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Business-Oriented Service Design in Practice - Learnings from a Swiss Universal Bank

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Abstract: Service-orientation is recognized as an important enabler for improved efficiency and flexibility of transformation processes in business. However, linking the primarily technological concept to the business world still remains a challenge. This includes achieving consistency between business process and service architectures as well as defining procedure and governance models for the implementation of service-oriented application systems. Ultimately, the goal is business-oriented metrics regarding external contacts, such as customer processes or networkability in general and internal processes, such as risk management or architecture management. Since research is still at the early stages in understanding the impact of these design efforts and the business values, in-depth case studies are appropriate for advancing research in these domains. This article recognizes this need and describes how a business-oriented service architecture has been developed and validated regarding the economic potentials at a large universal bank in Switzerland.

1 Introduction

1.1 Motivation

Although the concept of service-oriented architectures (SOA) has been in discussion for several years, it is mainly regarded as a technological concept for the integration of heterogeneous application environments. Services science [Spohrer et al. 2007] enhances this perspective from a business economic view promising a more flexible allocation of business activities, represented as distributed services among business partners in a value chain [Chesbrough/Spohrer 2006]. Simultaneously the Gartner Hype Cycle differentiates technical-driven and business-oriented SOA [Gartner 2008], estimating the latter still at an early stage. In-depth case studies can further validate the economic value of this flexible allocation, especially when derived in dynamic industries with an ongoing structural transformation driven by competence orientation, increased competition and business model adjustment such as the banking sector.

Application systems traditionally are the backbone of processes in the financial industry. Although custom-built software brings tailored functionality, the monolithic architecture of these systems often limits their ability to implement regulatory requirements, use additional customer channels, or flexibly integrate new products and service providers. In addition, individual developments impede banks to embark on new specialized and/or networked business models. Component- [Szyperski et al. 2002] and service-based infrastructures promise to provide the technological infrastructure for an improved networkability on the business leve. Current studies [IBM Global Services 2005], [Falkenberg et al. 2006] exemplify a high vertical integration in comparison to the defined core competence profiles in the banking industry. A significant decrease of the in-house production and disintegration of the value chain is expected in the next years leading to specialized providers and the emergence of differentiated networks.

To leverage from these infrastructures the alignment with processes and strategy is required. This article argues that in order to reach the claim of Steen et al. that SOA "provides better handles for architectural alignment and business and IT alignment, in particular" [Steen et al. 2005], a service architecture combining the business and technological perspective is needed. A business-oriented service architecture expands the well known business and IT alignment components of [Luftman/Brier 1999].

1.2 Research Methodology and Structure

Case study research is often referred to be an appropriate research strategy when evaluating contemporary phenomena in their natural context [Benbasat et al. 1987]. It is considered to be useful if research and theory are at their early stages [Darke et al. 1998]. Despite the broad discussion of SOA, the current literature features a lack of contributions which link business and technological perspective and provides in-depth insights into the design of service oriented architectures.

For example, [Stein/Roediger 2008] focus on business-oriented service descriptions but limit their case study to the relationships of an example service and not the design itself. [Gimnich 2007] describes the case of a European bank but concentrates on program management as part of a SOA migration project and the interdependencies of the different sub-projects. Service design is only referred to marginally as follow-up project. Similarly [Lawler/Howell-Barber 2008] contemplate in their multi-case study organizational impacts by describing several key program roles. [Heutschi 2007] characterizes two in-depth case studies for the financial industry by describing the architectural alternatives and service design principles. However, these two case studies concentrate on technical infrastructure and bottom-up service identification. The same holds for the application of the web service technology at the case study of [Dietrich et al. 2007]. [Klose et al. 2007] finally addresses top-down service identification but concentrates on visibility of the analyzed services to different stakeholders at the case of a production

company. Table 1 summarizes the comparison of the different case studies in terms of methodology (single vs. multi case study), covered industry, topic, approach and focus of the results as well as extent of the case study.

