

# Chapter 16

## Modeling of Service Systems

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### ABSTRACT

*An important aspect in the field of service science is service modeling; however, no comprehensive modeling approach exists. In this regard, the authors analyze literature of service science and look at existing modeling approaches. Based on this analysis they identify concepts necessary for modeling services. This paper specifies a semi-formalized meta-model comprising the concepts found and for having a more applicable meta-model, the authors transfer it into a technical space. Additionally a concrete syntax and implemented an editor, which supports service modeling, is specified. Overall, this work comprises existing approaches and presents a well-structured formalized meta-model for the domain of service modeling. This meta-model may be used as a starting point for further research within the area of service modeling.*

### INTRODUCTION

During the last years research areas like service science, service engineering and service marketing were established, due to the importance of services in highly developed economies (Fitzsimmons & Fitzsimmons, 2005). Service economies are characterized by services that are evolving continuously. In the past, services with a low level of complexity and a high degree in cus-

tomers interaction dominated the service industry. Therefore research approaches were most suited if they focused on managerial or customer specific aspects (Salvendy & Karwowski, 2010).

Nowadays services are getting more complex and have a higher variability and less customer interaction (Araujo & Spring, 2010). This alteration is due to services that are increasingly industrialized. These services are placed in a B2B-market, they are often product oriented and offered by goods producing companies (Johansson & Olhager, 2004). For tackling the challenges of

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this service evolution, new scientific approaches are necessary. Comparable to other disciplines, such as industrial and software engineering, an engineering approach is needed for a more standardized planning and management of complex services (Bullinger et al., 2003).

One of the most important aspects in service engineering is the formal or semi-formal description and modeling of services. Even though an increased demand for a standardized way of modeling services exists, a comprehensive approach or even standard is still missing (Bullinger et al., 2003; Alonso-Rasgado et al., n.d.; O’Sullivan, 2006). Our work tries to overcome this shortcoming by offering a comprehensive modeling approach. In order to do so, we based our work on the state of the art in service science. Hence we firstly analyzed the scientific literature in the domain of service science (e.g., Fitzsimmons & Fitzsimmons, 2005; Lovelock & Wright, 2002) as well as existing modeling approaches such as Shostack (1984), Kaner and Karni (2006), and Baida and Gordijn (2003). In a second step we defined a semi-formalized meta-model for describing and modeling services. This meta-model offers a precise description of the identified concepts necessary for service modeling and marks a starting point for an integrated and consistent modeling approach.

The outline of this paper is as follows: firstly, the “Methodical Approach” describes how we analyzed the service domain by looking at major literature sources and existing modeling approaches. Based on the results of this analysis, concepts were specified and a meta-model was developed. The chapter “Meta-model for service modeling” describes certain aspects of the specified meta-model. Originally the meta-model comprises a huge amount of detailed concepts. In this paper we focus on explaining the basic idea without going into detail. Furthermore, to increase the comprehensibility the concepts will be displayed in natural language instead of giving a formal description. The fourth chapter “Outlook” discusses

the presented results and explains how the meta-model was evaluated. Additionally, this chapter describes how the meta-model can be improved and what is needed to support further research in the domain of service modeling.

## **METHODICAL APPROACH**

For the development of the meta-model we took certain steps (Figure 1). Firstly we analyzed the literature of the service domain and existing service modeling approaches. This analysis provided the relevant concepts for service modeling. These concepts were augmented when necessary and described in a formal way by using mathematical and logical expressions. In addition we translated this meta-model and implemented an editor by using the Eclipse Modeling Framework (Budinsky et al., 2004). The aggregation of modeling concepts, the formalized meta-model and the implementation can be called “architecture for integrated service systems” (Böttcher, 2008).

### **Analysis of the Domain of Service Science**

The development of a meta-model for modeling services needs an understanding of the domain-specific concepts. Therefore we analyzed 20 major literature sources of the service domain. The selection of the sources was done by looking at the recommendations of domain relevant chairs and lectures as well as by analyzing the bibliography references of service-relevant articles. The major literature sources comprise, e.g., Lovelock and Wright (2002), Fitzsimmons and Fitzsimmons (2005), and Bruhn (2006). Next to the literature sources, we analyzed twelve existing modeling approaches. These approaches are explicitly coping with modeling services that are business-oriented, as opposed to IT-Services. Even though the analyzed modeling approaches represent a comprehensive state of the art, they are not all-

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