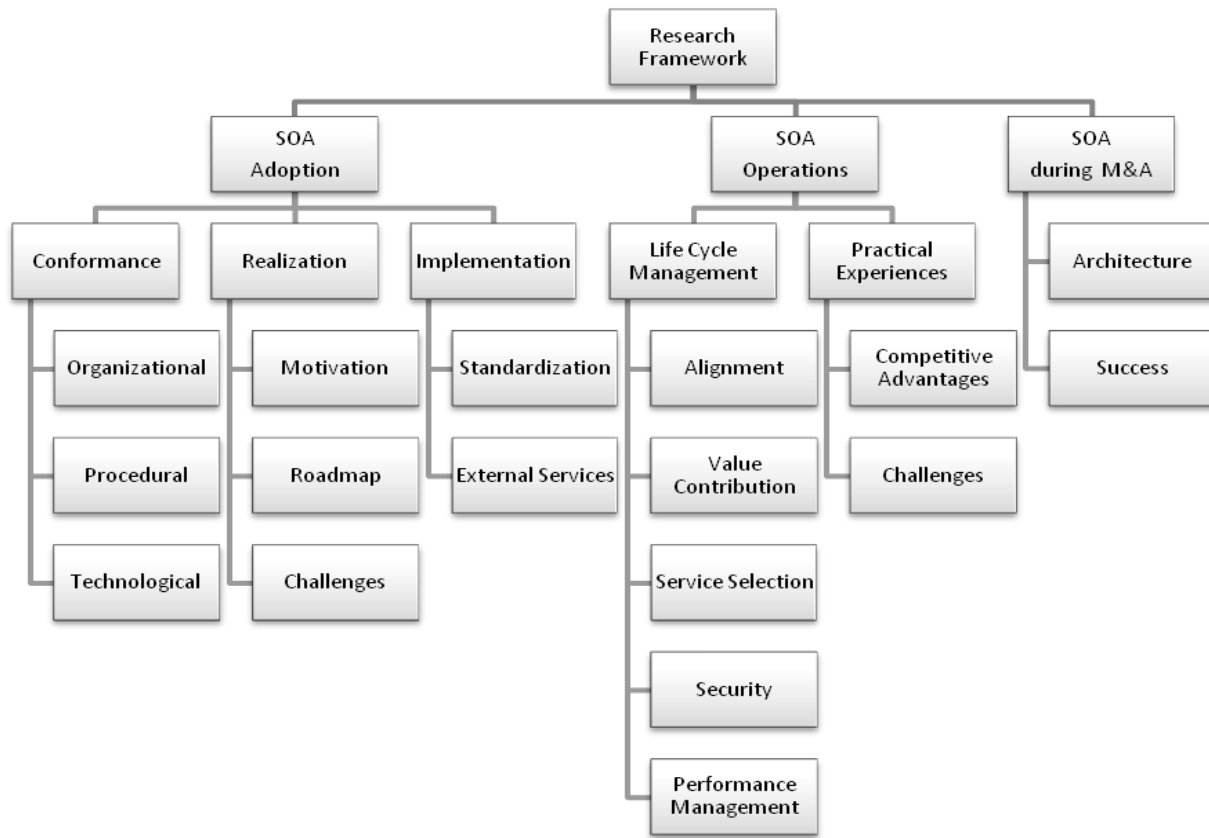

Figure 1. Research Framework

The second objective of the research framework emphasizes SOA operations in the German banking industry containing the SOA Life Cycle Management as well as practical experiences. It is investigated to which extent processes are totally implemented with the usage of services and how many services already exist. This helps to differentiate between banks with high service-orientation and those with low. Life Cycle Management as the second part of SOA Governance represents the first subtopic comprising five issues being derived from SOA Governance. However, some of these issues are modified in order to ensure that they are appropriate for the banking industry. On the one hand a high alignment (compliance between goals of the IT and goals of the management) is necessary in order to ensure that the IT and management divisions do not work independent or against each other. On the other hand the support of the SOA paradigm by the management has to be ensured. Thus, it is analyzed how this fit is realized in practice. In addition, services should always be selected carefully, i.e. a bank must always consider organizational and technical requirements for service selection. In order to investigate if and to which extent each service adds a specific value to the enterprise, tools ensuring value contribution of each single service as well as performance measurement tools for business critical services are investigated. Furthermore, security issues due to the importance especially concerning purchasing services from external providers and third parties are subject to the study.

