Association for Information Systems
AIS Electronic Library (AISeL)

AMCIS 2009 Proceedings

Americas Conference on Information Systems (AMCIS)

2009

Identification of Business Services Literature Review and Lessons Learned

Rene Boerner
Frankfurt School of Finance and Management, r.boerner@frankfurt-school.de

Matthias Goeken
Frankfurt School of Finance and Management, m.goeken@frankfurt-school.de

Identification of Business Services
Literature Review and Lessons Learned

Journal:	*15th Americas Conference on Information Systems*
Manuscript ID:	AMCIS-0353-2009.R1
Submission Type:	Paper
Mini-Track:	Analysis and Design for Service-Oriented Enterprises < Systems Analysis and Design (SIGSAND)

Identification of Business Services

Literature Review and Lessons Learned

René Börner
Frankfurt School of Finance & Management
ProcessLab
Sonnemannstrasse 9-11, 60314 Frankfurt, Germany
r.boerner@frankfurt-school.de

Matthias Goeken
Frankfurt School of Finance & Management
IT-Governance-Practice-Network
Sonnemannstrasse 9-11, 60314 Frankfurt, Germany
m.goeken@frankfurt-school.de

ABSTRACT

Business-driven identification of services is a precondition for a successful implementation of service-oriented architectures (SOA). This article compares existing identification methods retrieved from related work and discusses the shortcomings. In particular, a lack of economic aspects constitutes a problem and leaves space for improvements. Finally, the paper proposes a process-oriented method of service identification. This approach incorporates the business point of view, strategic and economic aspects as well as technical feasibility.

Keywords

Service-Oriented Architecture, Service Identification, Business Process Modeling, Business Services.

SERVICE IDENTIFICATION AND DESIGN

Service-orientation is a new and highly recognized paradigm in enterprise architecture. There are lots of expected benefits related to SOA in a technical and in a business-oriented sense. Although the business-oriented benefits, like flexibility and reusability/standardization, are of high importance, up to now, development of SOAs is mainly technically driven and most approaches consider technical aspects in the first place. However, experience and empirical evidence show that technically-driven implementations often fail in realizing the mentioned business-oriented benefits (Hagen, 2003; Legner and Heutschi, 2007).

Hence, approaches which focus on business issues are of primary importance. For the last couple of years some authors have been looking at the identification of services, which is one of the first most important steps in an overall approach. As these services are strongly related to business processes, they are often termed “business services”. However, there is still a lack of common understanding of what services (and business services) are and which goals are to be achieved. Due to this, existing approaches for service identification differ significantly from one another. In chapter 2 we present a framework of several criteria in order to compare approaches found in literature. Their strengths and shortcomings are discussed in chapter 3. Based on these findings, requirements of a new method to identify services from a business point of view are presented in chapter 4. Particularly, method engineering aspects as a foundation for this new process-oriented service identification (POSI) will be discussed.

COMPARISON CRITERIA

In order to compare the approaches for service identification, a catalogue consisting of selected criteria is applied to give an overview of approaches currently discussed in related literature. Some criteria have already been used by other researchers (Allen, 2006; Erl, 2004; Josuttis, 2008); others have been added to complement the existing ones. Table 1 shows the selected criteria summarized to six groups for a better understanding. All criteria will be discussed in detail in this chapter.

Basic aspects	**Economic aspects**
Industry sector	Value creation
Understanding of services	Maintenance and operation costs
Service hierarchy	Testing effort for new functionality
Granularity	Vendor dependency
SOA paradigm	Demand-oriented QoS levels
Starting point and direction of derivation	Customer satisfaction
"Tools"	Individualization of products and services
Types of categorization	Specialization in core competences
Business aspects	Increase of product range
Consideration of strategic aspects	Internal services offered to external customers
Legal compliance	Scalability
Internal policies / IT governance	Time-to-Market
Service level agreements	SOA controlling
Goal	**Components of method engineering**
Supported object	Activities
SOA lifecycle	(SOA-)Roles
Functional similarity	Results
Technical aspects	Techniques
Orchestration vs. choreography	Sequence of activities
Customer interaction	**Guidelines of design science research**
Employee interaction	Documentation
Criteria of information technology	Research rigor
Call frequency	Method evaluation