In this paper a single case study approach was used to evaluate the application of a procedure for hybrid service design deduced from theory and practice [Kohlmann 2007] to complement the findings e.g. of [Heutschi 2007] by visualizing business-oriented service design and its results. The insights from the case study in this paper can be used to further validate the economic potentials of SOA.

criteria	[Stein/Roediger 2008]	[Gimnich 2007]	[Lawler/Howell-Barber 2008]	[Heutschi 2007]	[Klose et al. 2007]	[Dietrich et al. 2007]
number of cases	single case study	2 single case studies	multi-case study with 14 cases	multi-case study with 4 cases	single case study	single case study
industry	automotive	finance, electronics	cross-industry	finance, logistics, telecommunication	manufacturing	production
topic	business-oriented service descriptions	top-down and bottom-up SOA migration	organizational impacts of SOA	architectural alternatives and service design principles	top-down service identification	technical-driven SOA
focus	visualization of architecture with 12 business services and relationships of a sample service as allocation diagram	program management and the interdependencies of the different sub-projects	description of several key program roles	technical infrastructure and bottom-up service identification	service analysis concerning takeover and visibility of the services to different stakeholders	seamless communication between all participants based upon IT services using Web service technology
coverage	short case study	short case studies	short case studies	in-depth case studies	in-depth but with limitations concerning service description and metrics	in-depth case study

Table 1: Comparison of Selected SOA Case Studies

The single case study is based upon the recommendations elaborated by [Dubé/Paré 2003] to ensure rigor in case research. The central research question concerning the case study focuses on the applicability of hybrid service design capturing business-oriented and technical-driven service identification. As data source direct observation in combination with 12 structured interviews and six workshops supplemented by the documentation of the eight-month-project was used. According to [Lee 1989] and its four requirements of MIS case study design, predictions were defined to evaluate the results. The replicability of the case as

well as the conducted lessons learned is ensured by defining the initial environment of the bank. This approach allows for a limited generalization of the founded results to comparable enterprises.

The structure of the paper reflects its goals: Section 2 provides the theoretical foundation for business-oriented service design. Section 3 presents the case study of a Swiss universal bank exemplifying the development of business-oriented service architecture in the financial industry. Section 4 summarizes the results and provides an outlook.

2 Business-oriented Service Design

Services map parts of a business process in the form of a function module that can be deployed independently and has a standardized interface [Kohlmann 2007]. Since numerous classification schemes for services as part of SOA have emerged (e.g. [Bonati et al. 2006], [Erl 2007], [Kohlmann 2007], [Rosen et al. 2008]) and a consolidated classification scheme is missing [Kohlmann 2007], this paper differentiates business-, application- and IT- services. Business services represent functionality of a specific business activity and transaction [Brown 2007]. The terms process services [Bonati et al. 2006] or task services [Erl 2006, 43ff] have emerged in parallel and are more or less used synonymously. Moreover, business service clusters combine several services of usually finer granularity due to their logical and functional proximity [Bell 2008]. The objective is to provide a user oriented perspective in a business model design scenario (Figure 1). Application services are focusing on independently usable and elaborately specified functional components [Kohlmann 2007]. In practice and theory also the terms integration services [Rosen et al. 2008] or entity services [Erl 2006] are used. IT services (or infrastructure services) finally encapsulate technical capabilities independent of any business domain [Brown 2007], [Rosen et al. 2008].

One key question in service design concerns the origins of services. Services can be identified in general by two approaches (Figure 1): technical-driven service modeling (bottom-up) and business-driven service modeling (top-down). The identification of services following a top-down approach is based upon business processes or business events while applying wide-spread design principles of SOA (e.g. [Baskerville et al. 2005], [Papazoglou/Georgakopoulos 2003]). Bottom-up refers to service modeling based upon the analysis of existing applications and their IS functionality [Nadham 2004] focusing on consolidating and rationalizing access to IS functionality by using services.

