

Service–Oriented Architecture for Business Management

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Katrina Leyking

Institute for Information Systems at the German Research Center for Artificial Intelligence, Germany

Jörg Ziemann

Institute for Information Systems at the German Research Center for Artificial Intelligence, Germany

INTRODUCTION

During the last two decades, many enterprises have put business processes in the focus of their organizational strategies both for internal and collaborative business activities. Business process models provide the IT department with a semiformal, business-driven requirements basis for implementing business strategy into information systems (Scheer, 1999). However, despite notable progress in integration technologies such as workflow management systems (WMS) and enterprise application integration (EAI) systems, executing enterprise applications along a business process has remained the challenge of any universal business process management (BPM) approach. The most recent technology paradigm of service-oriented architecture (SOA) is expected to accomplish seamless and flexible business process automation (Krafzig, Banke, & Slama, 2005). The vision of loosely coupled services, that execute business activities across heterogeneous, distributed software systems via the Internet, captivates by the extent of flexibility and responsiveness given to business management. Thus, service-oriented computing represents more than a concept of software engineering. It is rather considered to be the ultimate driver for a complete business reformation, finally bridging the gap between business strategy and technological infrastructure. Beyond these visionary perspectives, the effects of service-orientation on BPM methods and techniques will be manifold and challenging both for research and practice.

METHODOLOGY OF BUSINESS PROCESS MANAGEMENT

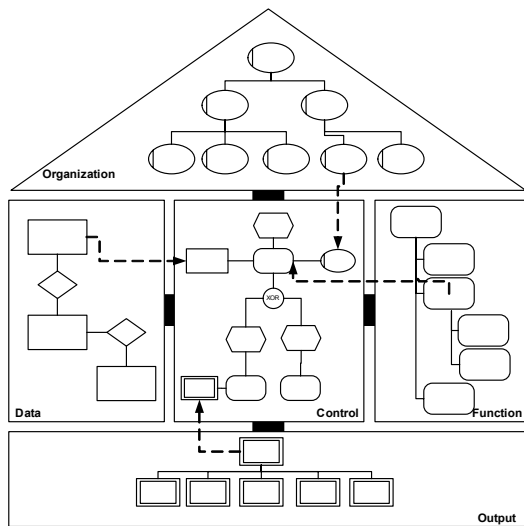
Since the age of industrialization, organizations have been functionally structured entities. Each department

succeeded because it concentrated its efforts on its specific domain irrespective of the overall enterprise mission (Taylor, 1911). With intensified competition in a globalizing world, more informed and demanding customers as well as ever accelerating developments in the information and communication technology (ICT) sector, companies had to redefine themselves and align their operations to the market more closely. Being forced to put themselves in the shoes of their customers, they began to view their operations as a continuous series of business activities, spanning various departments, all joining efforts for the purpose of output production to improve the customer's satisfaction. Thus, the idea of business processes gained ground.

In the beginning of the 1990s, this process-oriented management approach became known as business process reengineering (BPR) (Hammer & Champy, 2003). Various methodologies to manage and improve business processes in the context of enterprise architecture have emerged since. Among others—such as the Zachman framework (Zachman, 1987), the open system architecture for computer integrated manufacturing (CIMOSA) (Kosanke, Zelm, & Vernadat, 1999), or the business engineering concepts of PROMET—the architecture of integrated information systems (ARIS) has gained recognition throughout the research and industry community. It stands out due to its relevance for introducing standard software (e.g., SAP R/3), its extensive modeling tool support (e.g., ARIS Toolset), and its imperative focus on continuous process improvement (CPI). As it especially targets deriving IT systems from enterprise models, ARIS lends itself to examine business process management for the SOA context.

Being the shared interface of business and IT constraints, a business process model represents the starting point of ARIS for developing and integrating information systems. The core of the ARIS methodology focuses on structuring an enterprise's reality and

Figure 1. ARIS House with enterprise models



thus reducing complexity. Hence, the ARIS House organizes all information in five views: data, function, organization, output, and control (see Figure 1). Being in the center of the house schema, the control view takes business processes, which interrelate static components, for example, functions and data, to a dynamic, coherent whole. This integrating approach is reflected by the set of mutually referring model types proposed by the ARIS concept: entity-relationship (ER) diagrams for data representation, organizational hierarchies, function trees, and hierarchical output diagrams. The flagship notation, the event-driven process chain (EPC), has prevailed as a de-facto standard for semiformal business process modeling. It integrates all static elements of the ARIS House into a timely and logically structured flow of control composed of alternating functions and events. Thus, it gives them a specific meaning within an enterprise's operational flow (Scheer, 1999). For more details on EPC, refer to Keller, Nüttgens, and Scheer (1992).

Furthermore, the ARIS House of Business Engineering (HOBE) (Scheer, 1999) provides an overall BPM methodology structured into four levels:

1. The *process design* level includes all activities related to modeling business processes.
2. Business processes are scheduled and monitored at the second level of *process control*.
3. The level of *workflow control* is to instantiate the abstract processes as workflows transporting

working objects such as documents between human participants and computer systems.

4. Implemented by workflow management systems (WFS), these workflows access and use *integrated software applications* that support workers.

Feedback loops between these four levels complement the framework, illustrating and advocating continuous process improvement based on actual process performance. Corresponding to these levels of HOBE, various BPM life cycle models exist with similar phases (see, for example, Scholz & Wagner, 2004; Smith & Fingar, 2002; van der Aalst, Weske, & Wirtz, 2003).

Due to their process-driven alignment to executing system landscapes, BPM frameworks like ARIS can be used to systematically draw characteristics of the target SOA-based system from enterprise models. Vice versa, BPM frameworks may be enriched by the possibilities a SOA offers; for example, functions of the ARIS House can be realized with SOA in a better way than previous technologies allowed. Before delving into such a marriage of the two paradigms, we look at the basic concepts of service-oriented integration.

CHARACTERISTICS OF SERVICE-ORIENTED ARCHITECTURES

The term service-oriented architecture was coined by the Sun company for a computing environment that enabled dynamic discovery and use of services inside a network (McGovern, Tyagi, Stevens, & Matthew, 2003). Thus, a service is a self-contained software functionality that can be invoked by another application through a standardized interface while abstracting from the details of its implementation (Alonso, Casati, Harumi, & Machiraju, 2004). A SOA leverages services as functional building blocks, provided by a software application, registered in a service registry and discovered, bound, and executed by a service consumer, which again is another software application (cp. Figure 2).

Among a broad number of SOA definitions, all share the notion of a SOA as a specific form of a distributed software architecture, characterized by services that are discoverable, dynamically bound, modular, loosely coupled, coarse-grained, composable, self-healing, and invokable within a network (McGovern et al., 2003). Thus, SOA differs from previous EAI in a loose cou-

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