

## Chapter 3.20

# Semantic Business Process Mining of SAP Transactions

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### ABSTRACT

This chapter introduces semantic business process mining of SAP transaction logs. SAP systems are promising domains for semantic process mining as they contain transaction logs that are linked to large amounts of structured data. A challenge with process mining these transaction logs is that the core of SAP systems was not originally designed from the business process management perspective. The business process layer was added later without full rearrangement of the system. As a result, system logs produced by SAP are not process-based, but transaction-based. This means that the system does not produce traces of process instances that are needed for process mining. In this chapter, we show how data available in SAP systems can enrich process instance logs with ontologically structured concepts, and evaluate techniques for mapping

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executed transaction sequences with predefined process hierarchies.

### INTRODUCTION

To describe the current situation in dynamic business process environments we need tools that can assist rapid modeling. Process mining tools meet this requirement by extracting descriptive models from event logs in the underlying IT-systems to construct the business process descriptions from actual data.

SAP systems are promising domains for process mining. SAP is the most widely used Enterprise Resource Planning (ERP) system with a total market share of 27 percent worldwide in 2006 (Pang, 2007). Even though there may be blue print models defined for how the systems should support organizational business processes, there are often gaps between how the systems are planned to be used and how the employees actually carry out the operations.

The magnitude of data sources in a running ERP system is large, and within SAP there are several event and transaction logs that can be analyzed with process mining.

In this process mining work, we use transaction data that describe document dependencies between executed transactions. A transaction in a SAP system can be viewed as a small application. An example of a transaction is “*ME51 – Create Purchase Requisition*”. As the name indicates, this transaction enables a user to create a purchase requisition. “*ME51*” is the unique identifier for this transaction, called the transaction code. Such a transaction would produce a purchase requisition, which further can be referred to by a purchase order created in another transaction, like “*ME21 – Create Purchase Order*”. By tracing such document dependencies, we are able to extract transaction sequences that can be explored and analyzed with use of process mining.

Data in the underlying databases of SAP systems contain

- Transactional data – Daily operations, such as sales orders and invoices.
- Master data – Business entities such as customers, vendors and users.
- Ontological data – Metadata for interpretation and structuring of instances.

The transactional data are the basis building blocks for process mining analysis and describe events that are carried out. In the transactional data we typically find execution timestamps and relations to involved master data sources. The ontological data in SAP databases can be used to extract descriptions of the transactions and related entities. For instance, in the SAP database there are table structures that contain full text descriptions of transactions and business processes and their internal relationships.

Construction and maintenance of ontologies is work-intensive and has so far been a bottleneck to realization of many semantical technologies.

Ontologies tend to grow huge and complex, and both domain expertise and ontology modeling expertise are needed in ontology engineering (Gulla, 2006). In the underlying databases of SAP systems there are lots of structured data that can be extracted to form and populate ontologies. In semantic business process mining of SAP transactions, we can exploit available data structures to limit the extent of ontology engineering work.

One particular challenge with process mining of SAP transactions is the many-to-many relationship between transactions and defined business processes. Figure 1 shows an example from the business process hierarchy in SAP. In SAP systems, business processes are defined at four levels, “Enterprise Area”, “Scenario”, “Group” and “Business Process”. At the second lowest level, Figure 1 shows two business processes, “*Subsequent debit for empties and returnable packaging*” and “*Sales activity processing (standard)*”. As shown in the hierarchy, both of these business processes can involve the transaction “*V+01: Create Sales Call*”. The transaction logs in SAP systems contain no information about business process context. If we do process mining on transaction logs where “*V+01: Create Sales Call*” occurs, there is no available data that explicitly states whether this transaction was carried out in the context of “*Subsequent debit for empties and returnable packaging*”, “*Sales activity processing (standard)*” or another business process.

Transaction sequences themselves can be used as input to process mining algorithm to extract flow models and performance indicators. However, if we could map the executed transactions precisely to concepts in the defined business process hierarchies, we would be able to extract business process models with aggregated levels, and relate performance indicators to higher level process definitions.

In this chapter we will show how transaction sequences extracted from SAP systems can be enriched with relations to ontological concepts and we will evaluate three techniques for mapping

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