Table 1. Criteria by Groups

Basic Aspects

The *industry sector* is important to understand the background of the approaches discussed. Identified similarities and differences might be grounded in the industry sector in which they are applied. Possibly, some elements can be transferred successfully from one industry sector to another. The *understanding of services* differs tremendously among the approaches. Some consider a service comprehensively, i.e. it represents a complete business process. On the other extreme authors tend to a workflow-oriented view in which a (fully automated) service represents a single task. However, all authors use a *service hierarchy*. This classification usually consists of two or three levels (Erl, 2004; Josuttis, 2008). The differentiation of basic services and composed services is a common feature although there are varieties in detail. The right choice of *granularity* within an SOA is critical and extremely difficult. In the following, granularity shall describe the functional scope of a service. Obviously, there is no silver bullet for the right granularity. Fine-grained services can easily be reused in different contexts (i.e. for many processes) but this can lead to higher complexity when orchestrating the huge number of services. Coarse-grained services are able to fulfill more complex tasks but they are less flexible and harder to reuse.

The underlying *SOA paradigm* affects the identification and specification of services. It represents the idea of what an SOA actually is. The *direction of the analysis* (i.e. bottom-up or top-down) has an important effect on the specification of services and is therefore another criterion. The authors use a range of *tools* that can be subsumed into business process modeling (BPM), process decomposition, domain decomposition, asset analysis and portfolio management (Josuttis, 2008). Depending on the focus of the respective approach *types of categorization* vary. Whereas technically-driven approaches categorize e.g. by implementation strategy, business-driven approaches might differentiate by service consumer type (i.e. internal or external).

Business Aspects

The *business aspects* are the second group of criteria. C*onsideration of strategic aspects* is very important because an SOA is not implemented for its own sake but seeks tangible benefits for the company. Although the strategic relevance might be less critical for the identification of services itself, it is crucial for their design and subsequent sourcing strategies. A categorization by Allen therefore differentiates between three types of services (Allen, 2006). Commodity services are stable, sufficiently established services that every market player must have. They are suitable for outsourcing and standardization. Territory services are fairly wide-spread but less stable and usually represent business rules. Value-added services constitute the special value of a company's product or service in the market, i.e. a company's core competence. It is this highly innovative service that gives distinction to the company (Allen, 2006).

Laws and regulations limit a service's suitability for outsourcing. Thus, services handling sensitive customer data must be checked for *legal compliance*. Furthermore, *internal policies* must be taken into account when services are identified and specified afterwards. Ever growing requirements concerning flexibility and agility for existing and heterogeneous IT landscapes necessitate an *IT governance*. Thus, frameworks such as COBIT must not be ignored. *Service level agreements* (SLA) are important for the composition of services. Whether the figures in service levels can be summed up or have to be recalculated in one or another way must be checked for every single case.

SOAs are frequently mentioned as means for standardization and flexibilization without noticing the ambivalence of these *goals*. Most approaches implicitly hint at which goal should be achieved. The *object supported* by a service may be a complete value creating process or just one single task, i.e. a step in a workflow. Consideration of the *SOA lifecycle* shall ensure the sustained maintenance of identified and implemented services as well as the intake of new services. In order to identify redundant services, existing ones must be checked for *functional similarity*.

Technical Aspects

The way services are controlled belongs to the *technical aspects* of services. Basically, there is a differentiation between *orchestration and choreography* of services (Arsanjani, Ghosh, Allam, Abdollah, Ganapathy and Holley, 2008). Orchestration implies a central instance that coordinates all activities of a process and results in a composed service. Choreography means that services are called by other services and there is no unique steering unit. The sequence of services involved in a process is not stored as metadata (Josuttis, 2008).

Customer interaction is considered in different degrees by the approaches presented. As far as services (and not tangible products) are concerned, the inclusion of the external factor "customer" is essential. The same holds true for *employee interaction* because it sets certain limits for standardization, automation and outsourcing. Several *IT criteria* are especially important for the specification of previously identified services. Thus, they are part of most of the presented approaches. The *call frequency* of a service hints at its application. On the one hand a high frequency can point to a service with a small scope of functionality that can therefore be used flexibly in many business processes. On the other hand a sufficient standardization of coarser grained services could be a reason for a high call frequency as well.

