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Abstract

The paradigm of the Internet of Services envisions trade on a global service-enabled internet. Companies, which participate in this new world of services, face the challenges of changing market conditions, new competitive threats, and new legal regulations. Service-oriented Architectures (SOA) provide a promising way to address some of these challenges at the level of the company's IT infrastructure. In order to guideline an enterprise's organization and IT and ensure smooth operations, governance frameworks have been established. More specifically, IT Governance and recently SOA Governance have been introduced. The basic structure of IT Governance frameworks is applicable to an SOA. However, they lack functionality or applicability concerning SOA-specific challenges. Current approaches, which focus on mere SOA Governance, lack framework scope and are mostly driven by individual companies. This issue aggravates taking into account the shift to an Internet of Services. We identify key issues and provide initial insights on building blocks for a Service Governance Framework which enables operations for companies in a moderated service network. We discuss service life cycle phases, stakeholder roles, and management processes taking into consideration existing frameworks such as ITIL and CObIT as well as industry-specific approaches from companies such as SAP, Oracle, and HP.

Keywords: Service Oriented Architecture, Framework, Service Governance, Governance Management Processes, Governance Roles, Internet of Services.

1   INTRODUCTION

The Internet of Services is thought to enable agile enterprises to reach out to a global market and focus on core competencies but also create global competition. It is extending today's internet to become service-enabled, i.e. facilitating the trade as well as execution of services. For businesses it is supposed to be the underlying global infrastructure which allows forming flexible and agile service networks to provide value-added services (Heuser, 2007). It is "a multitude of connected IT services, which are offered, bought, sold, used, repurposed, and composed by a worldwide network of service providers, consumers, aggregators, and brokers resulting in a new way of offering, using, and organizing IT supported functionality" (Villasante, 2009). Trends like this make companies face constantly changing market conditions, new competitive threats, and new legal regulations which have an impact on their IT (Barros & Dumas, 2006). The Service-oriented Architecture (SOA) paradigm provides a promising way to address these challenges at the level of the company's IT infrastructure.

Diligent governance has been recognized in recent years as a major requirement for successful adaptation and operation IT, especially for large systems. Governance in general, be it political governance, Corporate or IT Governance, provides guidance for the definition of expectations and responsibilities as well as directions to assess the performance of organizations or projects. Governance elaborates guidelines and rules that need to be adopted and realized by the affected management processes and stakeholders. Service Governance must provide means to effectively exploit the capabilities of SOA in an Internet of Services.

For IT Governance, a number of existing frameworks provide structures, action scope, guidelines, and best practices. However, while the basic structure of IT Governance frameworks exceeds the needs of an SOA, they lack applicability concerning SOA-specific challenges, e.g. cross-company service deployment and third party service management. Current approaches, which centre on mere SOA Governance, lack framework scope and are mostly driven by individual companies. Hence, in order to meet governance requirements, existing frameworks need to be extended and/ or refocused.

We analyze existing approaches with respect to their applicability to SOA scenarios and the Internet of Services in particular. In a first step, we blend both, CObIT and ITIL, to get a basic set of governance processes, tasks, as well as a related set of key performance indicators and controls based on mature frameworks. Then, we discuss the major elements of a Service Governance approach. We provide the theoretical fundaments and initial keystones of a Service Governance Framework covering the service life cycle, involved roles, and management processes.

This research belongs to the design science paradigm (Hevner et al., 2004, March & Smith, 1995). It strives for developing a practically relevant artifact in form of a method framework for Service Governance in the Internet of Services. According to March and Smith (1995) and Hevner et al. (2004), (IT) artifacts are of four types: constructs, models, methods, and instantiations. Constructs are the vocabulary of a domain, a specialized language, and shared knowledge of a discipline or subdiscipline. Models are a set of propositions or statements expressing relationships among constructs. Methods are goal directed plans for manipulating constructs so that the solution statement model is realized. Instantiations (also implementations) operationalize constructs, models, and methods resulting in specific products.

