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The Implementation of Service-oriented Architectures in the German Banking Industry – A Case Study

Julian Eckert, Marc Bachhuber, Nicolas Repp, Ralf Steinmetz
Multimedia Communications Lab – KOM
Technische Universität Darmstadt, Germany
(eckert, bachhuber, repp, steinmetz)@kom.tu-darmstadt.de

ABSTRACT

Currently the concept of Service-oriented Architecture (SOA) becomes more and more important not only in research but also in practice. Especially in the banking industry as one of the cutting-edge industries concerning service-orientation, SOA emerged as a major topic. The realization of SOA implementation in the German banking industry varies, whereas some are in the adoption phase and some are already in the SOA operation phase. This has specific implications concerning the SOA Readiness as well as the SOA Maturity of German banks.

This paper depicts the research objective, the research design, and the conduction of a case study in the Germany banking industry investigating the SOA Readiness and SOA Maturity of German banks. For this purpose different phases as SOA adoption and SOA operation and the consequences of SOA while Merger & Acquisition (M&A) conduction are analyzed and evaluated. Finally preliminary findings are depicted.

Keywords

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

INTRODUCTION

The business community is affected continuously by changes in both environment and technology and inflexible heterogeneous systems often evolved 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 this kind of challenges was more than ever. Only companies with a high flexibility to adapt to new conditions will survive in the long-term (Becker et al., 2003). The Service-oriented Architecture (SOA) paradigm facilitates that self-contained loosely coupled services can be composed and orchestrated to cross-organizational business processes (Erl, 2005). Typically, a SOA consists of various loosely coupled services (Papazoglou, 2003; Papazoglou, 2007). 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 a big issue in the academic world but also in practice. The question arises to which extent the SOA paradigm has been established in the industry. Particularly, the banking industry as an early adopter of new technologies is a very interesting and important research area concerning the implementation of SOA. This sector has a lot of complex processes that are suitable for SOA implementation purposes. Studies as well as the SOA Check 2008 confirm the increasing importance of the SOA paradigm for the German banking industry in recent years (Martin, 2008; Schulte et al., 2007).

Due to this increasing importance, the paper gives an overview about the conducted SOA case study in the German banking industry. For this purpose different phases as SOA adoption and SOA operation as well as the consequences of SOA while M&A conduction are analyzed and evaluated. Further the SOA Readiness and SOA Maturity of German banks with a special regard to SOA Governance will be analyzed and evaluated. 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 while M&A conduction?

On the one hand those questions enable to understand how SOAs in German banks are implemented and why it is done in which way and to which extent. On the other hand those comprise an evaluation of the impacts a SOA offers in practice including both competitive advantage and cost reduction. For this purpose, based on the research questions a research framework has been developed including a lot of detailed "how" and "why" questions as depicted in Figure 1. In order to handle those question types the case study method was selected for this purpose (Yin, 2003).

The conducted case study comprises four cases in the German banking industry. The primary source of evidence is the conduction of an interview in each bank and the use of documents. However, surveys have also been 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 of all an introduction to SOA Governance including SOA Conformance and SOA Life Cycle Management is given pointing out the SOAMM. Secondly the research objective, defining the research framework of our study, is shown. In the next chapter the theoretical foundations of the case study method are depicted followed by a description of the case study conduction. 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 an SOA. Since Services are independent from each other they can be offered from different providers with several Quality of Service (QoS) 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 and not struggle against. 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 (that is also an extension of Corporate Governance) and adapted to the service paradigm. SOA Governance has the purpose 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 and 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 operation phase.

SOA Conformance contains all activities that deal with preparation of an enterprise to aspire SOA adoption. For this purpose all perceptions of SOA, organization, processes, and technology have to be aligned to the business strategy of the enterprise. It is very relevant to have a closer look at SOA Conformance in the banking industry in order to gain practical experiences. SOA Conformance reflects a major research field of our proposed research framework.