In summation, it is extremely worthwhile to investigate the implementation of all components that comprise SOA and their conformance with SOA Governance. However, this will suggest little about the suitability of daily use of services in the banking industry. Therefore, as a second subtopic referred to as practical experiences of SOA operations of the examined banks are analyzed. Due to the fact that competitive advantages are fundamental for each enterprise, the key benefits and the measurability of service deployment is a further objective. In addition, challenges and potential disadvantages that may occur due to the adoption of services are explored in order to be able to suggest guidelines that let banks avoid making the same mistakes or suboptimal decisions as others before.

In the radically changing world of globalization, M&As have gained more and more importance. In particular, SOA has developed into an auspicious approach to handle several challenges relating to M&As. The study of SOA during M&As has been included to the case study whereas both the architecture and the success of SOA during M&A conduction are analyzed. It is investigated if and to which extent a M&A has an impact on the development and/or improvement of a SOA. As a M&A can influence a SOA so can a SOA influence a M&A. It is very crucial to procure knowledge about the additional benefits a SOA generates, while a M&A is conducted and about the impact of SOA standardization on outsourcing and merging of single processes. Another assumption of SOA is that it diminishes costs in case of M&A and makes a contribution to accelerate this activity.

After focusing on the research objective the theoretical foundations are presented, concerning the appropriate research method, the case study method.

THEORETICAL FOUNDATIONS

In order to realize the overall goal of this study, the evaluation of the SOA Readiness and the SOA Maturity of German banks, the case study method as a research method was selected. This helps to evaluate the SOA Maturity of German banks by assigning each of them a specific maturity level on the basis of the SOAMM.

The idea of case study research is to investigate at the subject matter from different perspectives in order to be able to generalize the findings. A case study does not use sampling logic, such as a survey, since in analyzing few cases. Instead, replication logic is applied, analogous to that used in multiple experiments. That implies that every single case of the study must have a specific purpose and is not a further random sample. In multiple case designs a case can have the purpose to show similar results or contrasting results for predictable reasons (Myers, 2009; Yin, 2003).

As in other qualitative research disciplines there is a distinction between positivistic, interpretive, and critical approaches (Myers, 2009). The positivistic style is objective and assumes that the reality is objectively measurable and that this can be described independent of the observer. Despite appreciating this approach, this case study also includes a couple of interview questions that depend on the subjective meaning the respondents assign to them. Thus, these kinds of questions necessitate the additional involvement of the interpretive style, due to its consideration of the spoken language of the interviewees.

Furthermore, a case study can be explorative, descriptive, or explanative (Yin, 2003). The explorative style is the most associated style when conducting case studies. Although this style is applied to explore the competitive advantages and challenges for the rest of the study the investigating topic is already extensively explored so that this approach would add only little additional benefit. Thus, the study focuses on the descriptive style that is appropriate in order to determine the level of maturity and to specify the degree of readiness. Whenever possible, attempts are made at explaining the cause-effect interrelationships. Although this case study is primarily descriptive, the boarders in-between the styles are fuzzy and thus include explorative and explanative parts.

CASE STUDY CONDUCTION

Preparatory Work

Before the actual case study conduction the research questions have to be developed. These should be derived from previous research in order to ensure the questions are refined and insightful (Palmquist, 1997). Therefore, the questions are designed with regard to previously conducted surveys and publications.

The next step is to determine the unit of study. In case studies for business and management the unit of study is almost always an organization (Myers, 2009). Therefore, this case study uses each considered German bank as one single unit. Additionally, there is a distinction between single cases designs and multiple cases designs. Yin mentions various strengths and weaknesses for deciding for different types of research (Yin, 2003). In this study more than one German banks as well as different objectives such as SOA adoption and SOA operations and the consequences of SOA during Merger & Acquisition (M&A) conduction are investigated. Therefore, it was decided to conduct the case study with the help of the embedded multiple case design.

In contrast to surveys, case studies include multiple sources of evidence (Palmquist, 1997; Yin, 2003). The next step in conducting a case study is to use at least one kind of them. Although generally all of them are expedient for analyzing organizations interviews and documents like annual reports and already conducted surveys are most appropriate (Myers, 2009).

Our crucial evidence is the interview. In order to get an overview about SOA Readiness and SOA Maturity the case study was conducted with four different German banks that are familiar with the term of service-orientation. To get a second source of evidence we investigated existing surveys and qualitative publications.

A pilot study helps to enforce the robustness of case studies. It facilitates improvement in the design of the study to become more appropriate. Thus, at the beginning one specific German bank has been interviewed and the interview guide has been refined afterwards. This has affected the sequence of our interview questions so that the study becomes more plausible and the leitmotif has been improved. Yin strongly recommends the conduction of a pilot study, because this facilitates the improvement of the data collection plan with respect to both the content of data and the procedures to be followed (Yin, 2003).

