Resource-Aware Business Process Management: Analysis and Support

Summary

Organizations have tried to use simulation to analyze the performance of their business processes at some point. However, few organizations are using simulation in a structured and effective way. This can be attributed to several challenges that arise when mapping a real life business process onto a simulation model especially involving human resources. The first and major challenge is that resource models built in simulations are usually very simple and are not a true reflection of reality. Secondly, the focus of simulation is mainly on design yet it is more interesting to use simulation for operational decision making. Thirdly, there is limited support for the use of existing artifacts such as event logs and models as input when building simulation models.

In this thesis, we address these three limitations of simulation while focusing on the resource performance perspective. In the first part of this thesis, we discuss approaches taken to analyze the performance of resources from event logs. Process-Aware Information Systems (PAISs) are able to record information in event logs as they support business processes. In this thesis, we exploit such information about real executions of users recorded by PAISs. In particular, we analyze resource availability parameters and also quantify the relationship between workload and the speed at which resources work from event logs. Such information can be used to adequately set resource behavior parameters in simulation models. The techniques discussed in this section have been implemented in the process mining framework, ProM.

The second part of this thesis provides a more accurate modeling of the resource perspective in simulation models. Based on Colored Petri Net (CPN) models, we characterize resource availability, and the effect of workload on the processing speeds of resources based on a number of simulation parameters. Using simulation experiments, we investigate the effect of incorrectly modeling resources in simulation models. The results from this part indicate that it is crucial to accurately model and set resource parameters in simulation models.

In the final part of thesis, we discuss a framework for operational support where past executions of users are analyzed to gain knowledge about the way people work. Such information can be used as a basis for making decisions, for example, about the next task to execute. Under operational support, we

introduce four main kinds of queries that define a meta-model for operational support: the simple, compare, predict and recommend queries. Given a current execution in a workflow system, a client can send one of the queries and the current execution in the partial trace to the Operational Support Service (OSS). In turn, the OSS sends a response back to the client from a given operational support provider. The approach discussed is based on a real workflow system, Declare and the OSS in the ProM framework. Moreover, we also present an abstract testing platform for testing operational support algorithms. In particular, we tested recommendation algorithms based on a number of user behavior models. The test platform provides an interaction between a simulated user (based on a colored Petri net model), a workflow management system (using Declare) and the operational support service (in ProM).