The paper is organized as follows: In the subsequent section we elaborate on the fundamentals of an SOA as well as IT and SOA Governance. In Section 3, we outline necessary requirements for Service Governance by reviewing industry practice and provide building blocks for a Service Governance Framework. They include a frame for the service life cycle phase, stakeholder roles, and a management process cycle. The paper closes with a summarizing analysis of Service Governance for an Internet of Services realized through service marketplaces.

2   RELATED WORK

2.1   Service and Service-Oriented Architecture (SOA)

The SOA paradigm is a holistic approach towards the execution of business processes consisting of services within or across enterprise architectures. Structured adaptation is crucial to the success of a company's SOA. As an architectural paradigm, SOA defines a number of mechanisms, principles, and conditions: All functions (e.g. business functions) are defined as services.

Services can be regarded as "not storable and intangible goods which are constructed in cooperation with an external factor (usually the service consumer). Construction and consumption traditionally occur at the same time (uno-actu principle). Electronic services differ insofar as they are storable in a sense and their consumption, i.e. execution, does not necessarily involve concurrence" (Janiesch et al., 2008a). Services are designed to support reusability in different scenarios. In order to reuse, only a new parameterization is necessary without any change in its implementation. Service functionalities can be automatically discovered via service brokers or registries. They are centrally registered at a database which provides information about the services upon request. Services are self-describing. While interacting, services are loosely coupled. This means a mutual association via messages; dependencies are minimized to mere awareness. It facilitates a number of operations, e.g. their replacement by other services during runtime. Service operations always involve several parties. Services therefore adhere to a communications contract, a Service Level Agreement (SLA), defined by one or more service descriptions and related documents in order to regulate and control service execution. Services are autonomous concerning their logic. They are independent of other services, e.g. software modules, as well as resources such as databases. The realization of services follows the information hiding principle. Services are stateless. They minimize stored information regarding activities, i.e. state or context information concerning either execution or communication with other services is not saved. Services are completely independent of any platform, programming language or operating system. Their technical realization is transparent for service requestors and brokers. Services can be accessed by an invokable interface without any knowledge of its location. An important characteristic of services is their combinability. Services are designed to be assembled to form composite services, each consisting of several single or further composite services (Erl, 2005, Huhns & Singh, 2005).

Accordingly, an SOA is "an application architecture within which all functions are defined as independent services with well-defined invokable interfaces which can be called in defined sequences to form business processes" (Channabasavaiah et al., 2003).

In order to support and facilitate coordination and cooperation between service providers and service consumers, service brokers are established. These are registries known to all eligible providers and consumers. Providers register services by providing meta information such as name, functionalities, interfaces, etc. Consumers query a broker for a service needed – and if a service is found, the consumer and provider exchange interface specifications. If both sides agree to cooperate, a cooperation is established and concluded by an SLA (Huhns & Singh, 2005). Instead of merely being a broker, the platform host can evolve into a moderator who also supervises the delivery of services. In order to realize this vision and achieve this goal, a diligent governance concept is needed from the very beginning, to support the realization of these benefits.

2.2   IT and SOA Governance

The SOA paradigm offers advantages compared to common enterprise architectures such as an increased response rate to changing conditions or interoperability. However, these advantages entail new challenges such as the need for permanent monitoring and control of services – service guidance is required. By following specific guidelines in a top-down approach, an SOA is adopted, operated,

and continuously monitored and checked for adherence to regulations. Governance also ensures compliance, i.e. compliance to intra-company, normative or legal standards (e.g. the Sarbanes Oxley Act, Basel II etc.).