Actual Conduction

After preparatory work the actual conduction of the case study was enabled. Although, a case study can comprise various sources of evidence the most important part of this particular one are the interviews completed with enterprise architects and chief enterprise architects of German banks. The following section describes both the selection of the single cases and the selection of the pilot case.

The case study has been conducted anonymously. For this reason the interviewed German banks are denoted as B1, B2, B3, and B4. Each of these banks is familiar with SOA and has already implemented a couple of services. However, none of them has yet completely adopted SOA.

Before the conduction of the case study started, banks were selected that seemed to be appropriate. Bank B1 has had a few number of processes implemented by services and no further experience with SOA during the conduction of M&As. We selected bank B1, because no current M&A experience existed. Bank B2 and B3 have implemented more processes by services and have also gained more experience with M&A phases. The difference between B2 and B3 is that B2 represents a M&A buyer whereas B3 represents a M&A seller. So we analyze both the buyer and the seller to figure out what happens with the single services and the whole SOA respectively. B4 represents a bank with a high level of SOA experience and experiences with M&As. Thus, B4 was also included in the study.

We select bank B1 as the most appropriate bank for the pilot case, because B1 has had only a few number of processes implemented by services. The outcome of the pilot case study has been a refinement of the research framework, i.e. to focus more on "Security" instead of "Risk Management" in the SOA operations phase, because of its increasing relevance. In addition, it has been noticed that it is worthwhile to ask for SOA-Roadmaps before SOA adoption. Furthermore, questions have been introduced in order to figure out the number of processes implemented by services and the total number of services.

Evaluation

Due to the high importance of the evaluation, an evaluation plan has been developed as can be seen in Figure 2. The process of case study evaluation comprises four activities and two generic areas. Activities in context of this case study are triggered by the investigator. Each single activity depends on both generic areas. The generic areas represent external assumptions, which have impacts on the case study design. One generic area is theoretical foundations like surveys, papers, and news articles. The other one comprises our proposed research framework. For this purpose our special interest is dedicated to SOA Governance and SOA in phases of M&As.

In the first activity of the evaluation all the interviews are analyzed intensively. Second, the key aspects are identified and listed in an appropriate database. The identified key aspects have to be coded with regard to both already existing codes, derived from the research framework, and new created codes, derived from new aspects that result from interviews (Myers, 2009). The third activity is the composition of the single cases, which makes use of the pattern matching method described by Yin (Yin, 2003). This method enables the comparison of single cases with each other. Common issues and differences can be identified as well as reasons can be looked up in the interview transcripts. At last the findings have to be evaluated. That activity comprises the development of new propositions derived from the previous findings, which facilitates the development of new perceptions on the SOA topic. Therefore, this may trigger a reaction on both theoretical foundation and current focus areas.
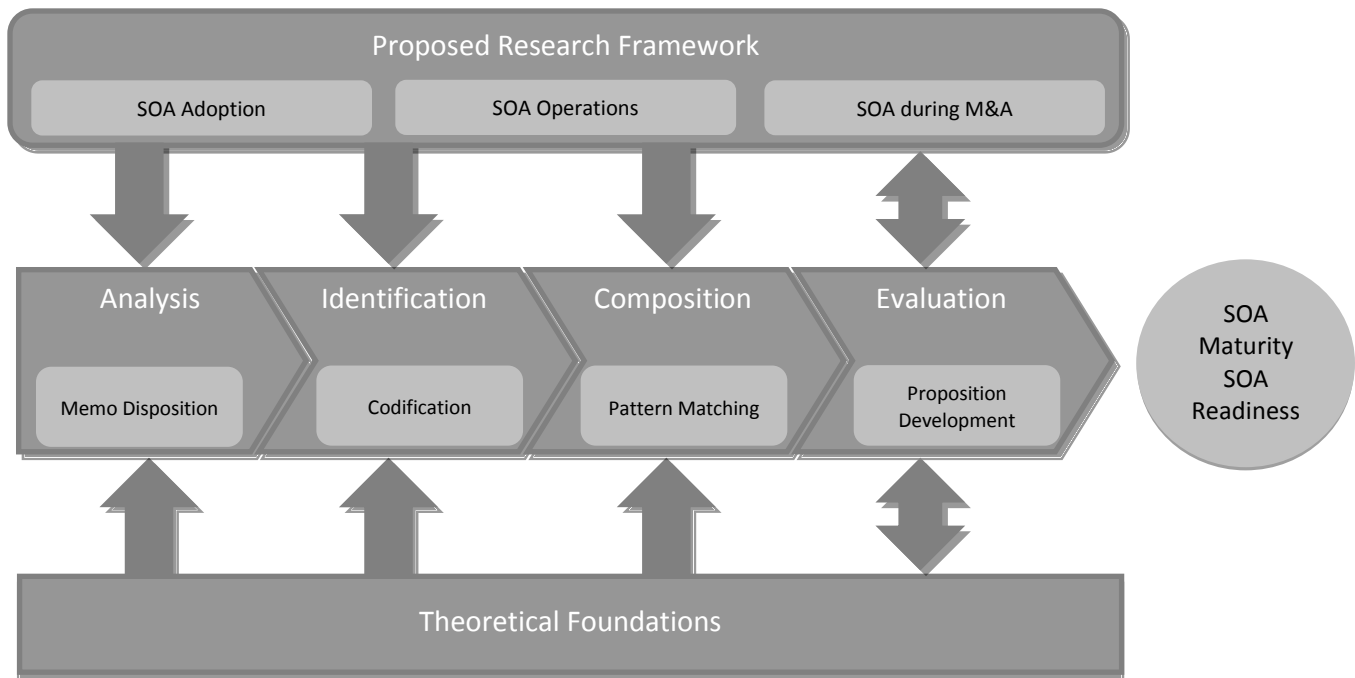
Figure 2. Evaluation Plan

