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Abstract

With the advancement of Service-Oriented Architecture in the technical and business domain, the management & engineering of services requires a thorough and systematic understanding of the service lifecycle for both business and software services. However, while service-oriented approaches acknowledge the importance of the service ecosystem, service lifecycle models are typically internally focused, paying limited attention to processes related to offering services to or using services from other actors. In this paper, we address this need by discussing the relations between a comprehensive service lifecycle approach for service management & engineering and the sourcing & purchasing of services. In particular we pay attention to the similarities and differences between sourcing business and software services, the alignment between service management & engineering and sourcing & purchasing, the role of sourcing in the transformation of an organization towards a service-oriented paradigm, the role of architectural approaches to sourcing in this transformation, and the sourcing of specific services at different levels of granularity.

Keywords: Service-Oriented Architecture, Service Management, Service Engineering, Service Lifecycle, Service Analysis, Service Design, Sourcing, Business Services, Software Services.
1 INTRODUCTION

Service-oriented thinking has become one of the fastest growing paradigms in academia and industry in response to the growing need for greater business integration, flexibility and agility. Originally technology-centric service concepts like Service-Oriented Architecture (SOA), are increasingly also leveraged for the business domain to refine models of businesses (Legner and Vogel 2007; Nayak et al. 2006). If applied on the business level as well as on the information technology (IT) level, the concept of service-orientation can therefore be seen as a comprehensive approach for servitization of the whole enterprise (Schroth 2007; Cherbakov et al. 2005).

Service-orientation on the business level enables organizations to expose and offer business capabilities as services to business partners in order to facilitate on-demand collaboration opportunities. Such an on-demand business needs to leverage its existent technology (Cherbakov et al. 2005). To support the agility of organizations in that respect, service-orientation on the technical level fosters the utilization of software services and enables a close business and IT alignment. Software services expose application functionalities that can be reused and composed based on business needs. A software service describes part of an application system, which can be consumed separately by several entities. Hence, a software service supports the execution of a business service.

From a (visionary) service perspective, organizations thrive in service ecosystems where their services are provided to others (external and internal service customers) and they themselves use services of others (internal or external service providers). However, while service-orientation particularly facilitates the encapsulation and flexible recombination capabilities of different actors, corresponding business and management problems are often underrepresented in publications about SOA-based service management & engineering. Particularly, a detailed discussion of the most important aspects of marketing & sales on the one hand and sourcing & purchasing on the other is missing in most related publications on service management & engineering approaches and the service lifecycle models underlying them. The contribution of this paper lies in bringing together the often technology-centric understanding of the core service lifecycle for management & engineering and the body of knowledge about sourcing & purchasing, thereby closing the gap between these areas and exploring a sound conceptual foundation for sourcing decisions throughout the service lifecycle for business and software services.

The remainder of this paper is structured as follows. In section 2, we provide some background about service management & engineering and have a closer look at the service analysis and design phases. Section 3 is dedicated to a literature exploration of the potentially relevant sourcing & purchasing literature. In section 4, we identify and address some critical issues when relating service management & engineering to sourcing & purchasing. Section 5 concludes the paper by summarizing the contribution made and pointing out areas for future research.

2 SERVICE MANAGEMENT & ENGINEERING

The management & engineering of services requires a thorough and systematic understanding of the service lifecycle based on a holistic view of SOA. Kohlborn et al. (2009a, 2009b) and Rosemann et al. (2009) present an integrated service lifecycle model that targets both business as well as software services and is founded by a thorough literature analysis (Schroebler 2008; Riedl et al. 2009). Their model consists of the following phases: (1) Service analysis: Identification and contextualization of a service (or portfolio of services); (2) Service design: Refinement of the service(s) into (a) more detailed specification(s); (3) Service implementation: Actual realization of the business or software service(s); (4) Service publishing: Dissemination of information about the service(s); (5) Service operations: Operation and monitoring, maintenance and improvement of the service(s); (6) Service retirement: Decommissioning of the service(s) and removal from the service portfolio.