Economic Aspects

Value creation is the added value created through deployment of a service. The customer has to be willing to pay for the result of a process, i.e. services should always increase the value of a product. The degree of value creation depends on an effective and efficient combination and coordination of resources (Roth, 2007). *Maintenance and operation costs* correlate strongly with the complexity of an IT infrastructure. An SOA can lead to a significant reduction of complexity. Moreover, well-defined functions and interfaces contribute to the robustness of IT systems which in turn lowers operational costs.

An intake of new services into the IT landscape of a company causes only little *testing effort for new functionality*. Only interfaces of the newly implemented services must be tested because interactions of other services are untouched. Implementation of an SOA decreases *vendor dependency* because such an architecture is platform independent. Firstly, this leads to immediate savings because the purchase of licenses may be unnecessary when open source products can be used. Secondly, a lock-in effect is avoided so the company is not bound to a vendor because of prohibitively high swapping costs. Thirdly, web services can flexibly be used and increase the agility of business processes. These web services can be purchased ad hoc from the cheapest provider respectively.

Flexible orchestration of services enables a *demand-oriented quality of service (QoS) level* for products. Customers receive exactly the quality they request. Thus, *customer satisfaction* is increased at the same time. This kind of orchestration allows for an *individualization of products* that leads to competitive advantages and thus is another economic aspect. *Specialization*

on core competencies plays an ever bigger role in today's competitive environment (Prahalad and Hamel, 1990). Identified service candidates can be classified on the basis of their strategic importance which has implications for sourcing decisions.

The *product range* can be *widened* by recombining services on the basis of existing core competencies. Originally internal services can be *offered in the marketplace* after being identified as services with such potential. The acquisition of service users generates even more economies of scale and leads to decreasing costs per unit. This, in turn, can boost the market share through decreasing prices for the service. The necessary *scalability* is another strength of SOAs. Deployment of certain services can significantly reduce the *time-to-market* of new products. This advantage can be crucial to position new products in the marketplace. Due to its agility and flexibility SOAs can react quickly to changing customer requirements. An *SOA controlling* could be implemented through a balanced scorecard. Qualitative goals have to be translated into quantitatively measurable key performance indicators (Mueller, Viering, Ahlemann, and Riempp, 2007).

Method engineering

The approaches compared in this paper are so called methods in design science research (Hevner, March, Park and Ram, 2004). For several years there have been efforts to guide the development of such methods in order to guarantee a high quality. The task of method engineering is to give this guidance. The most popular approaches all identify activities, roles, results, techniques and the sequence of activities as important components of methods (Gutzwiller, 1994; Heym, 1993; Karlsson, 2002; Goeken, 2006). Thus, a further set of criteria looks at how far *components of method engineering* are incorporated into existing approaches of service identification.

- *Activity*: Unit of execution that produces a result by facilitating techniques and notations.
- *Role*: Definition of who carries out which activities.
- *Result*: Artifact that is produced through an activity.
- *Technique*: Instruction that describes the course of action within an activity.
- *Sequence of activities*: Succession of activities.

For the evaluation of these components a 5-level Likert scale that ranges from "--" (not fulfilled) via "-", "o" and "+" to "++" (completely fulfilled) is applied.

Guidelines of Design Science Research

The same scale is used to evaluate the application of Hevner et al.'s *guidelines of design science research* (Hevner et al., 2004). *Documentation*, *research rigor* and *evaluation* are the three guidelines discussed here. The documentation has to ensure that results are communicated both technology-oriented as well as management-oriented. Research rigor corresponds to the applied research methodologies (e.g. a sound literature study). Evaluation is ought to guarantee quality and usability of the newly created method.

STRENGTHS AND SHORTCOMINGS OF EXISTING APPROACHES

The methods found in related literature differ considerably in their methodological approach. Advantages and disadvantages as well as a possible usability for adequate and process-oriented service identification are subject to discussion in the following.