For IT Governance, numerous frameworks have been specified, e.g. CObIT, ITIL, ValIT, ISO 20000, ISO 17799, etc. Basically, each of them focuses on a different aspect of a company's IT. While the IT Infrastructure Library (ITIL), e.g. mainly deals with management and support process definitions (Office of Governance Commerce, 2007), the ISO 17799 standard primarily targets security management (International Organization for Standardization, 2006). When these approaches are compared, we see that they do not exclude but rather complement each other. In comparison, CObIT is a high level governance and control framework, more tightly aligned with the business objectives of the organization than with operational issues (IT Governance Institute, 2007). As a matter of fact, all other frameworks class into CObIT. It has, so far, become a de facto standard for IT control globally, and its implementation increasingly gains interest.

Concerning SOA Governance, many software companies introduced their own definitions in whitepapers, often on behalf of own market interests (cf. Section 3.1). This resulted in the definition of a number of different approaches. Similarly, a number of definitions for SOA Governance can be found: "SOA Governance is a management structure including creational and administrative elements" (Fabini, 2007) or "SOA Governance is a set of solutions, policies and practices which enable companies to implement and manage an enterprise SOA" (Brauer & Kline, 2005).

It is difficult to give a common definition for SOA Governance as a number of different descriptions and understandings exist. The main objective is to define and introduce company-wide policies for the adoption and operation of an SOA as well as introduce mechanisms controlling their enforcement (Fabini, 2007, Windley, 2006). According to several authors, the basic difference between SOA and common/ former enterprise architectures is the service life cycle (Bea Systems, 2006, Brauer & Kline, 2005, Software AG, 2005). There is a paradigm shift concerning software development (Johannsen & Goeken, 2007). Hence, a central issue of Service Governance is considered to be the *service life cycle governance*.

In most cases, an SOA requires the restructuring or adaptation of the company's organizational structure. A *SOA Center of Excellence* as well as accompanying boards, consisting of management members and members from the different departments is recommended (Bieberstein et al., 2005b). In case of big companies, one central governance structure seems problematic – decentralized and coordinating as well as hierarchically structured governance positions are combined (Fabini, 2007). The deployment of an *SOA Maturity Model* is also recommended (Afshar, 2007, Johannsen & Goeken, 2007, Progress Software Corporation, 2006), measuring the maturation of a company's SOA. Results of such an assessment provide information concerning the progress and success of the realization of SOA. This way they have impact on the governance policies – a control cycle is created.

Most of the authors agree that SOA Governance is a fundamental requirement for a trouble-free adaptation as well as for successful operation. Regulations and control are the central elements which are to be effectively implemented. In parts, SOA makes the same demands on governance as common systems, but to some extent it exceeds the regulative support IT governance can provide. Regarding value contribution or IT-business alignment, existing IT Governance frameworks (e.g. CObIT) provide sufficient support. However, if confronted, e.g. with cross-organizational aspects, the scope of IT Governance frameworks is exceeded. SOA Governance needs to provide the abilities to guarantee sufficient SOA adaptability and integrity as well as to check services concerning capability, security aspects, and strategic business alignment.

3   CURRENT ISSUES AND PROPOSALS FOR SERVICE GOVERNANCE

3.1   Existing SOA Governance Approaches in Industry

An inherent characteristic of SOA is that services are not bound to existent entities, such as, e.g. accounting applications. They can be provided, bought or sold and executed in third party applications or environments. Additionally, to a greater extent than previous enterprise architecture concepts, SOA facilitates inter-organizational deployment of software artifacts. Thus, a governance approach must focus on the adoption and operation of SOA as enterprise architecture in a company. It must provide guidelines and mechanisms to ensure the integrity of an SOA and its adaptability to business and general administration processes. It also must provide tools to support the monitoring and control of services concerning security issues and the alignment to business processes. The main goal is to achieve adherence of the SOA system to various specifications and standards, such as the Sarbanes Oxley Act, ISO norms or internal regulations.

Numerous perspectives of SOA Governance exist driven by individual companies. Hence, they are rather product-oriented. Thus, approaches to SOA Governance do not always comprise all of the above mentioned elements. It depends on requirements and existing structures of the particular cases, which of the elements are considered useful. But they all concur that the adequate implementation of SOA Governance in a company requires an extra approach as extension to IT Governance to address SOA challenges (Woolf, 2007).