On the highest level of abstraction, this generic service lifecycle is applicable to both business and software services. If seen as a process model, a decomposition of the high level phases for the two
categories of services will lead to variations in the process steps on lower levels of granularity. Generally, the service lifecycle can be triggered from two different perspectives. Applied with a broader, organizational focus, the lifecycle addresses the need of the organization to be transformed according to the service paradigm. Choosing a narrower focus, the lifecycle addresses the need to develop or improve a specific service. A transformation will typically involve a comprehensive service analysis and design with organizational scope, followed by a full and more detailed analysis and design at the specific service level.

We will now have a closer look at the early phases of the service lifecycle. At the start of the service lifecycle it is required to perform some preparatory activities that are more of a strategic nature to “understand the business environment” and to achieve a service technology fit with the analyzed environment, as pointed out by Papazoglou (2008). The motivation for embarking on the SOA and services journey needs to be documented, e.g. by identifying business and IT imperatives that need to be resolved urgently (Marks and Bell 2006).

The service analysis phase captures all activities required for the identification and contextualization of a service. Service analysis can be driven by market requirements (e.g., what services could be profitable offerings?) and/or by various internal artifacts (e.g., strategy maps, process models, data models, application diagrams). In the latter case, the task is focused on the translation of one or more views (e.g., a process view) into a service-centered view. In general, the service analysis phase comprises all activities that are related to the analysis and decomposition of a project proposal or service idea into its components and relationships. This includes all activities related to the identification and description of the processes and services in a business problem domain (Papazoglou 2008). To guarantee an enterprise-wide, congruent use of terminology, an ontology should be developed and maintained (Erl 2005). Based on that ontology, a service description needs to be agreed on that suits the needs of business and IT. For each proposal for a new service, potential stakeholders need to be identified and consulted in order to maximize the reusability of the service candidate within the organization.

A central activity of service analysis is the examination of the feasibility of the project idea. Subsequent activities will only be executed if the project will provide a valuable outcome (e.g., return on investment) for the organization or its partners. If that is the case, a business sponsor or service owner is identified, project parameters are defined and the project gets final approval. Then the second part of the service analysis phase starts. Resources are allocated accordingly and the initial information base (business documentation, models, etc.) needs to be compiled. Based on the information provided, service candidates have to be identified, for example by decomposing capabilities or processes. Requirements have to be captured and analyzed including the identification of service layers and service candidates (Erl 2005). After the services and their interrelationships are identified, the services need to be detailed regarding their inputs and outputs, as this might lead to the development of additional service candidates. Additionally, different delivery scenarios should be analyzed and the most preferable one should be recommended.

In the next activity, service design, the conceptual service design is translated into a more detailed model of the service that can act as an appropriate specification for the actual development and reuse of the service. Service design is focused on refining the service idea to a degree that the service itself can be implemented afterwards. Hence, more detailed service requirements have to be captured and an elaborate design has to be produced including the specification of involved applications, processes, etc. Additionally, the scope of the architectural extension needs to be understood as well as the boundary of the architecture (Erl 2005). Once all these requirements are specified, a decision has to be made regarding the granularity of the service and the integration into the enterprise architecture. The risk has to be assessed and managed including an impact assessment and related mitigation plans and test cases. Service Level Agreements (SLAs) have to be defined thoroughly for both functional and non-functional properties of the service. The services identified are transformed into a set of concrete service interfaces (Papazoglou 2008).
3 SOURCING & PURCHASING

Before discussing in detail the relation between the service lifecycle and sourcing & purchasing, we will first present an overview of the sourcing & purchasing literature based on an explorative literature study (Fielt and Gangadharan 2009). This study reviewed classical purchasing literature, originating mostly from manufacturing, and outsourcing literature focusing on the outsourcing of business processes and information technology. As starting-point for the explorative analysis of classical purchasing literature, we followed ‘standard’ purchasing textbooks such as Van Weele (2005) and Monczka et al. (2005). The concept of purchasing refers to the management of resources external to an organization that are required for running, maintaining and managing the organization’s primary and support activities (Van Weele 2005). The goal is to ensure that the supply of all goods, services, capabilities and knowledge is secured at the most favourable conditions.