Table 2 compares five approaches and facilitates the criteria explained in chapter two. The most comprehensive *understanding of services* can be found in Böhmann & Krcmar's approach (Böhmann and Krcmar, 2005). Their services (modules) represent complete packages of service products offered to customers. Klose et al. and Arsanjani et al. look at process chunks with a smaller scope of functionality (Klose, Knackstedt and Beverungen, 2007; Arsanjani et al., 2008). Still, these chunks implement a complete and self-contained business functionality. The change from an object-oriented view to a service-oriented view that is postulated by many authors is not to be found in Winkler's approach (Winkler, 2007; Zacharias, 2005). Kohlmann & Alt's services support business processes, too (Kohlmann and Alt, 2007). However, the scope of their services differs significantly as far as functionality is concerned.

	Klose et al. (2007)	Böhmann & Krcmar (2005)	Winkler (2007)	Arsanjani et al. (2008)	Kohlmann & Alt (2007)
Basic aspects					
Industry sector	Production	IT services	Financial services	Financial services	Financial services
Understanding of services	Business process oriented	As module, very comprehensive	Object-oriented	Business process oriented	Business process oriented
Service hierarchy	2 levels: elemental and composed service	Process service	2 levels: basic and composed service	2 levels: elemental and composed service	3 levels: process, rule and entity service
Granularity	Middle	Coarse	Fine	Coarse	From coarse to fine
SOA paradigm	Architectural concept	Architectural concept	Architectural concept	Architectural concept	Architectural concept
Direction of analysis	Hybrid	Hybrid with bottom up tendency	Top down	Hybrid with focus on top down	Hybrid
"Tools"	Decomposition of business processes and SOA principles	Asset analysis	Decomposition of business processes	Goal service modeling, domain decomposition, asset analysis	BPM, asset analysis
Types of categorization	Consumer type	Consumer type, implementation strategy	Implementation strategy	Role in business model, consumer type, implementation strategy	Role in business model, implementation strategy
Business aspects					
Consideration of strategic aspects	Lines of interaction & line of visibility	Threats and opportunities of modular service architectures, external sourcing	-	Reference models and best practices from own industry, sourcing strategies	Sourcing strategies, inter-organizational cuts
Legal compliance	Legal requirements concerning customer data	-	-	-	Customer data remains in own company
Internal policies / IT governance	Only implicit	Only implicit	-	"Rules and policy analysis" within BPM	Naming of services
Service level agreements	-	Defined individually with performance indicators	-	-	-
Goal	Flexibilization	Flexibilization	Standardization	Flexibilization	Unclear
Supported object	Task	Business process	Task	Task	Business process
SOA lifecycle	-	-	-	Fractal model for service-oriented software development	-
Functional similarity	Industry standards	-	-	Self similar fractals, industry standards	Functional and semantic similarity in clustering phase
Technical aspects					
Orchestration vs. choreography	Orchestration	Orchestration	Unclear	Unclear	Orchestration
Customer interaction	Line of visibility, line of interaction	Customer specific configuration, customer integration, line of visibility	-	-	-
Employee interaction	Automatic, dialogue, manual	-	-	-	-

Criteria of information technology	Design principles of SOA	Reusability, standardization, independence	Reusability, redundancy, frequency	Reusability, flexibility	Reusability
Call frequency	-	-	Calls per time	-	-
Economic aspects					
Value creation	-	-	-	-	-
Maintenance and operation costs	-	Utilization of common resources	-	Elimination of redundancies	-
Testing effort for new functionality	-	-	-	-	-
Vendor dependency	-	-	-	-	-
Demand-oriented QoS levels	-	Within performance and design analysis	-	-	-
Customer satisfaction	-	-	-	-	-
Individualization of products and services	-	Included in goal definition	-	Inflexible architecture replaced by reusable components	-
Specialization in core competences	-	External sourcing options	-	-	Sourcing models
Increase of the product range	-	Included in goal definition	-	-	-
Internal services offered to external customers	-	-	-	-	-
Scalability	-	-	-	-	-
Time-to-Market	-	Included in goal definition	-	-	-
SOA controlling	-	-	-	-	-
Components of method engineering					
Activities	++	++	++	++	+
(SOA-)Roles	--	--	--	o	--
Results	+	++	+	++	+
Techniques	+	o	+	++	-
Sequence of activities	Sequential	Sequential	Sequential	Iterative, fractal	Sequential, iterative where applicable
Guidelines of design science research					
Documentation	++	++	+	++	o
Research rigor	++	++	o	-	+
Method evaluation	++	++	-	+	+

Table 2. Comparison of service identification methods

Granularity of services differs immensely among the compared methods. Klose et al. mainly describe composed services. Böhmann & Krcmar and Arsanjani et al. rather look at more encompassing process services. On the contrary, Winkler uses very fine grained, elemental services and thus is fairly close to an object-oriented approach. Kohlmann & Alt vary the granularity of services depending on the situation. The *SOA paradigm* of all five methods is an architectural concept. The *direction of the analysis* is usually hybrid, i.e. a top-down approach (which is the focus) is complemented by a bottom-up analysis of existing infrastructure. Only Winkler solely uses a top-down approach.