Neither approach is sufficient on its own. However comparisons of existing approaches [Klose et al. 2007], [Kohlmann 2007] have shown limitations in terms of combining top-down and bottom-up strategies or incorporating information from sourcing or network models. To leverage from service-oriented infrastructures the alignment with processes and strategy is required. The services must be designed to reflect their role as the interface between business processes and application

functionalities. This involves not only cataloging all services in a directory, but also in the form of preconfigured clusters of business services (tier 1) that map the business process steps [Bell 2008]. While a directory is closely linked to the application functionalities and there-fore enables the systematic development of application landscapes, the business service clusters provide a connection to the company's business and sourcing models. Following the concept of sourcing, a sourcing model substantiates a comprehensive sourcing strategy for one or more business processes of a bank [Alt/Zerndt 2008]. The intention is to realize specialization benefits in terms of a reallocation of average costs to a greater transaction volume as well as to increase certain competencies.

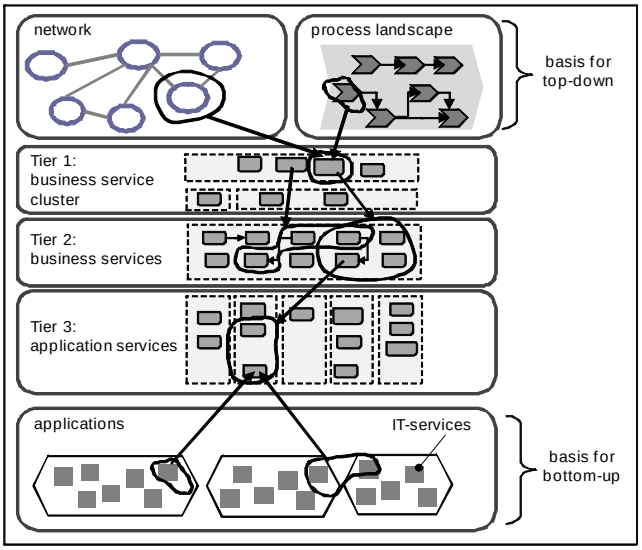

Figure 1: Service Identification Strategies

3 Service Design at a Swiss Universal Bank

The following section provides an in-depth case study of designing services at a Swiss bank. Section 3.1 describes the current changes in the finance industry followed by the general conditions at the Swiss bank in 3.2. Section 3.3 describes the design of business-oriented services and section 3.4 summarizes potentials and limitations.

3.1 Current Situation in the Finance Industry

The transformation of the European financial industry can currently be outlined by six main drivers: (1) market changes: increased competition based upon globalization and changes in market structures (e.g. regional banks overcome regional borders, market entry of non-banks) as well as market concentrations (e.g. [Geiger/ Hürzeler 2003], [IBM Global Services 2005]) and, more recently the crisis in the financial industry, (2) regulations: increased regulation efforts based upon emerging international guidelines such as SEPA (single European payment area) as well as following the current market crisis, (3) customer structure: increased customer expectations based upon internet based banking solutions such as online brokerage, higher transparency and more widespread comparison shopping, (4) product complexity: increased product diversity lead to higher costs for product listing, (5) technology: former development of proprietary applications resulted in intricate serviceable, mainframe-based and monolithic application landscapes [Homann et al. 2004], and (6) competitiveness: decreasing margins based upon additional cost pools deteriorate cost income ratios.

In particular, more international competition from countries such as Singapore and Dubai and the growing number of non-traditional financial service providers, such as trade and telecommunication companies influences the new, less vertically integrated anatomy of banks and their value chains. Generalizing these drivers, the banking sector is facing currently two main challenges: application integration and value chain reconfiguration [Baskerville et al. 2005]. However, existing core banking platforms support networkability and cross business processes only to a low extent [Alt/Smits 2007].

3.2 Case Description and Assumptions

The bank used for the case study is still a fully integrated bank with a multi channel approach. Its business processes include loans, payments and securities as well as most of the transaction related business processes (such as monitoring, investigations or reconciliation), transaction spanning processes (such as product development, compliance or client reporting) and, finally, support processes. The bank already has a process architecture with business processes documented on different granularities which ranges from compliance processes differentiating narrow tasks to support processes describing several sub-processes on high granularity. However, a consolidated cross-bank business process architecture is still missing.

