Service Lifecycle Management

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1 Service Orientation

1.1 Service-Oriented Architectures

Service-oriented architectures (SOA) are an intensively discussed architectural paradigm in science and practice (Mueller et al. 2010). Originally grounding in software modularization efforts, SOA is increasingly part of the discourse on business models (Buhl and Weinhardt 2009). For example, software providers no longer offer their solutions solely as complete packages, but rather allow customers to use them in parts or as a whole on a pay-per-use basis (Software as a Service, Platform as a Service). SOA's contribution within these business models is a flexibility gain obtained by abstracting from the underlying implementation. This abstraction leads to a decomposition of applications into fine-granular services. For example, a core banking system might offer a credit worthiness check, while a customer relationship management system processes the customer data. However, these applications are frequently based on different SOA models (e.g., SAP, Oracle). Consequently, increasing modularity causes higher complexity, due to heterogeneous service specifications, service development processes, service implementations, and operating models (Puschmann and Alt 2011). Adding to this, often several suppliers with heterogenous SOA platforms are involved. Without a dedicated management of services along their life cycle (Service Lifecycle Management – SLM), additional alignment efforts would be necessary. Thus, the management of services as well as service portfolios arising from the modularization of monolithic applications plays an important role. However, SLM approaches are just as heterogeneous as the different applications and their SOA models. The numerous facets exhibit a clear dichotomy between technical and business-oriented approaches, which is illustrated by two cases from the financial industry.

1.2 Examples and Potentials of SLM

Entris Banking (EB), a Swiss transaction bank, has been developing a business-oriented SLM for several years. At the core are services as for instance the processing of payments instructions. EB buys parts of the services from its suppliers and bundles them with in-house produced services in order to deliver the complete payments processing service. SLM at EB aims at providing Business Process Outsourcing (BPO) and IT-Outsourcing (ITO) services for banks. Governance models and roles operating on a multi-layered SLM process, comprising the phases Initiation, Monitoring, Governance and Enhancement, serve as the basis. This process covers all activities ranging from new service development and service operation to service enhancement or deactivation. Presently, focus is on the professionalization of the operation phase. Joint service developments take place, but are not yet institutionalized (e.g., by means of standardized processes). Due to the focus on the operation phase, systems support of SLM currently is restricted to a ticketing system for incident management. Additionally, EB operates a management cockpit that keeps track of service-related performance measures as, e.g., error rate and the degree of customer satisfaction. The realized benefits are manifold: by composing and/or bundling banking- and IT-services into business-oriented, standardized marketable services, EB was able to consolidate their service portfolio in the areas of "paying", "investing", and "financing". This way it realized economies of scale and complexity reductions. Due to higher standardization, EB achieved an increase in the number of possible individualized services for customers. Adaption of services to changing environmental factors, e.g., regulations, is implemented faster and at lower cost than before. Further, standardization of service levels and definition of service-related key figures enables EB to improve the monitoring of its service provisioning processes. For certain services, e.g., the operation of workplaces on customers' sites, monitoring is already performed in real-time. Additionally, the integration of external services, which is a key task of integrators, has become more efficient due to increasing standardization on both the service layer and the SLM layer (e.g., process standardization).

Credit Suisse (CS), a Swiss universal bank, follows a more technical approach. CS' historically grown application architecture, consisting of several thousands of applications with limited interoperability, interferes with the bank's business flexibility. Therefore, SLM at CS aims at managing technical services. These services encapsulate functionality of one or

more applications and provide them internally according to highly standardized rules. The SLM process at CS solely targets technical CORBA- and Web services. Consequently, compared to EB the services at CS exhibit less functionality, i.e., they are of lower granularity. The SLM process contains four so-called Stage Gates, control points that are to ensure a certain quality level and to avoid redundancies in the service portfolio. From an application point of view, the process is supported with technical SOA infrastructure components such as a service repository and an enterprise service bus. Further, a custom-built SLM application is in place. It facilitates a consistent and standardized description of services and offers functionality for invoking these services in order to support a comprehensive management and to foster service re-use. Benefits include increased interoperability between applications, more flexible adaptation of business processes and an increased re-use of certain functionalities (encapsulated in services). An example for the latter is a customer data service which delivers and manipulates customer data. It is utilized by more than 100 different applications and services. This in turn leads to a temporal and monetary reduction of adaptation efforts, e.g., for adhering to new regulations as in the case of EB. Further, increased service quality, higher integration capability of externally bought services, and increased flexibility of business process composition have been realized. Just as EB, CS has established an automated monitoring that keeps track of key figures such as availability rate, latency, and error rate.

