

IS SERVICE-ENGINEERING: A PROCESS MODEL FOR THE DEVELOPMENT OF IS SERVICES

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Abstract

The relevance of a service orientation for IS departments and IS service provider has assumed more importance in recent years. Constantly rising cost pressure and the fact that the highest costs occur in the run and not in the build phase of software applications has led to a radical change in IS. Customers now want better quality, more cost transparency and comparability of IS services. In order to meet these demands, many IS departments are currently implementing a service-oriented approach. The purpose of this approach is to abandon conventional project-oriented thinking in favor of service orientation and to describe a methodology for developing services which support business processes. These services are provided in a transparent manner to the customer by means of service catalogues. Our paper explains how IS services can be engineered using the techniques and methods of the service industry. The IS service-engineering process model is described and the essential steps of the modelling process are explained.

Keywords: IS service, services, service engineering, service catalogue.

1 INTRODUCTION

IS service provider and IS departments are presently facing numerous challenges. Customers demand better quality, more cost transparency and tools which provide improved communication between service providers and businesses (Appel et al., 2005). These developments have led to a stronger service orientation throughout the IS industry over the last few years (Zarnekow et al., 2006). This transformation primarily comprises the switch from a *project* orientation, which consists mainly of development projects, to a *service-oriented* approach. The new approach is based on a customer perspective which provides standardised IS services taking all lifecycle costs into consideration. A study examining the lifecycle costs of software applications concluded that development costs represent only around 20% of total cost (Zarnekow and Brenner, 2005). Most other costs occurred in operation, maintenance and requests for software changes. While the shift towards a service orientation has already begun, there remains a lack of suitable procedures, methods and tools for designing IS services (IS service engineering). This shortfall can be attributed to the complexity of the engineering process. The objective of this article is to present a procedural model for the systematic configuration and development of services. Special emphasis is placed on the business processes of the customer and on developments in which the service provider and customer are both involved. In addition, the methodology takes into account the existing application landscape of service providers. IS service engineering leads to a more flexible application landscape, which in turn permits IS departments to respond more rapidly to the demands of their customers.

2 RELATED RESEARCH AND METHODOLOGICAL APPROACH

The debate about service- and product-engineering goes back more than 20 years. In 1982, Shostack published the so-called "Service Blueprinting," which laid the cornerstone for the systematic development of services (Shostack, 1982). Other models followed, such as those of (Scheuing and Johnson, 1989), (Edvardsson and Olsson, 1996) and (Tax and Stuart, 1997). De Jong and Vermeulen provide a complete overview of the literature in new service development (De Jong and Vermeulen, 2003). The overwhelming number of procedural models and methods described are based mainly on phase models. Iterative models or prototyping approaches, such as those used in software development, have only been examined in depth by a few researchers e.g. (Scheuing and Johnson, 1989).

A detailed overview of all currently known models was undertaken by Bullinger, Meiren and Fähnrich (Bullinger and Meiren, 2001; Bullinger et al., 2003). They concluded that all service-development models had at least one of four key weaknesses: insufficient detailing, non-configurability, lack of field tests or lack of information and communication technology support. As a specialisation of traditional service engineering, the IS service orientation is relatively new in the field of information management, too (Turner and Budgen, 2003; Zarnekow and Brenner, 2003). Therefore, research literature on methodologies for IS service development is lacking. With respect to computer technology, researchers, such as Zhang, Chen and Zhou (Zhang et al., 2005), have been concerned for several years with the design and composition of Web services¹.

In the next section we present a procedural model designing IS services which are adapted to customer processes and requirements. We used two research methods. First, we conducted four focus groups with experts in the field of IS at Altana Pharma, T-Systems, Deutsche Bahn, Deutsche Bank, syskoplan and Bayer Business Services (Greenbaum, 1997; Wilkinson 2004). Over a period of one year, we presented the latest developments and discussed them multilaterally with these companies in workshops and interviews. According to design science, constructs can be evaluated through observational methods, such as case study methods (Hevner et al., 2004). Therefore, we based our results on an in-depth case-study at one company in 2005. This enabled us to address more detailed questions and to acquire knowledge about what can be implemented in practice. The deployment of case studies to generate explanations, follows the research approach proposed by Yin (Yin, 2002).