The business strategy is not limited to an outsourcing capability but also includes the insourcing option for certain business processes. Current challenges are the integration of existing application systems and heterogeneous business processes. Hence, the IT-strategy is following a standard software approach with two core banking applications. Based upon these conditions four asumptions were derived

for the results of the case study in order to enhance replicability for comparable scenarios.

- Business-oriented service design approaches (see [Kohlmann 2007]) are suitable to develop coherent service architectures fostering business IT alignment and sourcing capabilities.
- Business-oriented service architectures facilitate business networking (see [Reitbauer et al. 2008]).
- Business-oriented service architectures enhance governance of IT systems and the enforcement of functional requirements from business to IT.
- Qualitative value of SOA and quantitative economic assumptions of SOA can be verified.

3.3 Business-oriented Service Architecture at the Swiss Universal Bank

Methodology Evaluation and Objectives

The bank aims to develop a cross-functional service model by applying a business-oriented service design approach. Services are seen as a possibility for cost and complexity reduction, integration of existing heterogeneous application landscapes, as well as for standardization and enhancement of more individual pricing models.

The characteristics and goals to design a business-oriented service architecture were: (1) to encapsulate all business functionalities in business services as basis for the realization into technical services, (2) to consider variations in financial instruments and channels, (3) to leverage from already specified business services from other enterprises, initiatives or research projects, (4) to ensure that the business services can be assembled by partially parallel specified application services, (5) to ensure a comprehensive understanding between IT and business of the functionalities by providing a bank-wide reference (blueprint), (6) to design a to-be IT-architecture, (7) to identify redundancies in existing applications and processes, (8) to identify unused but maintained functions to reduce costs, (9) to enhance standardization and (10) to align existing architectures and models.

Prior to service design, existing approaches and methodologies were evaluated. The criteria included in the assessment reflected the described goals and purposes such as: (1) service design is based upon business processes, business models, regulations and sourcing capabilities, (2) service design includes bottom-up verification by linking the business services with application services or systems functionalities, (3) the design approach provides a hierarchical service typology, and (4) the methodology includes a reference service map to overcome existing restrictions in the granularity levels of the bank's process architecture leading to the

enhancement of the bank's business networkability [Alt/Smits 2007]; (v) the methodology provides a procedure for linking services on different granularity levels and/or sources.

As a result of the evaluation process a business-oriented service design approach (e.g. [Kohlmann 2007], [Kohlmann/Alt 2009a], [Kohlmann/Alt 2009b]) has been chosen, which comprises a procedure for service identification, a procedure for clustering business services as well as a procedure for aligning services on different granularity levels and sources. Figure 2 shows the integration of these three procedure in the overall service architecture development process of the bank.