These two case examples illustrate the dichotomy between business-oriented and technical approaches. The same dichotomy is also prevalent in literature (Buhl et al. 2008). This article first classifies existing approaches and provides the foundation for an integrated understanding of SLM that connects both perspectives.

2 Concept and Approaches

2.1 Concept

Technical service-orientation roots in software development. In this paradigm, services denote bundles of one or more application functionalities. By means of standardized interfaces these services can be utilized without being aware of their specific implementation (programming language, platform, etc.) (Erl 2006). For such interfaces different standards have been and are being developed, e.g., the Web Services Description Language (WSDL).

In recent years another, business-oriented, perspective on the topic has emerged. As in the case of EB, it does not primarily focus on technical, but on business-oriented aspects of services. This perspective sees services as "the application of specialized competencies (knowledge and skills) through deeds, processes, and performances to create value for the benefit of another entity or the entity itself" (Lusch and Vargo 2006, p. 2). Questions concerning possible business models or cooperation between and coordination of companies in inter-organizational service systems, e.g., via electronic service marketplaces (Bardhan et al. 2010), arise.

The following two sections provide a more detailed analysis of both perspectives.

2.2 IT-Oriented Approaches

IT-oriented approaches focus on the management of technical services, e.g., in the form of Web services. Behara and Inaganti (2007) define "SOA Management" as "the Management and Monitoring of applications, services, processes, middleware, infrastructure, and software tools in accordance with the business goals". Besides, approaches for the management of IT Services exist. Examples are trading stations, application provision, and IT support services. The most well known representatives are the IT Infrastructure Library (ITIL), Control Objectives for Information Related Technology (COBIT), and the enhanced Telecom Operations Map (eTOM).

ITIL is a collection of established common practices describing a possible implementation of Service Management. The documentations comprise roles, processes and tools that support the introduction and operation of service management. In version 3 ITIL differentiates between the five process areas service strategy, service development, service transition, service operation, and continual service improvement. While ITIL focuses on the management of IT services, COBIT aims at connecting IT specific (e.g., ITIL) to company-wide frameworks (e.g., COSO); in other words, it integrates IT governance and corporate governance. COBIT differentiates between processes and objectives. The latter can be thought of as critical areas that must be covered by processes in any case. Additionally, a multitude of works describe the relationship between COBIT and further IT standards such as FIPS, TGAF, NISP, and ISO 13335. In contrast to the frameworks described so far, eTOM puts emphasis on inter-organizational aspects and defines corresponding processes for the telecommunications and IT services sector. A special feature of eTOM is a data model that facilitates systems integration.

2.3 Business-Oriented Approaches

The previous paragraph dealt with technical services. However, services often contain business-oriented aspects that go beyond technical elements. Examples are costs and customer segments. Most of the business-oriented approaches can be attributed to certain scientific disciplines, particularly marketing, controlling, product management, finance, and engineering. Especially in engineering a new scientific sub-discipline called Service Engineering has been evolving in recent years (Bullinger and Scheer 2005). It aims at transferring approaches from industrial product development and product management to the services area, mostly by means of process-based models.

IBM coined the term Service Science, Management and Engineering (Maglio and Spohrer 2008), which aims at generalizing the objective of inter-organizational approaches to arbitrary scientific disciplines. In this sense, e.g., Kohlborn et al. (2009) analyze different portfolio management techniques and transfer their findings to the field of Service Portfolio Management. An example is the Boston Consulting Group-matrix. Krug et al. (2010) present a lifecycle-based approach that emphasizes the aspect of co-creation, i.e., the involvement of the customer into the production process. Further, some marketing approaches (e.g., Lusch and Vargo 2006) can be attributed to this class, because they frequently aim at a systematization of sales efforts and have no focus on IT-related aspects.