The most common *tools* that are used are BPM and domain decomposition. Different *types of categorization* are facilitated to classify services in various dimensions. Particularly Arsanjani et al. look at services from different points of view. The role within a business model distinguishes basic services from process services. Consumer type categorizes services in internally used ones and those (also) used by partners and customers. The implementation strategy marks composed services or externally sourced ones. The consumer type is a focus in Klose et al.'s and Böhmann & Krcmar's approaches because customer integration and interaction are crucial. Only Klose et al. fail to discuss implementation strategies.

A *consideration of strategic aspects* is omitted from Winkler's method. Klose et al. rarely mention these aspects. Still, their thoughts on line of visibility and line of interaction somehow hint at a link to strategic aspects. Arsanjani et al. advocate the use of reference models and best practices obtained from peer groups. They consider the sourcing potential of identified service candidates. Böhmann & Krcmar examine strategic implications of an SOA in much more detail. Threats and opportunities as well as sourcing strategies are part of their identification method. Similarly, Kohlmann & Alt discuss these strategies as well as cuts in processes in inter-organizational networks. *Internal policies* are only incorporated by Arsanjani et al. and Kohlmann & Alt. The latter for instance make the point of consistent naming of service candidates. This consistency is necessary for a high rate of reusability among services and for adequate SOA governance.

Goal of the implementation of an SOA in Winkler's method is standardization. In Kohlmann & Alt's approach there is no clear goal to be identified. The other three methods clearly aim at a flexibilization. Apart from Arsanjani et al., who present a fractal model for service-oriented software development, the *SOA lifecycle* is ignored by other authors. *Functional similarities* are not discussed by Böhmann & Krcmar and Winkler. In contrast, Kohlmann & Alt discuss not only functional but also semantic similarities. Arsanjani et al. use the self-similarity of fractals for service-oriented software development. Apart from Winkler and Arsanjani et al.'s methods that cannot be classified unambiguously, all authors imply an *orchestration* of services by a central instance. *Customer interaction* is a focus in Klose et al.'s and Böhmann & Krcmar's approach although the former originates from a production company. The huge importance of the "customer factor" in service industries is not reflected at all in the three other approaches. *Employee interaction* is only discussed by Klose et al. They differentiate between automated, semi-automated and manually conducted services. Looking at *IT criteria* the nomination of reusability stands out in all approaches. This is not surprising considering the prominence of it in recent SOA literature. Klose et al. use a comprehensive catalogue of design principles of an SOA.

The *economic aspects* of services are completely out of scope in Klose et al.'s and Winkler's approaches. With the notable exception of *specialization on core competencies* there is no discussion of economic aspects in Kohlmann & Alt's method. *Maintenance and operation costs* are addressed by Böhmann & Krcmar and Arsanjani et al. The utilization of common resources through reduction of redundancies and multiple calls by the implementation of services is brought forward in both approaches. The only authors considering a *demand-oriented QoS level* are Böhmann & Krcmar with their performance and design analysis. This is plausible because their stakeholder-based approach demands an integration of customers. *Individualization of products and services* is supported by Böhmann & Krcmar's modularization and by the usage of reusable components (Arsanjani et al.). *Specialization on core competencies* is also a postulation in Böhmann & Krcmar's method. Within their goal definition they consider an *increase of the product range* and the *time-to-market* of new products. All other economic aspects, namely *value creation, testing effort for new functionality, vendor dependency, customer satisfaction, internal services offered to external customers, scalability* and *SOA controlling* are not considered in any of the approaches.