Challenges

Although the case study investigation has been prepared carefully, in the case study preparation phase, the conduction phase as well as during the evaluation several challenges and difficulties occurred.

First of all in the case study preparation, it has been very difficult to select appropriate banks with different views for the case study investigation, since for each of the preselected banks SOA is already an important topic. Thus, each final selected bank has already started with the implementation of a SOA and no further bank could be identified that refused SOA adoption generally. Furthermore, each bank has a different understanding of what is a SOA; e.g. some of them already treat the existence of several services as a SOA. However, none of them has implemented their entire business processes by services. Due to this fact and the fact that M&A plays a role for each bank, it has not been possible to identify completely diverse cases.

In the conduction phase, the selection of appropriate interviewees has not been easy since a person had to be selected which has sufficient knowledge about this topic and is able to provide information for this specific scenario. In addition, it has been hard to focus on keeping the structure for the research questions during the interviews because of the diverse knowledge of the interviewees. Concerning the interview conduction it can be stated that it has been advantageous to interview the contact persons by two investigators. This facilitates to follow the conversation precisely in order to be able to pose the right questions at the right time. This enables to get a broader understanding and cover the entire research framework.

PRELIMINARY FINDINGS

Since the interviews were conducted in January 2009, the investigation is not finished yet. Nevertheless five major findings can already be identified. These kinds of findings are preliminary and not entirely validated at this time. However, the reader of this paper may catch a glimpse of the recent experiences with SOA.

The first finding is that SOA is not as hybrid as it seems since each of the investigated German bank possesses a higher technology maturity level as the maturity level of organization and processes. This is due to the fact that SOA is almost always driven by IT and receives only moderate management support. The second finding is that the SOA adoption, no matter how SOA is realized – self-developed or purchased from external providers, is triggered by the bank and not by external consultants. However, consultants are often included for implementation purposes. The third finding is that SOA is more project driven than process driven at present. Therefore SOA seems to be not as holistic as it has been supposed in theory to be. The fourth finding is that SOA roadmaps often exist in huge SOA projects, whereas nowadays SOA Life Cycle

Management is implemented incompletely. The fifth finding is that SOA is only relevant for small M&A projects. Although banks with few M&A experience suggest the adoption of SOA in those phases, the ones which have higher experience are discouraged since the costs for coordination and service alignment become very high. They suggested that theoretically identical services are too different to each other in practice with regard to both the functionality and the parameters.

CONCLUSION

This paper provides an inside view in the SOA case study conduction in the German banking industry. The research objective, the research design, and the conduction of a case study are presented. Different phases such as SOA adoption and SOA operations and the consequences of SOA during Merger & Acquisition (M&A) conduction are analyzed and evaluated. Furthermore, the developed research framework is exhibited enabling the investigation, comparison, and evaluation of the single cases of the study.

As a preliminary insight, the importance of SOA for the German banking industry is highlighted. The study already approves that currently SOA is far away from being a hype topic. Instead, SOA developed towards a fundamental design principle in various areas of application. Nevertheless, there are still some major challenges to tackle. The analysis and evaluation of all the conducted interviews with respect to the research objectives are future steps for the case study. As a result the study should give detailed insights concerning SOA adoption, SOA operations, and SOA during M&A conduction in order to determine the SOA Readiness and the SOA Maturity of German banks.

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