The SOA Governance approach of SAP AG, e.g. consists of a guidelines framework and an organizational institution, the Process Integration Content (PIC) Council. The framework has three parts: modeling and implementation guidelines, a special review process performed by the PIC council (guidelines enforcement), and the continuous execution of manual and automated service tests (SAP AG, 2007). The process is model-driven with the support of an integrated modeling suite. The actual engineering and development process starts with the identification and structuring of functional requirements. They are scrutinized in a map which covers deployment units, process components, and business objects. The resulting integration scenario model defines the necessary interactions and results in a service orchestration. The resulting content is subject to a review process by architects and an approval by management. The PIC Council guarantees quality of process integration content by reviewing interfaces for semantic correctness, ensuring standard conformity, encouraging reuse, establishing enterprise-wide consolidation and improving the integration guidelines. The SAP AG approach implements the idea of the SOA Center of Excellence, defining a council as central element of SOA Governance. The design of individual services is also governed by an enterprise service design guide which promotes a business-driven view based on processes and scenarios. Thereby services are not to be designed isolated from each other and are meant to be reused (SAP AG, 2005). The guidelines include concepts of service design for SAP internal development, business analysts, system integrators, and independent software vendors. The procedure is three-stage and consists of indicator-based service discovery, service design and documentation. The methodology also distinguishes the three levels of design of single services, service systems design, and service-enabling of enterprise applications. It is centered on the notion of so-called design contexts which represent patterns for improving applications with services.

Similarly, a comprehensive examination of the scope of SOA Governance is given by Oracle, Inc. (Afshar, 2007). Oracle's approach attempts to give an overview of the entire Governance domain. Starting from a generic point of view, Oracle Inc. identifies eight decision fields. Within each field, policies for key issues are to be defined, in order to assure the according requirements on SOA and their reliable realization. The approach combines these decision fields with an SOA adoption model and a comprehensive set of best practices. The following table gives a short overview:

Decision Field	Key Aspect
Architecture	Standards, architectural assessment mechanisms, reference architectures, application guidelines
Data	Data ownership, data service architecture, formats and standards, formalizing of the description of data requirements in SLAs
Finance	Funding of business and technical services, of the hardware and software infrastructure, backbones and assignment to accounts
Operations	Enforcement of policies and rewards/ penalties, capacity planning, operational model for cross-department deployment
People	Incentives for employees, organizational structure, roles and responsibilities, SOA training
Portfolios	Project, service, and legacy portfolios for strategic planning of SOA and support for project management
Project Execution	Project selection and adaptation, competence alignment, formalizing the life cycle process control of business processes and policies
Technology Infrastructure	Strategic SOA platform, governance platform, migration of legacy systems, design and implementation of infrastructure services

Table 1.   Key Aspects of SOA Governance Decision Fields

Apart from these approaches, many other companies propose proprietary models. We give an overview of the variety of the field in the following:

Brauer and Kline (2005) at HP define different components supporting the implementation and management of SOA. They provide a holistic controlling framework, emphasizing the integration of people (organization), processes, and technology.

Bieberstein et al. (2005a) of IBM propose an SOA Governance Model. They identify six governance processes and three steps for launching the SOA Governance Model. The SOA strategy and SOA objectives should be defined in a way that both business and IT units have a clear understanding of them. According to them, policies, defined by governance positions, form the basis for any decision. Their model is completed by a set of best practices. Bieberstein et al. (2005b) also describe an approach to guide an SOA successfully, emphasizing transformation of organizational structures and behavioral practices. They propose the Human Services Bus (HSB) as a new organizational institution, streamlining cross-department processes, thus optimally exploiting the SOA approach.

webMethods' (2006) SOA Governance approach consists of two parts: Architecture Governance and Service Life Cycle Governance, the latter is divided into design-time, run-time, and change-time governance. Architecture Governance comprises issues such as corporate technology standards, the definition of an SOA topology and determination of an SOA platform strategy. Service Life Cycle Governance focuses on the regulation of design etc. of services through according policies and enforcement mechanisms.