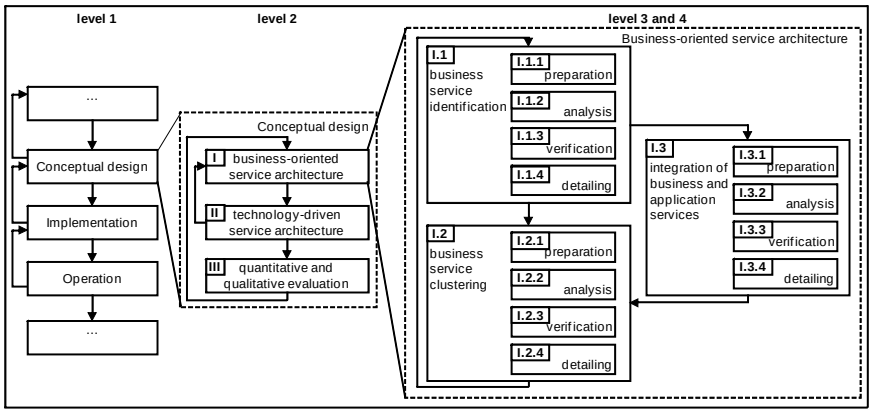

Figure 2: Reduced Development Process of Service Architecture

Level 1 is comparable to existing software engineering processes [Krallmann et al. 2002]. The conceptual design of the service architecture comprises in level 2 the design of the (I) business-oriented service architecture, (II) realization scenarios in terms of a technology-driven service architecture and (III) a quantitative and qualitative evaluation of the specified services as well as possible realization scenarios. The differentiation of the process steps is not completed yet, e.g. the setup of a quantitative and qualitative assessment model is still at the beginnings (cf. section 3.4). In level 3 the referred procedure models for (I.1) service identification, (I.2) clustering and (I.3) integration are incorporated. Each procedure distinguishes four phases (level 4 of the development process): preparation, analysis, verification and detailing. Each phase describes several process steps (equals level 5) as well as input and output documents. An example would be the step: deduction of the business service candidates based upon design principles, service criteria, business objects, business processes and sourcing models as part of the (I.1.2) analysis phase of the business service identification [Kohlmann/Alt 2009b].

Business-oriented Service Design

Prior to identifying and designing services a structure of the future service architecture was designed. A service map was used to structure the business services

along with their relationships and dependencies. The structure of the bank's service map (Figure 4) reflects partially the structure of the bank's process architecture: (A) governance/management, (B) sales and (C) support. The remaining parts of the process architecture (1) money transactions, (2) finance and real estate, (3) assets and investment management as well as (4) trade and capital market have been restructured to (D) transaction-specific and (E) transaction spanning as services can be used in several business processes.

The existing process architecture encompassed three levels with 80 business processes at level 3. Each business process was documented by several sub- processes and tasks varying in terms of granularity (e.g. risk and compliance processes are described in detail, sales and trade was on higher granularity). As the process architecture incorporated an application-driven functionality perspective instead of a value chain perspective a reference process architecture including the most important bank processes was used as an additional input [Alt/Zerndt 2008]. A second input was a business object model with nine domains and 37 business objects. The third input was a service map preliminary defined by the Swiss bank itself, which, however, was focusing on the application-oriented service identification (bottom-up). Moreover a meta-model provided the link between processes, business objects, applications and services (Figure 3). Finally, the existing application architecture of the Swiss bank as well as existing application services were used during the verification of the business service candidates.

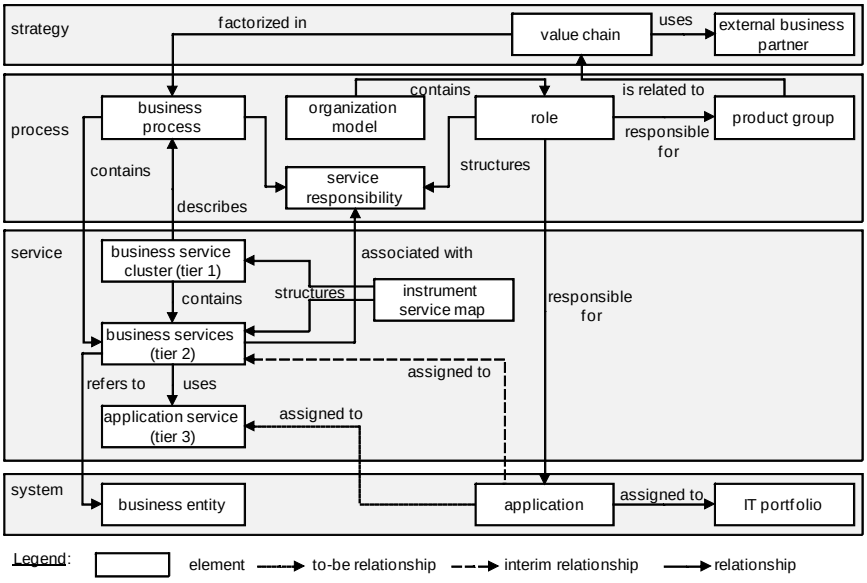

Figure 3: Simplified Meta-model of the Swiss Bank

Using techniques described in the service design methodology (e.g. [Kohlmann/ Alt 2009a], [Kohlmann/Alt 2009b]) the business services were iteratively identified starting with the business process loans in order to ensure the applicability of

the methodology and the input information. All business services were described upon a specification template aligned between business and IT departments. Prioritizing a rapid identification of the business services a core description is consecutive expanded by service quality and input/output in a second step. Table 2 shows the specification template applied to two business services. To reduce complexity the bank has chosen to combine the description elements to six building blocks.