Sourcing decisions refer to whether an organization should perform activities inside or outside the organizations and, therefore, define the boundaries of the organization. Making the right sourcing decisions is of strategic importance because it enables the organization to leverage its resources in four ways (Quinn & Hilmer, 1994): (1) it maximizes returns on internal resources by focusing investments and efforts on what it does best, (2) it results in well-developed core capabilities that can create and protect competitive advantage, (3) it fully utilizes the investments, specialized capabilities and innovations of external suppliers, and (4) it creates speed and flexibility in changing markets and technological situations.

Van Weele (2005, p. 120) differentiates between two different types of outsourcing: (1) Turnkey outsourcing: The responsibility for the operation of an entire function (or activities) is allocated to an external provider. This means not only the execution of activities, but also the coordination of activities. (2) Partial outsourcing: A part of an integrated function is outsourced and the coordination of the function and activities still lies with the client. A major issue is here the demarcation of responsibilities between client and provider. The benefits and drawbacks of outsourcing will differ for the type of outsourcing selected (Van Weele, 2005, p. 121). Turnkey outsourcing means no responsibility and requires little experience with the function but also means limited influence and large dependency. Partial outsourcing means more influence but also requires more capabilities of the client and a stronger need for coordination and communication.

An essential question with respect to outsourcing relates to what should (not) be outsourced for what reasons. Two important strategic perspectives are related to different approaches with respect to the activities of an organization: (1) competences and (2) costs. One perspective is based upon the ‘core competence’ approach (Quinn & Hilmer, 1994). This requires an organization to critically think about what it should do (and what it should not do) to create and capture value. The other perspective is cost-efficiency based upon the ‘transaction cost’ approach (Van Weele, 2005, p. 125) or the ‘total costs’ approach (Monczka, et al., 2005, p. 189-194), including the costs of switching from internal to external or vice versa. Other important considerations are strategic alignment and technological maturity (Monczka, et al., 2005, p. 189-194). Venkatesan (1992) takes the product architecture as starting-point for make-or-buy decisions. First Venkatesan distinguishes between strategic and non-strategic subsystems. With respect to the former, a further distinction is made between strategic and commodity families of components. The urgency for outsourcing of commodity families of components is determined by the organization’s performance in this area.

After the strategic decision to source externally has been made, a more tactical and operational purchasing process takes place. A generic purchasing process is presented by Van Weele, (2005, p. 13-15 and p. 28-30). The first three steps, define specification, select supplier and contract management, are the tactical purchasing function and are primarily of a technical-commercial nature while the last three steps, ordering, expediting and evaluation, are the operational purchasing (or ordering) function and are primarily of a logistics-administrative nature. Because these steps are closely connected, the problems in one step are often caused by deficiencies in a previous step. For example, a late delivery (expediting step) may be caused by a fault in the contract agreement. In general there can be a great difference in the steps of the purchasing process that are passed and the way the activities in the steps are carried out depending upon the sourcing situation. Van Weele (2005, p. 30) distinguishes between
three purchasing situations: (1) a new-task situation: This is the case when the organization purchases a completely new product, supplied by an unknown supplier. Defining the specification is critical for successfully passing through the other steps. (2) The modified rebuy: This situation occurs when the organization wants to purchase a new product from a known supplier or an existing product from a new supplier. Often there is dissatisfaction with the current supplier or better alternatives have become available. The focus is on the last four steps of the process. (3) The straight rebuy: This is when a known product is purchased from a known supplier, this is the most common situation. The emphasis is on the last 3 steps of the process and the focus is on the speed and efficiency of the transaction.

Nowadays, there is also a lot of attention for sourcing in the business process and IT literature. The outsourcing of IT has its roots in a growing focus on core competences and uncertainty about IT’s value (Lacity et al., 1996). Other reasons relate to having access to external capabilities, dealing with fluctuations in needed capacity, realizing expected cost savings and switching to a more attractive financial model (pay per use). Next we will take a closer look at this literature, focussing on the work of Templeton College by Feeny and Willcocks and their co-authors and the work of MIT by Ross and Weill and their co-authors.