As far as *components of method engineering* are concerned all compared approaches do fairly well regarding the described *activities*. *Results* and *techniques* are usually explained in a satisfactory way. Solely *roles* are not explained in any of the approaches. Arsanjani et al. – explicitly mentioning components of method engineering – hint at the existence of roles in their method but do without further detailing. The *sequence of activities* is usually sequential. Kohlmann & Alt allow iteration at certain points. Exceptionally, Arsanjani et al. present an iterative, fractal procedure. Based on three selected *guidelines of design science research* (Hevner et al., 2004) especially Klose et al. and Böhmann & Krcmar excel with their methods. Both approaches comply entirely with the guidelines concerning *documentation*, *research rigor* and *evaluation*. Winkler particularly misses an evaluation of her method whereas a lack of research rigor is the weakest point in Arsanjani et al.'s approach. Kohlmann & Alt show shortcomings in both documentation and research rigor but have a clear advantage in evaluation though.

LESSONS LEARNED & FURTHER RESEARCH: A METHOD FOR PROCESS-ORIENTED SERVICE IDENTIFICATION

As shown in previous chapters approaches for service identification differ in many ways. However, a comparison on the basis of selected criteria also identifies commonalities both in the existence and the absence of certain aspects. A new method for process-oriented service identification (POSI) has to resolve relevant flaws. Thus, aspects that are vital for the design of POSI are to be discussed in the following.

Business processes represented in a formal or semi-formal notation such as Business Process Modeling Notation (BPMN) should be the foundation of POSI. However, no SOA project will create an IT infrastructure from scratch. Therefore, given factors, e.g. existing hardware and software, must be considered. A top-down approach based on BPM or domain decomposition has to be complemented by a bottom-up analysis to guarantee a successful technical implementation.

A new method should be configurable to be applicable in different contexts, to realize different goals and to reflect company specific characteristics, e.g. it should be possible to configure POSI with respect to the users' preferences and goals of the identification process (either standardization or flexibilization). Especially the level of composed services is important in this context. Basic services, e.g. retrieval or alteration of data, are regularly subject to standardization. In contrast, process services should be flexible in most cases (Papazoglou and Georgakopoulos, 2003). However, looking at composed services the goal may differ case by case because the complexity of such services varies depending on the situation and other characteristics.

Composed services will most likely be subject to sourcing decisions because neither whole process services (which constitute the existence of an enterprise) nor basic services (that are too small) are suitable for outsourcing. Table 2 shows that economic aspects in particular find little or none adherence in existing methods. For this reason, POSI has to combine the identification of services with the consideration of these aspects. Especially functional similarities shall serve as a basis for identifying standardization potentials. Subsequently, sourcing strategies can be evaluated. Summing up, a new method for process-oriented service identification has to focus on the following aspects:

- Service identification based on BPM complemented by a bottom-up analysis
- Discovery of functional similarities to evaluate standardization potential
- Configuration regarding standardization and flexibilization
- Consideration of economic aspects

Future research will aim at consistency and soundness of the method which we plan to realize by complying with the formal requirements of method engineering. This means that activities, techniques, results and roles have to be designed, explained and documented. Furthermore, their relationships must be described and defined.

Based on Gutzwiller (1994) and Goeken (2006), activities will be defined canonically, i.e. parts of activities or sub activities are again seen as activities. Thus, they are structured hierarchically and constitute a process model which describes the activities, their relationships as well as their sequence. This process model will also define inputs and outputs for the designated activities (results of or for other activities respectively) as well as roles that perform them. The model must also provide for XOR choices to support an inherent configurability e.g. concerning standardization and flexibilization.

Additionally, techniques, which give a detailed guidance how to perform activities in order to produce results, are part of a method. The activity "reusability analysis" for example will be supported by a technique to measure functional similarities in business processes. Thus, a certain set of techniques is used to create results by supporting the activities. Finally, a documentation of these results (intermediary or final) should be provided by the method. The former should contain all relevant information either to initiate the next activity or to complete the business process.

The striking absence of roles in all presented methods is a major flaw due to the fact, that SOA is often seen as a means to accomplish alignment of business and IT. Therefore, roles must be described which support this alignment in a structural manner by guaranteeing the existence of both, the business and the technical perspective within a development endeavor. Furthermore, process orientation can only be ensured if a process owner who knows the business context is involved in the identification and design of services. Consequently, a new method has to manage roles explicitly. The implementation of an organizational unit called "Service Design Unit" (consisting of a process owner from the business side and a service owner from the IT department) is one example for a measure suggested in POSI. In future work, the activities and results of this unit within the method will be discussed in more detail.