After ensuring SOA Conformance, the enterprise is ready to establish a SOA Life Cycle Management. All of the including services have to be checked in periodical intervals in order to ensure they help to enhance value. Therefore often services have to be modified or replaced by other services or have to be removed without substitution (Bell, 2008). This set of tasks is the SOA Life Cycle Management including 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 to attain the business goals and increase the transparency. Since this is crucial, these items are adapted to our 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 so-called maturity level. The appropriate models for this purpose are so-called maturity models. Although there are various different approaches for ranking the SOA Maturity of an enterprise we primarily focus 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 are technology, processes, and organization. SOAMM assumes the enterprise has to offer SOA Conformance in each of the three sections before it will reach level 2. A second presumption is that SOA Life Cycle Management has to be implemented first of all organization, following processes, and afterwards technology. In order to check if this assumption is close to reality or just theory, we decided to use SOAMM as the most appropriate model for our 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 in a bank as SOA adoption, SOA operations, and SOA while 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 foundation for the questions that have been used for the personal interviews.

The first objective "SOA adoption" is divided into three subtopics whereas the first one focuses 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 as well as the maturity of technology. The second subtopic called "Realization" highlights motivations for a SOA adoption or issues against it. This includes reasons for SOA adoptions as well as the degree of SOA experiences a bank acquired on its own and the influences of external consultants. For this purpose the degree of standardization is investigated describing this ratio. Further, 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.

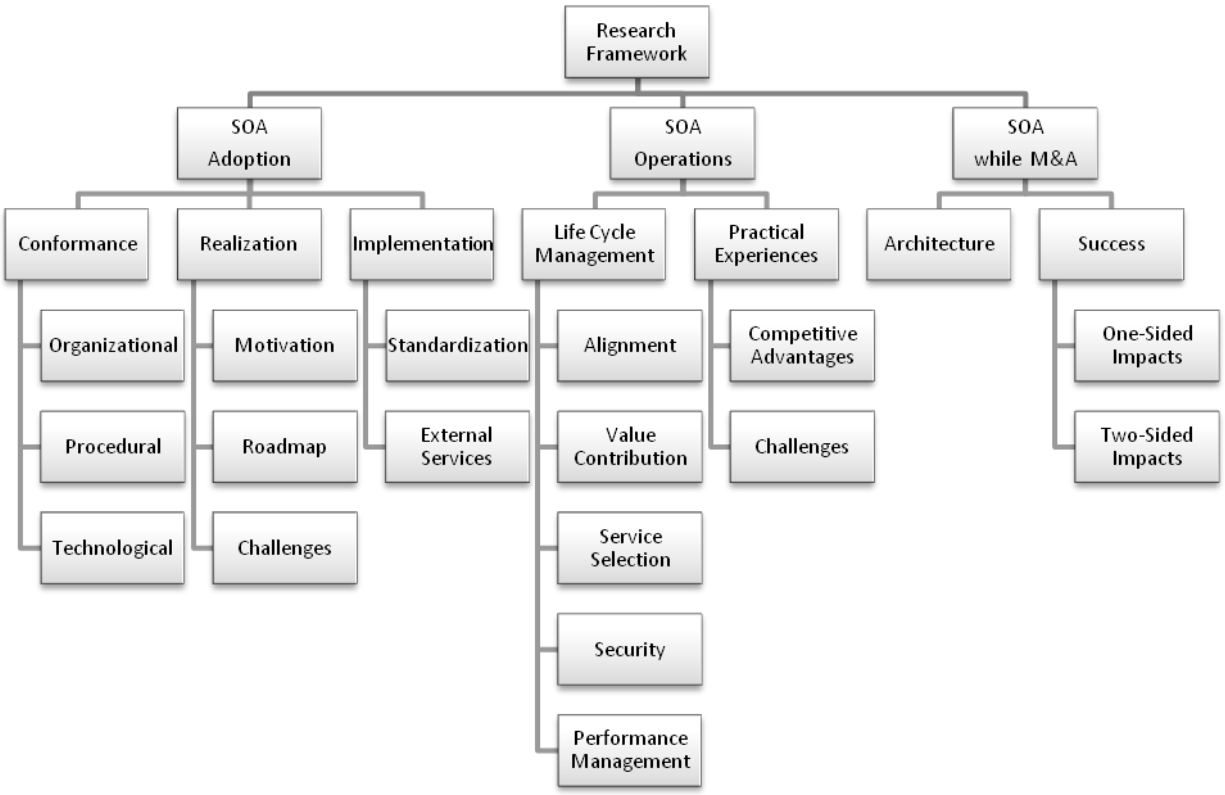

Figure 1. Research Framework

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. In this context 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. The term "Alignment" stands for the compliance between goals of the IT and goals of the management. On the one hand a high alignment is necessary in order to ensure that the IT division and the management 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 has always to consider organizational and technical requirements for service selection purposes. 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 for purchasing services from external providers and third parties are subject to the study.

