Process Mining Applied to the BPI Challenge 2012: Divide and Conquer While Discerning Resources

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Abstract. A real-life event log, taken from a Dutch financial institute, is analyzed using state-of-the-art process mining techniques. The log contains events related to loan/overdraft applications of customers. We propose a hierarchical decomposition of the log into homogenous subsets of cases based on characteristics such as the final decision, offer, and suspicion of fraud. These subsets are used to uncover interesting insights. The event log in its entirety and the homogeneous subsets are analyzed using various process mining techniques. More specifically, we analyze the event log (a) on the resource perspective and the influence of resources on execution/turnaround times of activities, (b) on the control-flow perspective, and (c) for process diagnostics. A dedicated ProM[1] plug-in developed for this challenge allows for a comprehensive analysis of the resource perspective. For the analysis of control-flow and process diagnostics, we use recent, but pre-existing, ProM plug-ins. As the evaluation shows, our mix of techniques is able to uncover many interesting findings and could be used to improve the underlying loan/overdraft application handling process.

1 Analysis

The event log provided for the challenge pertains to the application process for a personal loan or overdraft within a Dutch financial institute. We analyze the event log on three different aspects:

– *Resource perspective:* Understanding the correlations between resources, workloads, and processing speeds of cases is gaining attention in recent years in process mining. We focus on the resource perspective and analyze whether there are remarkable differences between resources in their way of handling applications and the final outcome, in their execution and turnaround times on different activities and their influence on cycle times of cases. We have developed a dedicated plug-in called Resource Work Analysis in ProM for this analysis.
– *Control-flow perspective:* Control-flow discovery is one of the crucial steps in understanding the real process execution behavior. The event log provided for

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[1] ProM is an extensible framework that provides a comprehensive set of tools/plug-ins for the discovery and analysis of process models from event logs. See `http://www.processmining.org` for more information and to download ProM.

the challenge is characterized by (i) *heterogeneity of cases* and (ii) *concurrency within the process*. Traditional process discovery algorithms have difficulties in dealing with these issues and generate spaghetti-like process models. We propose a hierarchical decomposition of the log based on homogeneity in cases and apply the two-phase approach to process discovery [1] to mine comprehensible process maps.
– *Process diagnostics:* Our third analysis is focussed on uncovering deviations and other non-conforming behavior. We analyze the event log using trace alignment [2], which has been proposed as a powerful technique for process diagnostics. Trace alignment can be used to explore the process in the early stages of analysis and to answer specific questions in later stages of analysis.

2 Results and Conclusions

Our analysis of the event log reveals that several resources perform multi-tasking, i.e., work on simultaneous cases. Such resources exhibit a negative influence on the execution times of activities leading to high turnaround times. Furthermore, several resources are often idle although an activity is available for execution. This impacts the cycle time of cases. Obviously, these are undesirable for customers and the organization. From a control-flow perspective, at first glance, the event log may seem complex due to the heterogeneity in the log. However, a hierarchical classification of the log based on the characteristics of the loan/overdraft applications (e.g., final decision, offer, suspicion of fraud, etc.) helps to simplify analysis significantly. Analyzing homogenous subsets of cases in the event log based on the classification reveals that the process is in fact rather simple. Comprehensible process models and interesting diagnostic insights can be uncovered using such a classification. For example, we uncovered several outliers in the event log such as the approval of loan applications by automated resource and execution of activities even after the cancellation and/or approval of loan applications. The reader is referred to [3] for a comprehensive report on the approach, analysis, and results.

References

1. Li, J., Bose, R.P.J.C., van der Aalst, W.M.P.: Mining Context-Dependent and Interactive Business Process Maps using Execution Patterns. In zur Muehlen, M., Su, J., eds.: BPM 2010 Workshops. Volume 66 of LNBIP., Springer-Verlag (2011) 109–121
2. Bose, R.P.J.C., van der Aalst, W.M.P.: Process Diagnostics Using Trace Alignment: Opportunities, Issues, and Challenges. Information Systems **37**(2) (2012) 117–141
3. Bose, R.P.J.C., van der Aalst, W.M.P.: Process Mining Applied to the BPI Challenge 2012: Divide and Conquer While Discerning Resources. Technical Report BPM-12-16, BPMCenter.org (2012) `http://bpmcenter.org/wp-content/uploads/reports/2012/BPM-12-16.pdf`.