One of the fundamental sourcing decisions is about the scope of IT outsourcing: total outsourcing where more than 80% of the IT budget is located with external parties or selective outsourcing where this is between the 20 and 80% (Lacity et al., 1996). Selective outsourcing raises the question what should be outsourced and how. This will depend upon the internal motivation and abilities, but also on the opportunities of the market. Lacity et al. (1996) suggest making a sourcing decision for different sourcing models based upon three considerations for the IT portfolio: (1) Business considerations: Decisions based upon the contribution of IT activity to business positioning (commodity or differentiator) and the contribution of IT activity to business operations (critical or useful), (2) Economic considerations: Decisions based upon the managerial practices (leading or lagging) and the in-house economies of scale. Because medium-sized organizations can achieve economies of scale, managerial practices often make the difference, and (3) Technical considerations: Decisions based upon the degree of technological integration and the degree of technological maturity. Outsourcing immature technology is often riskier than outsourcing mature technology.

A different perspective is presented by Ross and Beath (2006) who use the enterprise architecture maturity as start-point for the outsourcing decision. They define enterprise architecture as ‘the organizing logic for a firm’s IT infrastructure and business process capabilities to address the firm’s need for business process integration and standardization.’ Ross, Weill and Robertson (2006) define four stages of enterprise architecture maturity: (1) Business Silos, (2) Standardized Technology, (3) Optimized Core and (4) Business Modularity. Ross and Beath (2006) argue that different outsourcing arrangements play a different role with respect to enterprise architecture. A transition exchange (provider executes a well-defined, repeatable IT process or IT-enabled business process on behalf of the client) is useful in getting from Optimized Core (stage 3) to Business Modularity (stage 4) because in this way a client can make use of plug-and-play, industry-standard components in an effective and efficient manner.

4 DISCUSSION

One of the major drivers of SOA is the vision that organizations increasingly operate in service ecosystems that facilitate the exchange of services between different, internal and external, service consumers and providers. So far we have articulated the gap between, on the one hand, SOA-based service management & engineering and, on the other hand, sourcing & purchasing by providing and explored the literature in both areas. Nest we will discuss this gap in more detail and identify some critical issues.

Similarities and differences between sourcing business and software services

For both service management & engineering and sourcing & purchasing, a high-level process can address business as well as software services. A decomposition of the high level phases for the two categories of services will lead to variations in the process steps on lower levels of granularity. While on a
general level most activities and decisions are similar for both business and software services, for example the need for contractual arrangements and service level agreements, they will differ when looking in more detail, in particular for business services that are not software-based, for example, specifying and measuring service quality for human-to-human interaction versus computer-to-computer interaction. For software-based business services, there are different sourcing combinations possible. When considering the simplest scenario, one business service with one software service, then the most straightforward scenarios are that both are either internally or externally sourced. Another option is sourcing the business service is internally and sourcing the software service externally. For example, a human resources shared service centre that makes use of a human resources application service of an external provider. Finally, and maybe more rarely, the business service can be externally sourced, while the software service is internally sourced. This may, for example, be the case when an outsourced business service uses a software service which is also critical for other, internal business services or when specific regulations apply that prohibit external data storage.

Alignment between service management & engineering and sourcing & purchasing

The preparation and service analysis (and to some extent service design) of the service lifecycle should be closely aligned with the strategic sourcing decisions. For example, the preparation should include the alignment with the sourcing strategy, in addition to the business strategy, and understanding supply markets for business and software services. Service analysis and design are also closely related with the tactical purchasing process, in particular defining functional and non-functional service characteristics for the specification and contracting. Service implementation and operation (for the use of external services) need to be tightly linked to the operational purchasing process of use (e.g. authorization, accounting) and evaluation (e.g. service levels). Moreover, the relation between service management & engineering and service sourcing & purchasing is bidirectional. Service sourcing & purchasing can identify innovative services that offer new opportunities for the organisation (preparation and service analysis) and a change in supplier may result in a need to service redesign and implementation.