3 PROCESS MODEL FOR THE DEVELOPMENT OF IS-SERVICES

3.1 IS-Services

IS services lack a common understanding in theory and in practice. Our own understanding is derived from (Zarnekow and Brenner., 2005), who define services as "the grouping of preliminary services used to support customers business processes". Examples of business processes supported by services are financial accounting, payroll accounting, goods receipt booking or data-reading transactions. Furthermore, non-process-linked services that are not used for a specific business process must be differentiated from one another. For example, desktop services consisting of preliminary services such as mail, calendar, printing, etc. used in more than one business process are classified in the group of non-process-linked services. Therefore, the difference between services supporting the business process and those unrelated to it is of particular importance, as it leads to a distinct form of modelling with respect to the service-engineering process.

The distinction between services and preliminary services originates from the manufacturing sector. Services are offered to the customer (sales product), whereas preliminary services are internally

¹ Web services can be equated in large part with process-supporting IS services (see Section 3)

manufactured products. A service, for example, might consist of activities such as “maintenance of server hardware”, “backup execution”, “updating software”, et cetera. Only a customer-oriented grouping of preliminary services is able to generate a offering (IS service). In turn, preliminary services themselves, may also consist of several other preliminary services. In analogy to industrial production, this view offers the possibility to construct a bill of materials.

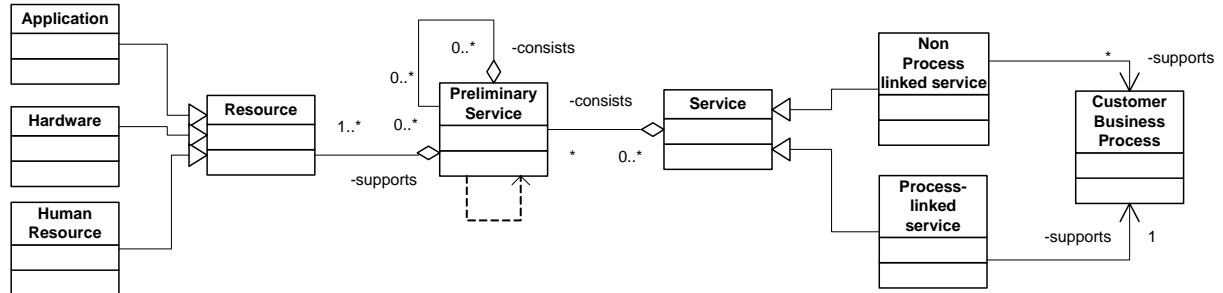


Figure 1. Meta-Model of IS Services

In terms of the definition of application software (Balzert, 2000), services and preliminary services can be differentiated from one another through the degree of customer and business orientation, as well as by their granularity. While application software fully or partially supports a multitude of business processes, business-process-linked services focus on supporting *one* business process or one activity within a process. In this case, preliminary services for several software applications may be used and grouped into a service (see Figure 1). This clarifies the different approaches. While software application takes a technically oriented view, the service orientation focuses on customer business processes.

3.2 Process Model for developing IS services

IS service engineering is a method for meeting customer IS service requirements. Based on traditional industrial product-engineering² methods (VDI, 2003) (VDI translation: Association of German Engineers), such as value engineering, product planning, functional description, structuring of functions, IS service engineering describes a method beginning with customer requirements analysis up to preliminary service bundling and cataloguing (see Figure 2). The method itself is broken down into the three main steps: "customer requirements analysis", "mapping of functions and service solutions" and "service bundling and cataloguing of the IS service".

In contrast to traditional software engineering methods such as the waterfall or spiral models, the focus is not on specifying software applications like Enterprise Resource Planning-Systems, but rather on an individual IS service that supports one or more activities of a business process (in the case of process-linked IS services). Moreover, an IS service can be supported by different applications.

3.2.1 Customer requirements analysis

The focus of the customer-requirements analysis is on documenting the necessary functional and qualitative IS service requirements, clarifying the objectives of the planned service and specifying a common understanding. Part of this process entails the collection of documents about supported business processes, external requirements (e.g. laws, security, and markets), and internal requirements (company wide security guidelines). The entire process step results in a requirements specification containing overall knowledge about the planned IS service. The structure of this document should be standardised so that this document can be used for sourcing purposes. Furthermore, the requirements

² VDI Directive 2221: Method for the Development and Design of Technical Systems and Products

specification is the basis for the following engineering steps. If essential specification elements are missing during these engineering steps, the document would have to be extended.