To sum up, it is very worthwhile to investigate the implementation of all SOA comprising components and their conformance with SOA Governance. However, this will tell nothing about the suitability of daily use of services in the banking industry. Therefore, as a second subtopic referred to as practical experiences of SOA operation of the examined banks are examined. 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 and to avoid that banks or enterprises from similar industries do the same mistakes or suboptimal decisions like other ones before.

In a dynamically changing world of globalization, M&As have gained more and more importance. In particular SOA has developed to an auspicious approach to handle several challenges relating to M&As. For this reason this topic has been

included to the case study whereas both the architecture of SOA while M&As are conducted and the kind of success due to SOA adoption are examined. However, generic questions as how a SOA influences a M&A conduction are important in this context. With respect to the architecture it may also be the other way around that is a forthcoming M&A influences SOA. Thus, it is investigated if and to which extent a M&A has an impact on the development and/or improvement of a SOA. Furthermore, it is examined which challenges a SOA imply for the architecture in this situation. On the other hand it is very crucial to get knowledge about the additional benefit a SOA generates while an 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. For this purpose both the one-sided impacts and the two-sided impacts are explored. The first are effects like lower costs, a shorter time-to-market, or more flexibility that influence the bank selfish. The second are the same effects like in one-sided effects, but with regard to the impacts to both buyer and seller.

After focusing on the research objective the theoretical foundations concerning the appropriate research method, the case study method, is depicted.

THEORETICAL FOUNDATIONS

In order to realize the superior 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 is selected. This method facilitates to find out the degree of SOA Readiness due to its suitability to deal with "how" and "why" questions. This also 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 like a survey, since in analyzing few cases there is nothing like significance. 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).

Like 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, our case study also includes a couple of interview questions that depend on the subjective meaning the respondents assign to them. Thus for this kind of questions it is required to involve additionally 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, we focus on the descriptive style that is appropriate in order to determine the level of maturity and to specify the degree of readiness. Whenever possible we also try to explain the cause-effect interrelationships. Hence although this case study is primarily descriptive the boarders in-between the styles are fuzzy and also 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 as well as holistic and embedded ones. An embedded approach is divided into at least two sub units that can be explored separately whereas a holistic one is atomic and permits no further divisions. Yin mentions various strengths and weaknesses for deciding for different types of research (Yin, 2003). In our study more than one German bank as well as different objectives as SOA adoption and SOA operation and the consequences of SOA while Merger & Acquisition (M&A) conduction are investigated. Therefore we decided to conduct the case study with the help of the embedded multiple case design.

In contrast to surveys in case studies multiple sources of evidences are included (Palmquist, 1997). Yin specified in his book "Case Study Method" six different sources of evidences (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 we conducted the case study 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 and compared our investigations with theoretical publications with respect to promises and challenges of SOA they announce.

A pilot study helps to enforce the robustness of the case studies. It facilitates to improve the design of the study to become more appropriate for its purposes. 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 on the one hand becomes more plausible and on the other hand the leitmotif has been improved. Yin strongly recommends the conduction of a pilot study emphasizes that 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 one are the interviews accomplished with enterprise architects and chief enterprise architects of German banks. This 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 in the following 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 a completely adopted SOA yet.

Before we started conducting the actual case study we selected banks that seem to be appropriate for our purposes. Bank B1 has a little number of processes implemented by services and no further experience with SOA while M&As. We selected bank B1, because this facilitates to investigate the reasons for SOA in the case no M&A experience exists. Bank B2 and B3 have implemented more processes by service 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. So we also include B4 in our study.

We select bank B1 as the most appropriate one for the pilot case, because B1 has only a little number of processes implemented by services. For this reason it is possible to get a quick overview about crucial services and roadmaps that have been developed.

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 operation phase because of the increasing relevance. In addition, it has been noticed that it is worthwhile to ask for SOA-Roadmaps before SOA adoption and for challenges in this phase (in opposite to challenges in the SOA operation phase). Furthermore questions have been introduced in order to figure out the number of processes implemented by services and the total number of services in the architecture.

After conducting the case study, in the evaluation, all different sources of evidence are put together. This activity is called triangulation. The reason for looking from different perspectives is to affirm the conclusions of the case study (Yin, 2003).