building blocks	description elements	business partner master service	transaction execution service
service functionality *(core)*	description	The service provides (CRUD) all information of a customer.	The service triggers the execution of a transaction. This includes the placement of an order or transmission of payments instructions to SWIFT, SIC, PostFinance as well as placement of subscription orders of external issuances.
service context *(core)*	linked application service	21 technical services: e.g. *createBusinessPartner*; *IdentifyBP* …	not yet specified
	business object	Business partner (BP)	order; partner master data
	responsibility	organizational unit *customer care*	business process *trade execution*
	applications	SDS	OnlineBank; Cantophone;SWIFT;SIC; ZVNT…
service behavior *(core)*	pre condition	ID available and existing	Transaction is verified and authorized
	post condition	datasets are readout and returned	Transaction is executed and transmitted.
	service interdependencies	used by all business services accessing BP information	none
service interface *(expanded)*	input	Customer-ID	Transaction-ID
	output	Name, address, country master data, account numbers, flag for keyword customers…	Transaction information according the used standard (e.g. as SWIFT message) including IBAN SWIFT code …
service quality *(expanded)*	expected response time	less than 2 seconds	less than 5 seconds
	automation	fully automated; STP-rate 100%	fully automated; STP-rate 100%
	error recovery	level A; within 1hour	level A; within 1hour
business impact *(core)*	reusability	Client accounting reutilization where transactions are processed	Transaction execution of payments and securities instruments
	service cluster	refunding; sales mgt.; customer care; loans mgt.; transaction mgt.; contract mgt.; solvency..	transaction execution
	covered business tasks (process link)	All business processes concerning customer mgt. and/or customer transactions	sales payments; execution payments transactions; sales monetary transactions; sales assets; financial security; issuance interest instruments; accounting products; customer order entry…

Table 2: Specification of Selected Business Services

The business-oriented service architecture differentiates currently three levels. Tier 1 consists of business service clusters classified in the mentioned service map structure and shown in Figure 4. At present 38 business service clusters cover most business processes. Enhancements will possibly take place for the business area institutional clients. Tier 2 contains the 137 business services itself. Figure 4 shows at the example of the business service cluster transaction execution the tier-2 business services: prepare transaction, routing definition, pooling execution,

transaction execution, business partner master and transaction master. The latter two provide a one-view at the business objects business partner and transaction.

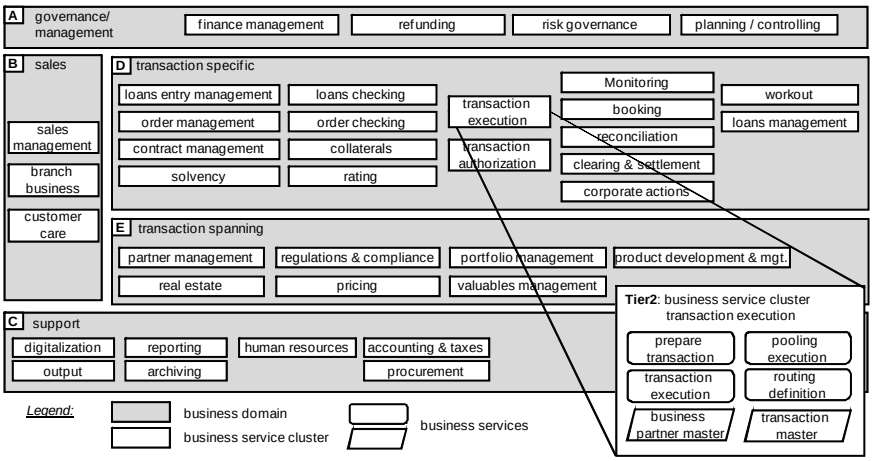

Figure 4: Business Service Architecture Tier-1

Tier-3 provides the application services realizing the business services. Currently, the available application services are covering less than 15% of the functionality described in the business services (e.g. the business partner master service is described thoroughly by 21 application services, whereas the transaction execution service is not supported, see Table 1). Hence as interim alignment the business services are linked with the applications itself (Figure 3). Once the specification of the application services is completed the business services are linked with the applications via the application services.