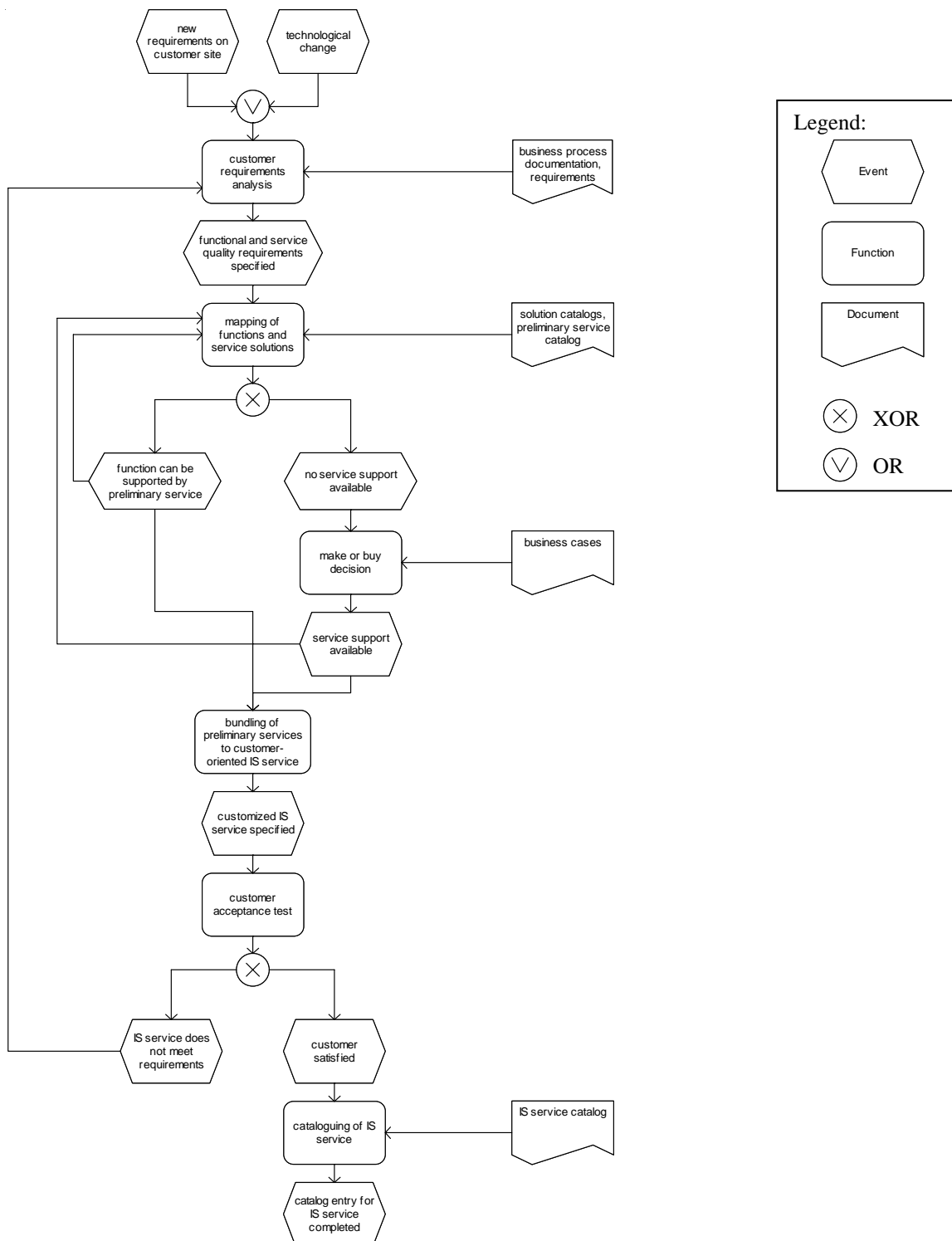


Figure 2. Process model for IS service engineering

In order to specify functional requirements, it is necessary to elaborate the IS supported business processes at the customer site. According to our understanding, business processes are activities (more

than one) that are ordered in a specific way so as to produce services or products. A good example is a typical credit assessment process in the banking sector that is assisted by many different IS services such as "providing debtor information" or "risk calculation". In business engineering, there are several methods and approaches used, such as UML (Fowler, 2003) or Event-driven Process Chains (EPC) (Scheer, 1998), to model business processes. If all relevant business processes are considered, functional requirements would have to be determined for each supported activity. One conclusion of our study is that in most cases, the functions are identical to the activities of the business process.