The approach by Software AG (2005) identifies maturity and governance levels. Besides this 6-level-maturity model they define an SOA service life cycle, incorporating services, related artifacts, and roles. They provide a 5-step SOA adaptation plan as well as a set of best practices.

Bea Systems, Inc. (2006) clearly emphasizes the importance of the service life cycle as the most critical requirement of a successful holistic SOA Governance approach. Central policy definition and enforcement, regulating the design, building, provisioning, and operation of services, affect the whole SOA referring to quality assurance, monitoring, and SLA management. The primary goals are reduced development costs and faster time-to-service. With the acquisition of Bea Systems, Inc. by Oracle, Inc. it is reasonable to assume that their approaches will merge.

This list of governance model proposals shows the diversity of approaches to SOA Governance. However, most of them show congruencies which can be generalized. For governance within the Internet of Services, an approach is needed that lies between the requirements of an SOA and the more

general governance of IT. Thus, Service Governance, as we understand it, is a form of IT Governance and is mainly driven by the Corporate Governance of the host. It subsumes several points from the current best practices of SOA Governance, e.g. comprises it considers cross-company issues of multiple parties. Also, SOA as enterprise architecture is addressed. However, in addition Service Governance comprises the consideration of cross-company legal aspects exceeding those of current SOA Governance approaches, i.e. contract management over country borders, country-specific laws for data transmission and protection, and laws concerning the fulfillment of online contracts. Being a cross-company approach the framework needs to consider the interests of all stakeholders of the platform. Both the interests of the host and customers have to be included. Preconditions to be fulfilled by suppliers also have to be formulated, and vice versa. In contrast, SOA and IT Governance approaches normally focus on the operation within a single organization, considering a single stakeholder.

3.2   Building Blocks of a Common Service Governance Framework: Service Life Cycle

As a balanced starting point, the IT Governance frameworks of CObIT and ITIL v3 can be used. This is not only because they provide insights from relatively unbiased organizations rather than individual enterprises, but because they are at both ends of the governance spectrum: strategic governance and IT management. CObIT focuses on strategically important tasks (i.e. main processes) and ITIL focuses on management tasks (i.e. support processes), which are often subject to outsourcing and, thus, the ideal blueprint for managed third-party processes (IT Governance Institute, 2007, Office of Governance Commerce, 2007). Figure 1 depicts existing processes which have been taken over as-is or in an abridged form to focus on the specific needs of a Service Governance Framework. Most of the time however, the governance processes need to be extended to cater for the specific needs in an Internet of Services.
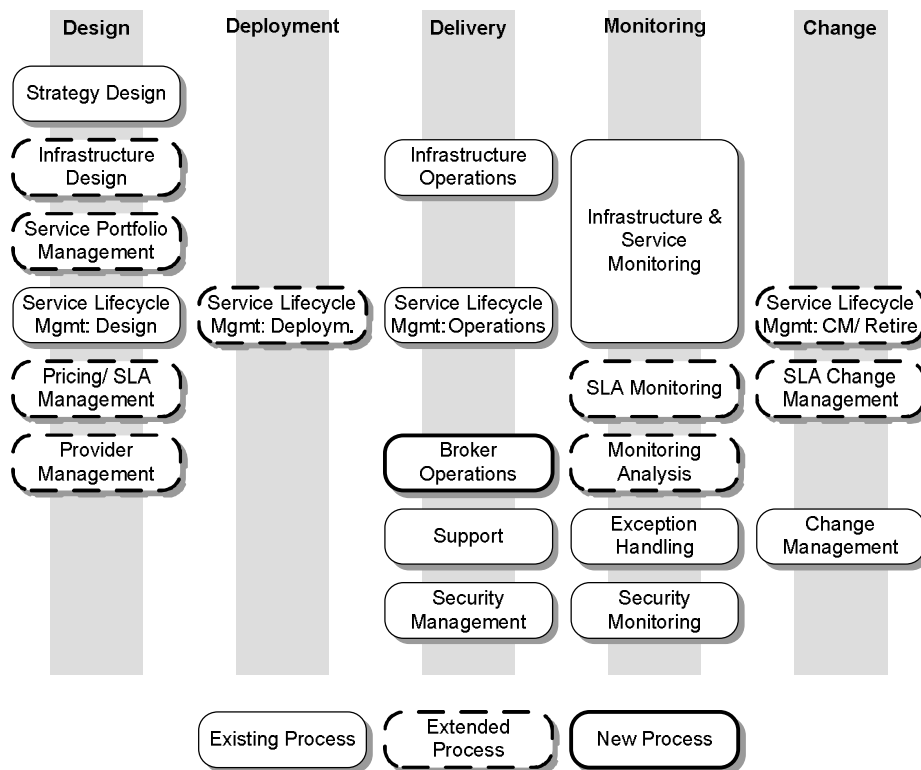

