Chapter XIV
Semantic Business Process Management:
Applying Ontologies in BPM

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ABSTRACT

Even though process orientation/BPM is a widely accepted paradigm with heavy impact on industry and research the available technology does not support the business professionals' tasks in an appropriate manner that is in a way allowing processes modeling using concepts from the business domain. This results in a gap between the business people expertise and the IT knowledge required. The current trend in bridging this gap is to utilize technologies developed for the Semantic Web, for example ontologies, while maintaining reusability and flexibility of processes. In this chapter the authors present an over-view of existing technologies, supporting the BPM lifecycle, and focus on potential benefits Semantic Web technologies can bring to BPM. The authors will show how these technologies help automate the transition between the inherently separate/detached business professionals' level and the IT level without the burden of additional knowledge acquisition on behalf of the business professionals. As background information they briefly discuss existing process modeling notations like the Business Process Model-ing Notation (BPMN) as well as the execution centric Business Process Execution Language (BPEL),

and their limitations in terms of proper support for the business professional. The chapter stresses on the added value Semantic Web technologies yield when leveraged for the benefit of BPM. For this the authors give examples of existing BPM techniques that can be improved by using Semantic Web technologies, as well as novel approaches which became possible only through the availability of semantic descriptions. They show how process model configuration can be automated and thus simplified and how flexibility during process execution is increased. Additionally, they present innovative techniques like automatic process composition and auto-completion of process models where suitable process fragments are automatically discovered to make up the process model. They also present a reference architecture of a BPM system that utilizes Semantic Web technologies in an SOA environment.

1. INTRODUCTION

Business Process Management (BPM) has gained an extraordinary acclaim in the last decades and is being successfully applied for business process enactment in enterprises as well as for scripting integration logic [We07]. A multitude of both commercial and non-commercial tools supporting all or some of the life cycle phases of a process exists. Nowadays, mergers and acquisitions of companies are commonplace and typically they require splitting and merging of the IT support and integration of the business processes and the domain models of the affected companies. While IT infrastructure is easier to integrate, in particular using the SOA [Bu00] paradigm, it is extremely complicated to reconcile differences on the business level, especially business processes and domain model. To enable this reconciliation business people depend on the assistance of IT personnel. Due to the differences in terminologies and background the collaborative work of technical personnel and business experts is tedious and error-prone. Definitely there is a lack of support on a significant scale for this collaborative endeavor. The need for comprehensive support that narrows the gap between IT and businesses, i.e. domain experts, is obvious and has been proven by multiple case studies and reports.

Semantic Web Services [CDM+04] is a technology based on approaches and techniques from the Semantic Web [BJO01, HBM02]. They use ontologies as underlying conceptual framework to describe functional and non-functional properties of service in a machine-understandable manner. The technology has been created to facilitate the shift from human-to-application interactions to human-to-application-to-human interactions which in turn is needed in order to automate the daily tasks of human aided by computers. The same techniques can be applied to automate interactions among applications that are by design not interoperable, since they have been created using different domain models. A similar approach can be applied in order to address the above mentioned differences in terminology and domain knowledge between IT and business experts.

In this chapter we motivate the need of semantic information in the field of BPM and use the business process lifecycle to structure the discussion and show during which phases of this life cycle semantic information can be used to achieve improvements. We give an overview of the existing Semantic Web Services technologies and we stress on the added value Semantic Web and Semantic Web Service technologies yield when leveraged for the benefit of BPM [HLD+05]. For this we give an overview of common BPM techniques that can be improved by using Semantic Web technologies, as well as present novel approaches which became possible only through the availability of semantic descriptions. We show for instance how process model configuration can be automated and thus simpli-

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