Abstract: Mobile Process Landscaping

This thesis introduces a method for modeling and analyzing business processes and supporting information systems in mobile environments – the Mobile Process Landscaping (MPL) method. This method allows developing closely linked process and system models under consideration of specific mobility characteristics. In addition, the method supports the automated model analysis to identify potential improvements in both the process and the system design, based on a definition of typical mobility issues. The method allows uncovering hidden model characteristics which would most likely not be obvious during a manual process inspection, especially when dealing with large and complex mobile business process models.

As a foundation for the development of the method, this thesis summarizes the basic concepts in the field of mobility and shows in which industries mobile processes and information systems are of particular relevance. The current state of organizational mobile processes and systems is reviewed on the basis of a large case study analysis, resulting in a framework for mobility in organizations which comprises typical characteristics of mobile processes and information systems. The existing methods for designing and analyzing (mobile) processes and systems are examined. Furthermore, the particular roles of the process context and the mutual dependencies between process and system design issues are discussed and an overview of proposed research fields is given. On the basis of this groundwork, requirements for a methodological approach for modeling and analyzing mobile processes and systems are deduced. The existing modeling methods are evaluated with regard to these requirements.

The thesis presents further the MPL method and its application with a case study from the electricity utility industry. It includes an in-depth description of the MPL model creation, which is based on hierarchical and timed Colored Petri Nets (CPNs) and the Unified Modeling Language (UML). The structure of the MPL model is described in detail, comprising a process landscape model, a business object model, and a context model. The process landscape model contains the dynamic model parts. It consists of several layers and allows refining the selected model elements with sub-models. The business object model and the context model describe the static model parts. Standard techniques to create static and dynamic models are extended to describe mobility-specific model characteristics, such as locations, mobile applications and devices, or cellular networks. The method allows creating hierarchical process models with either a top-down or a bottom-up modeling approach.

The thesis also includes an in-depth description of the MPL model analysis. Besides the verification of correctness and consistency, the performance analysis is explained, which allows cost and time ratio estimations based on the process outcome. The core part of the presented method is the automated model analysis regarding its optimization potential emerging from the mobility characteristics of processes and systems. Several analyses cover aspects like task mobility, recurrent visits, role mobility, interdependencies between role and location changes, mobile waiting times, robustness against connectivity fluctuation, business object availability, and potential for mobilizing and de-mobilizing process steps. These analyses aim at identifying the optimization potential which is usually not obvious in advance, for example, for large process models that are too complex for manual inspection. Based on the identified shortcomings, the MPL model can be improved. Whether a model change leads effectively to an economic improvement can be verified with model performance ratios created by model simulation.

In order to apply the MPL method, the thesis includes a few patterns for creating an MPL model, such as typical context elements and mobile system architectures. Furthermore, a tool supporting modeling and analyzing the method is introduced. The presented method is validated by describing the application of the MPL method to mobile claims assessment processes from the insurance industry. It is shown how the model creation and analysis was conducted, which optimization potentials could be revealed, how the processes and systems were redesigned to address the identified issues, and that model changes led to significant and quantifiable improvements of the process performance. The final discussion provides an evaluation of the introduced method, a validation of research hypotheses, and an outlook for further research opportunities.