3.4 Lessons Learned and Limitations

A framework for economic potentials of SOA [Viering/Müller 2007] has been chosen to structure the recognized value of the specified business-oriented service architecture by the Swiss bank (Table 2). Factors concerning the scalability and robustness of systems could not be verified as the realization of the business services via application services is still at its commencement. The identification and specification of the 137 business services took eight months. It has been recognized, that the development of business-oriented service architecture requires a thoroughly coordination with architectural, IT and business teams to enhance acceptability and implementation. Referring to the predictions in section 3.2 the case could not currently validate a quantitative business value as the rollout of the results by the architectural team is still in progress.

External vs. Internal potentials	Bank's recognized potentials	Description	Potentials of SOA
Internal potentials	Business requirements	The break-down of business requirements is improved as first the implications on the business services are discussed. Afterwards via the application services the implications on the IT systems can be identified.	(1); (4); (8); (9)
	Risk mgt. within project mgt.	Using the business service map all affected functionalities and systems of a project can be identified and potential risks can be recognized. Within program management interdependencies of projects can be made transparent to manage and plan projects more efficient.	(9)
	Optimization of application architecture	The business-oriented service architecture is used as basis for to-be application architecture and to identify redundancies in existing applications. Moreover not-used but maintained functions can be identified via the realization of the business services.	(7)
	Comprehensive understanding between business and IT	The business-oriented service architecture provides a loosely coupled view on the business capabilities of the bank while being simultaneously linked with IT via the application services. This enhances a comprehensive understanding between business and IT. It's recognized as the highest potential of the business-oriented service architecture by the bank.	(8)
External potentials	Basis for business process sourcing	The ability of the Swiss bank to source business processes is fostered as (1) interdependencies between processes are transparent upon the service architecture, (2) the exemplification of the quantitative potential of a sourcing scenario is improved and (3) the understanding of the implications on systems are enhanced.	(6); (8); (9)
	Risk management	The organizational unit risk management is using the business-oriented service architecture as reference to calculate / exemplify risks e.g. for systems following market strategy changes.	(7)
Legend economic potentials of SOA: (1) modular product development; (2) better scalability of systems; (3) integrate external offerings; (4) business logic in process steps; (5) dynamic IT support of business processes; (6) decomposition of value chain; (7) application portfolio consolidation; (8) higher degree of transparency in processes; (9) faster adaption to change and (10) more robust systems [Viering/Müller 2007].			

Table 3: Recognized Business Value of SOA at the Swiss Bank

4 Summary and Outlook

Service-oriented architectures (SOA) have been discussed for several years and promise the integration of heterogeneous application environments from a technological view. Many contributions focus on the design of services as key requirement for implementing any SOA. To leverage from service-oriented infrastructures the alignment with processes and strategy is required. The services must be designed to reflect their role as the interface between business processes and application functionalities. Despite the broad discussion of SOA in-depth studies of the application of business-oriented service design are infrequent particularly in the financial industry (see section 1). The financial industry is characterized by fundamental business transformation, value chain redesign as well as heterogeneous application landscapes which limit the required business networking. Banks and providers would benefit from a business-oriented design view on services allowing for optimization of application architecture or business process sourcing.

Hence this paper has described, how a Swiss universal bank (see section 3) developed a business-oriented service architecture. The case has shown (1) the identification and specification of 137 business services, (2) its composition into 38 busi-

ness service clusters, (3) the exemplification via a business service map, (4) the link towards underlying application architecture via application services and (5) the potentials, limitations and lessons learned of the reached service architecture. Further research will focus on how business-oriented service architecture can enhance the standardization of partner profiles in dynamic business networks as e.g. preliminarily discussed with standards such as ebXML. Simultaneously the bank will be observed further for technical realization of the business services and a possible deduction of a quantitative business value.

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