Figure 1.   *Service Governance Framework for the Internet of Services based on ITIL and CObIT.*

All relevant governance processes from these frameworks can be grouped in a life cycle consisting of five phases: design, deployment, delivery, monitoring, and change (Janiesch et al., 2008b). In each of these phases, several processes constitute the Service Governance Framework. The design phase contains all sorts of strategic aspects of the use or operating of such a platform and traded services. Identifying requirements, development of services, as well as the selection of third-party services are components of the deployment phase. The delivery phase comprises all aspects of service and infrastructure operations. It is closely coupled with the monitoring phase as they are executed concurrently. The monitor phase contains all aspects of service and infrastructure monitoring. The change phase includes all processes and tasks needed to adjust and change the infrastructure and services traded.

Functionality within the Internet of Services is centered on the central service broker component. It cannot be found in current general IT Governance frameworks or in SOA Governance frameworks. Thus, this process is new. There is a need for future refinements of the framework as this first version is intended to show the scope of the Service Governance. While this scope will also be refined, the main focus for detailed development needs focus on the process of broker operations. This is of particular importance if – as mentioned above – services are not only brokered like tradable goods but also moderated in a value-added manner similar to product-service bundles (Schroeder, 2008).

3.3   Building Blocks of a Common Service Governance Framework: Management Processes

Services in an SOA are tightly linked to business processes. These are controlled, monitored, and improved by management and its processes. Generally, a management process is the process of planning and controlling the performance or execution of any type of activity, e.g. projects as well as business processes or workflows. It is a tool for managers to control existing business processes actively – sometimes also referred to as factual leadership. It can relate to the top management of an organization as well as to project management and risk management.

Commonly, the management process can consist of the following phases, mostly described as a circle (Burghardt, 2000) as depicted in the following Figure.
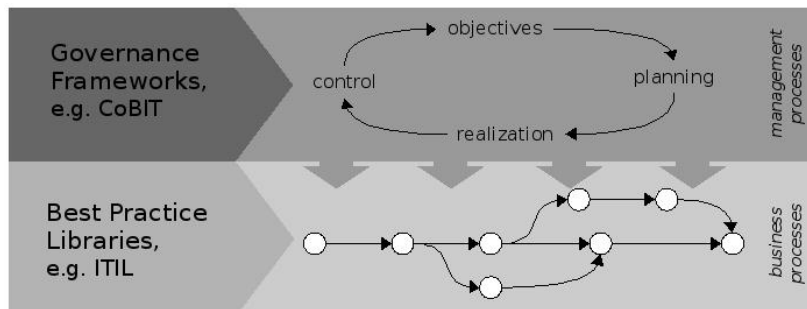

Figure 2.   Management and Business Processes.