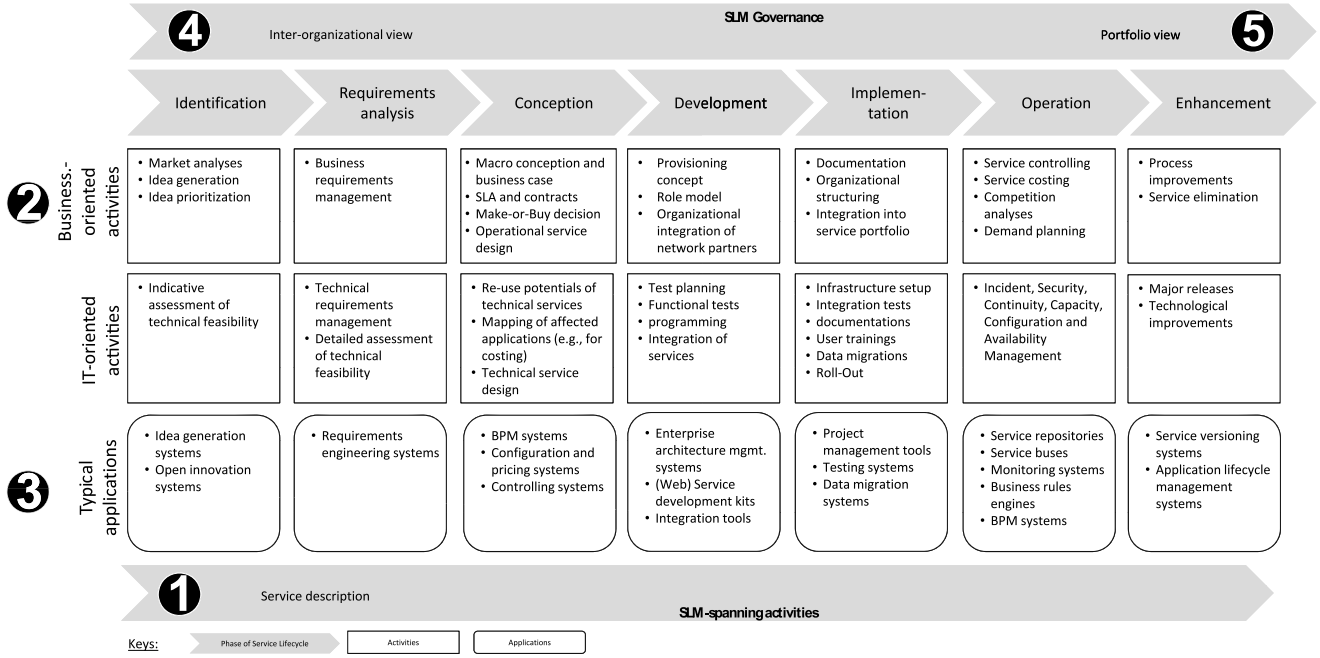

Fig. 1 Integrated Service Lifecycle Management

3 Integrated SLM

3.1 Requirements

The "Service Lifecycle" integrates both perspectives (Bardhan et al. 2010). Based on an analysis and subsequent consolidation of the approaches presented so far, seven generic phases can be identified within the service lifecycle: identification, requirements analysis, conception, development, implementation, operation, and enhancement of services, both from a business- and a technical perspective (see **Fig. 1**). The service lifecycle enables a process-oriented, integrated view on these two perspectives. This view must consider five requirements (see also **Fig. 1**).

1. *Service description*: The description of a service constitutes the basis of many management-related activities along the service lifecycle. Its creation and maintenance thus is denoted as an overarching element in **Fig. 1**. For example, it is a prerequisite for the configuration, composition, and utilization of services, as it codifies corresponding knowledge (Barros 2012). Most of available service description standards focus on technical services. An example is WSDL, which aims at describing the interfaces of Web services. Besides, descriptions of non- or semi-technical services are usually less structured in practice and mostly realized with company-specific, individual approaches. Attempts for description approaches that unify both perspectives are *Serviguration* (Baida 2006), a semantic extension of WSDL (WSDL-S), REA (Resource Event Agent) Ontology, and especially the Unified Service Description Language (USDL). The latter aims at describing business, operational, and technical aspects of any kind of service. In doing so, it is positioned complementarily to more specialized approaches like WSDL.
2. *Value orientation*: The bridge between value oriented corporate management and process-oriented corporate organization is considered a gap in science and practice (Buhl et al. 2011), which at least partially stems from the unavailability of approaches that address cost- as well as revenue-aspects for the management of services. The realization of a value oriented SLM not only requires a costing approach that is compatible with service-orientation (e.g., activity based costing), but also transparency of dependencies between services, i.e., the composition of a service. Given these, transparency of (expected) costs/revenues per service (functionality) might be achieved, which in turn would enable economically sound decision-taking within SLM, e.g., by means of business cases. Today, cost- and revenue elements are mostly defined on objects rather than services. This allows for example to determine the costs of a piece of hardware (e.g., a server), but not the service-related costs (e.g., storage or the operation of a server).
3. *System support*: Due to its complexity, SLM particularly requires consistent IT support in addition to formalized processes (OGC 2010). The two case examples introduced before and an analysis of more than 70 SLM applications reveal a clear misbalance among available solutions, as these predominantly address technical services. Examples are service repositories, message brokers, and enterprise service buses. The postulated consistency between technical and business services, e.g., with respect to costing and dependency analyses, is not realized within contemporary applications. Additionally, no single solution covers the whole life cycle. Rather, application clusters prevail, focusing on certain aspects such as project management during service development, publication, and matchmaking of operating services and monitoring. Consequently, companies are forced to apply a best-of-breed approach if they are to address the whole service lifecycle. **Figure 1** depicts typical application types per lifecycle phase. Especially from a scientific viewpoint there is a clear shortage of discourse

on the support potentials of IT within integrated SLM.