REFERENCES

1. Allen, P. (2006) Service Orientation: Winning Strategies and Best Practices, Cambridge University Press, Cambridge.
2. Arsanjani, A., Ghosh, S., Allam, A., Abdollah, T., Ganapathy, S. and Holley, K. (2008) SOMA: A method for developing service-oriented solutions, *IBM Systems Journal,* 47, 3, 377-396.
3. Böhmann, T. and Krcmar, H. (2005) Modularisierung: Grundlagen und Anwendung bei IT-Dienstleistungen, in Thomas Herrmann, Uwe Kleinbeck and Helmut Krcmar (Eds.) *Konzepte für das Service Engineering. Modularisierung, Prozessgestaltung und Produktivitätsmanagement,* Heidelberg.

4. Erl, T. (2004) Service-Oriented Architecture - A Field Guide to Integrating XML and Web Services, Prentice Hall, Upper Saddle River, NJ.
5. Goeken, M. (2006) Entwicklung von Data-Warehouse-Systemen, Deutscher Universitäts-Verlag, Wiesbaden.
6. Gutzwiller, T. A. (1994) Das CC-RIM-Referenzmodell für den Entwurf von betrieblichen, transaktionsorientierten Informationssystemen, Heidelberg.
7. Hagen, C. (2003) Integrationsarchitektur der Credit Suisse, in Stephan Aier and Marten Schoenherr (Eds.) *Enterprise Application Integration - Flexibilisierung komplexer Unternehmensarchitekturen,* Berlin.
8. Hevner, A. R., March, S. T., Park, J. and Ram, S. (2004) Design Science In Information Systems Research, *MISQ,* 28, 1, 75-105.
9. Heym, M. (1993) Methoden-Engineering - Spezifikation und Integration von Entwicklungsmethoden für Informationssysteme, Universität St. Gallen.
10. Josuttis, N. (2008) SOA in der Praxis - System-Design für verteilte Geschäftsprozesse, Heidelberg.
11. Karlsson, F. (2002) Meta-Method for Method Configuration - A Rational Unified Process Case, Linköping University.
12. Klose, K., Knackstedt, R. and Beverungen, D. (2007) Identification of Services - A Stakeholder-Based Approach to SOA Development and Its Application in the Area of Production Planning, *ECIS 2007*, St. Gallen, 1802-1814.
13. Kohlmann, F. and Alt, R. (2007) Business-Driven Service Modeling - A Methodological Approach from the Finance Industry, in Witold Abramowicz and Leszek Maciaszek (Eds.) *Business Process & Service Computing: First International Working Conference on Business Process and Services Computing,* GI, Leipzig, 180-193.
14. Legner, C. and Heutschi, R. (2007) SOA Adoption in Practice - Findings From Early SOA Implementations, *ECIS 2007*, St. Gallen, 1643-1654.
15. Mueller, B., Viering, G., Ahlemann, F. and Riempp, G. (2007) Towards Understanding The Sources Of The Economic Potential Of Service-Oriented Architecture: Findings From The Automotive And Banking Industry, *ECIS 2007*, St. Gallen, 1608-1619.
16. Papazoglou, M. P. and Georgakopoulos, D. (2003) Service-Oriented Computing, *CACM,* 46, 10, 25-28.
17. Prahalad, C. K. and Hamel, G. (1990) The Core Competence of the Corporation, *HBR,* 68, 3, 79-91.
18. Roth, R. (2007) Wertschöpfungsorientierter Serviceentwurf, in Gernot Starke and Stefan Tilkov (Eds.) *SOA - Expertenwissen,* Heidelberg.
19. Winkler, V. (2007) Identifikation und Gestaltung von Services. Vorgehen und beispielhafte Anwendung im Finanzdienstleistungsbereich, *Wirtschaftsinformatik,* 49, 4, 257-266.
20. Zacharias, R. (2005) Serviceorientierung: Der OO-König ist tot, es lebe der SOA-König, *OBJEKTspektrum,* 12, 2, 43-52.