The objective phase describes a desirable realistic state, defining the aim to be achieved. The planning phase identifies possible ways to achieve the goal. The realization phase triggers, e.g. organization, human resources management etc. During the control phase the degree of target achievement is measured. During each phase, communication and exchange of information between the involved parties is crucial. During the planning and realization phase the subordinate business processes are designed and implemented. During the control phase they are monitored and assessed and the need for change management is evaluated. This can lead to starting over again with the objective phase.

Concerning IT management, there are a number of frameworks that support process management, as e.g. CObIT or ITIL. CObIT provides supporting mechanisms on leadership or governance level, while ITIL targets management of software production in general, i.e. on business process level (Kamleiter

& Langer, 2006). In case of SOA, a governance framework is of particular importance, as in an SOA the link between IT and business processes is closer than in previous enterprise architecture approaches.

3.4   Building Blocks of a Common Service Governance Framework: Roles

Weill and Ross (2004) stress the human involvement in IT Governance in their definition of IT Governance as they suggest to specify "the decision rights and accountability framework to encourage desirable behavior in the use of IT". Consequently, as a further step starting from the guidelines for organization forms and responsibilities, a more concrete shaping of the necessary roles is given in this section.

In the Internet of Services, several main stakeholder roles have been identified: service provider, service brokers or platform hosts, and service consumers (Barros & Dumas, 2006). The following Figure gives an overview of the stakeholder roles. While the service consumer and the service provider are actual persons taking the specific stakeholder role, the service broker is a virtual entity, e.g. a marketplace, a piece of software. Nonetheless it is operated by actual persons who act as a platform host.
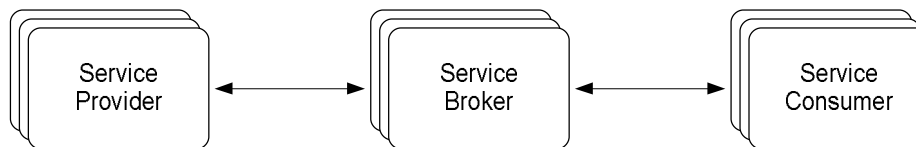

Figure 2.   General Role in the Internet of Services.

The service provider stakeholder supports agencies that hold governance and operational responsibility for a service, including organizational structures and other business aspects, as well as systems and other implementation artifacts. The service provider represents the role of a development party, producing and publishing services ready for execution. Largely, they are the service owners, responsible for the service implementation as well as maintenance.

The service consumer finds services via the service broker and requests and invokes them. He is the customer in the market transaction. For aggregated services, providers can act as consumers to create value-added services.

The main role of a service broker is to provide service location and description information contained in a service registry. So far the broker role is mainly associated with maintaining registries. As the central information database, its actuality is crucial to the success of the whole SOA system. However, intermediaries can play additional roles, e.g. mutually providing themselves brokering services, load balancing functionalities or negotiation support services (Erl, 2005). With an increasing number of services, registries become more and more important. They serve as a central location for tracking and managing services. The reusability of services depends on registries as these provide a way to share services across organizational borders. As a moderating entity the scope of the host is extended since it also has to attend to run-time and change-time issues such as services, which is updated while being in use. They must not be interrupted during execution.

Gu and Lago (2007) also give an overview of typical service life cycle models, including roles and responsibilities, developed mainly by software companies. Bieberstein et al. (2005a) defines various organizational SOA specific roles which are needed within one or more of the stakeholder roles.

4   CHALLENGES OF A GOVERNANCE APPROACH FOR A SERVICE MARKETPLACE PLATFORM

The scope of this paper has been the examination of Service Governance starting from two perspectives – SOA and IT Governance. For IT Governance, there are existing frameworks that provide structures, action scope, guidelines, and best practices. As this research concluded, the basic structure of IT Governance frameworks is applicable to SOA. However, they lack functionality or applicability concerning SOA-specific challenges, i.e. cross-company service deployment. Hence, unchanged, these frameworks are not fully suitable. SOA Governance requires at least an enhancement. In fact, approaches that focus on mere SOA Governance, lacking framework scope, already exist. An overview has been presented above. Most of them represent generic approaches and are hence applicable for adoption.