4. *Inter-organizational view*: Increasing decentralization of value creation in service systems requires an inter-organizational orientation of SLM. Cooperating partners must agree on basic rules, i.e., they have to establish an inter-organizational governance alongside with a corresponding role model. Additionally, standardized processes with explicit inter-organizational interfaces must be designed and implemented. For example, a service user purchases support services in case of service outages or login errors. As a central contact point, an SLM provider takes on all requests. Although the SLM provider performs all processes directed to the customer, it might buy parts of the corresponding output from external suppliers.
5. *Portfolio view*: The description and design of single services constitutes the basis for SLM. However, especially in inter-organizational contexts the use of SOA leads to high complexity. For example, a service that offers the processing of payments transactions might require 50 application services that are jointly realized by a core banking system, an archiving system and an output management system. If the payments transaction process, which utilizes the aforementioned service, were changed in some way, this would in turn require amendments to one or more of the affected services. Assuming that 10 services in each system are subject to change per year, totally 30 services would have to be altered. If different providers, just as in the aforementioned example, deliver these services, complexity further increases due to non-aligned service models. An overarching portfolio view ensures to place emphasis not only on the management of single services along their lifecycle, but also to consider dependencies between services (and organizations). Consequently, several contact points with the SLM process depicted in **Fig. 1** exist, e.g., the integration of new services into the portfolio once implementation has been completed.

3.2 Business Models for SLM

Depending on the degree of external service consumption, two basic business models exist for an integrated SLM. In a centralized model an SLM provider assumes all relevant processes. In a decentralized model, the SLM provider buys at least some services from external suppliers and coordinates the customer's interface as a specialist. Two examples illustrate these business models:

Swisscom IT-Services AG (Swisscom) is, among others, an SLM provider for the "Esprit banks", a coalition of eleven Swiss regional banks. Swisscom acts as a specialist focusing on the management of the customer interface and on bundling all required services such as help desk, implementation/system integration, infrastructure, and application management. These services are provided by different internal and external suppliers (e.g., Finnova, Avaloq).

In contrast, the Hewlett Packard Banking Service Center (HP) follows a centralized business model. They offer banking software, desktop- and system management solutions, document printing services, and outsourcing services for banks. Amongst others, HP is SLM provider for Berner Kantonalbank, a Swiss cantonal bank. This bank buys all SLM services from HP. A core banking system, operated and maintained by HP, is the basis for service exchange. HP produces all SLM services itself, without external partners, and thus is completely vertically integrated.

4 Outlook

The diffusion of SOA in companies will continue to proceed. This is due to both growing diffusion of business-oriented service approaches and continuing adaptation of the paradigm by the software solutions of big software vendors. Two further developments support this trend.

First, demand for customer-oriented bundling of fine-granular services is increasing. In the banking industry, for example, currently many new end-customer services are emerging on electronic channels, such as mobile banking, or in social networks. The provisioning of these services requires both, a further opening-up of application architectures and the development of new, business-oriented services (e.g., for online advisory).

Second, an emergence and growing diffusion of inter-organizational standardization efforts, e.g., the Banking Industry Architecture Network (BIAN) in the financial industry, can be observed. These aim at business-oriented and technical standardization of services and thus constitute the basis for inter-organizational financial networks. An example is a service that determines the routing of an international payments transaction: the service can only be exchanged via inter-organizational service networks if it precisely defines which activities it comprises and over which interfaces it is accessible.

Driven by these developments, this article outlines the cornerstones of an integrated SLM. It elaborates on requirements regarding unified service description, value-orientation, systems support, inter-organizational orientation, and portfolio-orientation. An integrated SLM offers potential benefits in terms of costs, time, and quality. For example, reduced costs are a result of inter-organizationally standardized SLM processes, among others. Time benefits arise from increased automation of the SLM processes, which is enabled by an inter-organizationally aligned application architecture. Lastly, the quality of service definition, provision, and enhancement can be increased by unified Service Level Agreements. However, in order for these benefits to materialize, SLM requires extensive standardization with respect to governance, processes, applications, and service descriptions. To achieve this, inter-organizational role models and applications must be put in place. For the mentioned areas of research few findings exist so far. SLM will thus be an important field of research and practical application in the years to come.

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