Functions themselves can be described with different levels of detail and granularity. Starting with the lowest level of detail, descriptions of functions are highly complex and difficult to understand. For complexity reduction purposes, highly aggregated functions (level-one functions) should first be subdivided into several sub-functions. This partition can be depicted in hierarchy diagrams. Hierarchy diagrams distinguish up to four function levels (Scheer, 1998; Olle et al., 1988):

1. Bundles of functions: these summarise a multiplicity of activities and functions
2. Functions: a function is a complex activity that can be subdivided into several sub-functions
3. Sub-functions: activities that are part of functions or sub-functions and can be subdivided into primary functions
4. Primary functions: activities that cannot meaningfully be separated further into more detailed functions

As Scheer explained, function diagrams are sometimes problematic, because of the unconstrained level definition (Scheer, 1998). However, this top-down-approach, in combination with bottom-up methods, leads to a structured procedure of determining function hierarchies.

In the case of non-process-linked IS services (e.g. desktop services), the focus is exclusively on the customer needs analysis, since the business process is omitted as the object of analysis. As with process-supporting services, the customer's specific IS requirements are systematically adopted and incorporated, using interview techniques such as brainstorming or structured interviews.

3.2.2 *Mapping of functional requirements and service solutions*

After determining all important functions and quality requirements on the customer site, the IS service provider must map these results to its own service and preliminary-service portfolio. In order to identify the mapping rules of preliminary services for supporting a business process, drawing up a software map can be helpful (Lankes et al., 2005).

In the event of process-linked-services, activities (on one site) and applications, hardware, support services etc. are plotted against one another. As mentioned earlier, activities are identical to functions in most cases. Should other functions not covering the activities arise due to customer requirements, these must be added as columns within the matrix. In the case of IS services not used for a single business process (such as desktop services or helpdesk services that are not specific to business processes), functions arising from customer requirements and applications are plotted against one another.

As in Figure 2, "mapping of functions and service solutions" can be determinate with two events. First, the IS service provider is able to support the required business function with one or more preliminary services out of its service portfolio. In this case, the mapping process continues with the next customer function. Secondly, the service provider may have no service support available. If so, an additional step (make or buy decision) has to be interposed. The purpose of the make-or-buy decision is to check whether this new service requirement should be produced internally or purchased externally. In the case of internal service development, corresponding applications modules and service flow charts must be designed. If not, otherwise the interfaces to external vendors must be specified. In any event, this process step ends with the event 'service support available'. On reaching the last step, the process

restarts with the next customer function. If all business functions are supported by preliminary IS services, the bundling process initiates.

3.2.3 *Service bundling and IS Service Cataloguing*

The objective of this task is to bundle all identified preliminary services into a IS service (sales product). This bundling process includes the functional description of the entire service, definition of homogeneous service level requirements, service planning and service costing and pricing.

A service bundle must satisfy the following preconditions:

- Descriptiveness of functionality: the constructed IS service must be "describable" in the language of the customer (without technical details).
- Cost allocation and pricing per sales unit: pay-per-use concepts should be applicable to the service.
- Ability to control the service quality: it must be possible to control and record important quality data.

After bundling preliminary services into sales products, the customer acceptance test and service cataloguing must be performed. The objective of the customer acceptance test is to verify if customer requirements can be fulfilled by the constructed service. For functional tests, traditional test procedures from software development are suitable. Using these traditional tests, the most important standard cases can be covered. If significant problems occur, the process must return to the "customer requirements analysis".

If all customer requirements are met, the developed IS service should be catalogued by the service provider. By so doing, the service offering is available to other customers in the future, and can be reused.