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.

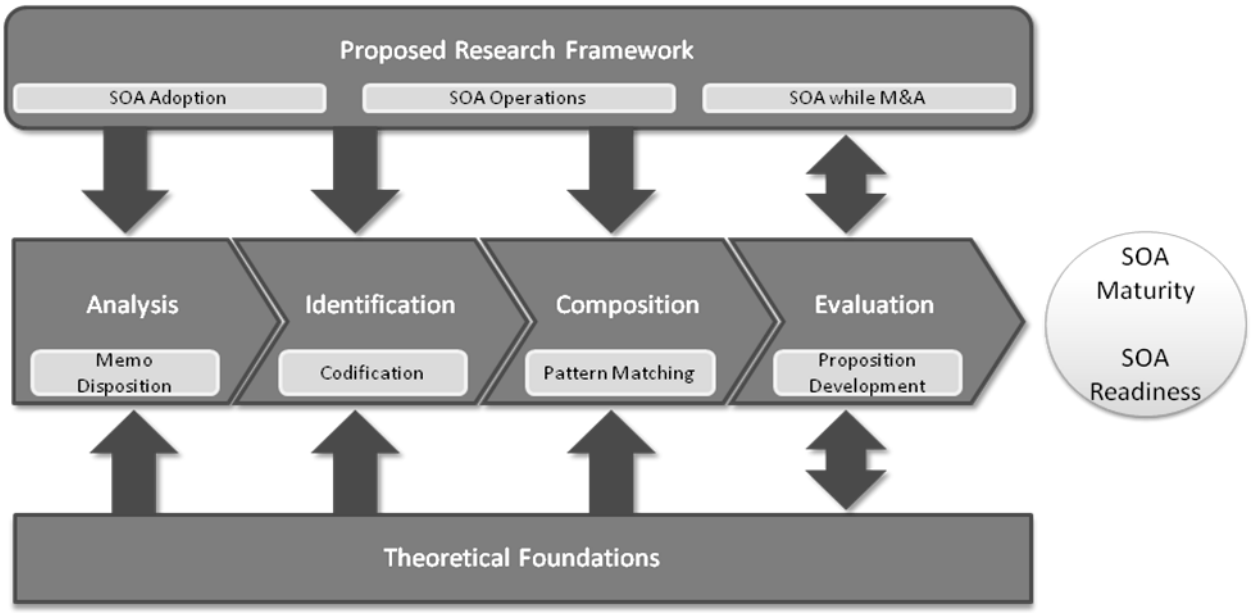

Figure 2. Evaluation Plan

In the first activity of the evaluation all the interviews were analyzed intensively with the help of various comments and emphasizing of "interesting points". Secondly the key aspects were identified and listed in an appropriate database. The identified key aspects were 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 (Myer, 2009). The third activity is composition of the single cases, which makes use of the pattern matching method described by Yin (Yin, 2003). This method enables to compare the single cases with each other. Common issues and differences can be identified as well as reasons for this can be looked up in the interview transcripts. At last the findings were 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.

PRELIMINARY FINDINGS

Since the interviews were conducted in January 2009, our investigation is not finished yet. Nevertheless five major findings could already be identified. These kinds of findings are preliminary and not really validated at that time. However, due to this, the reader of this paper may catch a glimpse of recent SOA experiences and be enabled to get some pleasant anticipation.

The first finding is that SOA is not as hybrid as it seems since each of the investigated German bank possess 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 earns 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 projects driven than process driven at present. Therefore SOA seems to be not as holistic as it supposed to be in theory. 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 just 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 effort for coordination and service alignment becomes very high. They argued 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 conducted SOA case study in the German banking industry. For this purpose the research objective, the research design, and the conduction of a case study are depicted. Different phases as SOA adoption and SOA operation and the consequences of SOA while Merger & Acquisition (M&A) conduction are analyzed and evaluated. The proposed case study comprises four different German banks representing banks with and without an extensive

SOA experience as well as banks in different phases as in the SOA adoption or SOA operation phase. Also banks with M&A experiences are included. Further an overview of SOA Governance and an appropriate model for maturity evaluation so-called SOAMM is given. Additionally, the developed research framework is depicted enabling the investigation, comparison, and evaluation of the single cases of our study. Finally, as a first result this paper depicts preliminary results of the case study.

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