The role of sourcing in the transformation of an organization towards a service-oriented paradigm

From an organisational perspective, the service lifecycle addresses the transformation to the service paradigm. This will typically involve a comprehensive service analysis and design with organisational scope, which can be driven by external market factors or by internal artefacts. However, less attention has been paid to externally driven transformation initiated by strategic partnerships with suppliers or the availability of innovative or best-in-class services on the supply market. In addition, once an organization starts with identifying services based upon its business capabilities, this also seems to offer a unique window-of-opportunity for (re)considering the strategic sourcing strategy and (re)reconsidering the (traditional) insourcing and outsourcing decisions. For business services this can be on the level of complete business capabilities, as in turnkey or total outsourcing, or on the level of individual business services, as in partial or selective outsourcing. When transformation results in a need for new services supplied by unknown suppliers, then this ‘new-task situation’ requires defining the service specification for successfully purchasing and closely related to the service design.

The role of architectural approaches to sourcing in this transformation

The transformation to a service-oriented architecture may benefit from architectural approaches in the purchasing and outsourcing literature, for example, Venkatesan’s approach for make-or-buy decisions based upon the strategic and non-strategic subsystems in the product architecture. One may argue that SOA first of all needs to focus on what not to make but that it is a logic that is hard to operationalize into a method (Venkatesan, 1992). And it may be that, in line with Venkatesan’s argument, it is the architectural knowledge, capturing customer requirements and translating them into the language of performance specifications for business capabilities and for business and software services. This can create unique customer services and business processes, even though many services are sourced externally. Furthermore, SOA promises an increased agility and alignment of business and IT. This may imply that sourcing decisions can be (re)considered more frequently and changed more easily enabled by an advanced service enterprise architecture. However, this may not yet be easily accomplishable at the start of the transformation to SOA as, in line with Ross and Beath (2006), the maturity of the en-
terprise architecture may not be advanced to the stage of business modularity that allows for business and software services that offer plug-and-play business process modules.

The sourcing of specific services at different levels of granularity

Focusing on a specific service, there will also be a decision during service analysis and design to provide that service in-house or to make use of external service providers. In general, one may expect that for services of higher granularity this will be a more strategic decision, comparable to the components in Venkatesan’s approach, which needs to be closely aligned with strategic sourcing choices based upon core competences (Quinn & Hilmer, 1994) and business considerations (Lacity et al. 1996), while for services of lower granularity this will be more driven by cost-efficiency (Van Weele, 2005; Monczka et al. 2005) based upon economical and technical considerations (Lacity et al. 1996). However, also for services of lower granularity one should be aware of the strategic importance of a service and its significance for the competitive position of the business. Moreover, the sourcing decision is a recurring decision in service design, as many services are composed of other services for which the same sourcing decision can apply. The outcome of service design will depend upon the make-or-buy decision. While an internal service has to be specified in such a way that it can be developed and implemented, external services have to be specified to enable and facilitate selection of suitable external service candidates. This is also related to the flexibility in requirements (Morisio, 2002); whether the company needs a service that fulfils specific requirements or whether a commoditized standard service will be sufficient.

5 CONCLUDING REMARKS AND ACKNOWLEDGEMENTS

From an academic point of view, this paper offers a starting point for a better integration of established sourcing & purchasing knowledge into the domain of service management & engineering and identifies touching points that appear to be worthwhile to be investigated in more depth in future work. Practical implications of this paper include improved guidance for decision makers in (to be) service-oriented organisations with regard to sourcing & purchasing-related decisions.

An empirical exploration/validation of the combined lifecycles in real-world case studies or action research projects will provide the rigor needed to put the conceptual framework on a sound empirical foundation. Other limitations of the current work include the limited literature taken into consideration and lack of attention to other forms of service sourcing, such as managed services, for example. Future research could target an increased understanding of relationship between the concepts of service reuse and service sourcing & purchasing, the formal use of method engineering to combine existing service management & engineering and sourcing & purchasing methods, or questions related to the role of approaches from the areas of open service innovation and service co-creation for bringing together service management & engineering, marketing & purchasing and sourcing & purchasing in an even more comprehensive view.

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