4 CASE STUDY

The case study was conducted in 2005 at a German pharmaceutical company in the course of developing the IS service-engineering process model. There were several problems within this company when the IS organisation decided to rebuild itself into a service provider with the aid of a service catalogue. With the size of the company growing strongly in the recent years, a very heterogeneous IS infrastructure had developed. This led to support and maintenance problems and a lack of IS cost transparency, so that customers (technical and development divisions) quickly became dissatisfied with the IS department.

In contrast to the finely granulated IS service definitions indicated in chapter 3.1, the emphasis at this company was exclusively on non-process-linked IS services at the application and desktops level. Thus, at the outset, a distinction was made between the groups "activities," "application services" (partially process-linked) and "infrastructure services" (non-process-linked)(see Figure 3).

The starting point for implementing IS services was the analysis of the internal service landscape. By interviewing numerous representatives, the activities and then the IS services of individual areas were systematically identified, and classified into a service life cycle. With the incorporation of life-cycle phases, an attempt was made to improve the integrity of the services being examined. As an extension of the abovementioned approach towards service orientation, the company added a definition of the concept of IS service-components. However, this not only represents an interim aggregation stage of preliminary services on the path to customer oriented services, but also is the precondition for achieving this. The grouping structure is displayed in Figure 3.

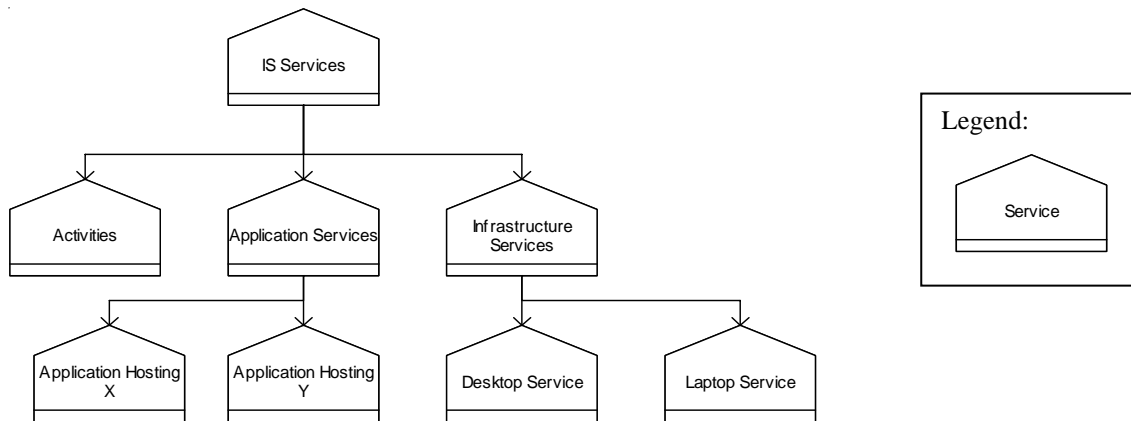


Figure 3. Extract of the service portfolio

The IS department used the following elements as essential description features for services, service components and preliminary services: Name, Version, Customer Value, Service Responsible, Service Description, Delivery Conditions, Training, Service Times, etc. At the conclusion of the grouping process, 25 services were assigned to 12 service categories.

Since the project is still in the implementation phase, no practical experiences of the customer acceptance test and final service cataloguing can be relayed up to the present. However, the assessment of representatives of the IS department were positive. Thus, an overall view of all services and activities was established, which has led to an increase in the transparency of the IS provider's service portfolio.

5 CONCLUSION AND OUTLOOK

The presented IS service-engineering process model permits IS departments and service providers to respond flexibly to customer requirements. Unlike methods and procedures from the web-service field, this engineering method starts on the customer side and includes these requirements at a very early design phase. In contrast to software development methods, the modelling object is a business supporting service that can use services derived from different applications. The stronger integration of the customer into the development process permits the delivery of services that conform to customer requirements in quality, quantity, functionality and price. The functional view of the service creates reusable elements which further decrease development times. Reusability of preliminary services is the cornerstone for standardisation.

In the future, this method need to be improved through several new case studies and supplemented with a role model. Tools such as a service catalogue will also be developed. A service catalogue is usable for the documentation, transfer and management of IS services. Furthermore, additional cases should clarify what granularity level for services and preliminary services must be selected.

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