The organizational aspect, often identified as one major decision field of SOA Governance, is an important issue. We investigated in detail the service life cycle, roles and responsibilities, and management processes. Common SOA-specific organizational as well as stakeholder roles were presented. Our focus on a specific form of Governance for Services in the open Internet of Services is future facing. Papazoglou and Georgakopoulos (2003) elaborate on service marketplaces as an (in areas) existing occurrence of SOA and Janiesch et al. (2008c) present an infrastructure and web-based business model for a generic service marketplace. They argue that services will have the largest share in the future business value networks. Thus, services have to be transformed into tradable goods; service marketplaces are considered to be an adequate vehicle to do so.

This entails new challenges such as monitoring and billing techniques and cross-company legal issues which require an improved form of service (marketplace) governance. It shows that the particularities of a moderated SOA cannot easily be addressed and managed by a common IT or SOA Governance approach.

We developed an outline of a governance framework which can be used for a service marketplace incorporating the above described role concepts. While investigating existing frameworks for IT Governance, we learned that an SOA introduces challenges for traditional governance frameworks. In fact, in the case of an SOA marketplace approach, it is to assume that the regulatory demands exceed existing structures in governance frameworks. This *Service Marketplace Governance* is a form of IT Governance and is mainly driven by the agenda of the marketplace host or service broker/ moderator. It is also an extension of SOA Governance and considers the conformance and regulatory needs of a service marketplace host. In four main points, it can be distinguished from the common SOA Governance approach:

It comprises a form of SOA Governance including an according policy framework. (It is considered a *super class* of the common SOA governance approach.)

It pays special attention to cross-company legal aspects, e.g. data protection/ security. Additionally, the term *Service (Marketplace) Governance* comprises the consideration of contract management over country borders, country-specific laws for data transmission and protection, and laws concerning the fulfillment of online contracts (such as the Fernabsatzgesetz (Distance Selling Act) in Germany).

It covers different service monitoring aspects. Technically, there are a variety of possibilities to realize service or SLA monitoring: decentralized, centralized, or hybrid monitoring, However, centralized monitoring is considered inappropriate due to the large number of service providers and executors and the very large number of services being offered on the platform. Hence, a decentralized monitoring approach might be the better solution. This, however, comes with additional requirements for a Service Governance Framework.

It includes the interests of multiple parties, i.e. stakeholders. Operating a service marketplace platform involves much more stakeholders than common SOA approaches. SOA platforms incorporate at most

two parties: the platform host (which is the service provider, broker, moderator, and developer) and the service consumer. Being a cross-company approach this framework considers the interests of all stakeholders of the marketplace platform: Consumers, platform hosts or service brokers, and service providers. Both the interests of the platform host (broker/ moderator) and service consumer are included. Preconditions to be fulfilled by the service provider are also formulated, and vice versa: A marketplace governance approach defines policies with respect to service consumers regarding the interests of platform hosts and service providers. In contrast, SOA and IT Governance approaches normally focus on the operation within a single organization, considering a single stakeholder.

One way to address these challenges is to make extended use of certification of platform conform behavior of service providers, executors, etc. A generally accepted way for service providers to show their competence and compliance with certain standards is the certification of the service provider and its organization, e.g. based on the well established ISO 9001 audit and certification for quality management purposes.

The above assumes a governance approach for one (centralized) marketplace platform which acts as a broker (or moderator) for service providers. This governance approach does not yet cover governance of multi-broker architectures which have different brokers communicating and trading obeying certain rules. In fact, however, it addresses complex requirements for controlling and directing an SOA service marketplace and all of its services and stakeholders, common existing IT Governance frameworks fail to cover.

Acknowledgement

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