Chapter 2
State-of-the-Art Components, Tools, and Methods for Process Mining and Semantic Modelling

ABSTRACT

This chapter describes the state-of-the-art technologies, tools, and methods that are closely connected to the work done in this book. The chapter describes in detail the key components of the process mining and semantic modelling methods and the different technologies that enable the practical application of the techniques. In essence, the chapter explains the main tools and mechanisms that are applied in this book, ranging from the events log to the different tools that are applied for process mining, and the existing algorithms used to discover the process models and to support the interpretations and/or further analysis of the models at semantic levels.

INTRODUCTION

The chapter describes in details the key components of the process mining and semantic modelling methods, and the different technologies that enable the practical application of the techniques. In essence, the chapter explains the main tools and mechanisms that are applied in this book; ranging from the events log to the different tools that are applied for process mining, and

the existing algorithms used to discover the process models and to support the interpretations and/or further analysis of the models at semantic levels.

- the need for events data from the different information systems or databases for process mining.
- the different information which are expected to be existing in the events data logs for process mining and further steps of semantic-based process mining.
- the data quality challenges that may be encountered in reality when performing the process mining tasks, as well as
- how the identified challenges with process mining can be addressed.

Consequently, the chapter looks at current tools and methods which support the semantic-based process mining approaches – ranging from the annotation of events log, to the ontological representation of the resulting models and the semantic reasoning aptitudes. This is then followed by an illustration of how the different tools/components are integrated and can be applied to carry out the analysis of the event logs and derived process models at a more abstraction level. Finally, the chapter summarizes the presented state of the art components or approaches, and then subsequently propose a semantic-based process mining framework (in chapter 3) that integrates the different tools/components towards the application and development of the semantic process mining approach.

EVENT LOGS

Process mining algorithms use the event logs to learn and reason about processes by coupling in a technical manner: *event history data* and *process models* (Van der Aalst, 2011). Indeed, data logged in IT systems can be utilized (analysed) towards the provision of a better understanding or insights about the real-time processes. This is done in order to improve the quality of the discovered models, support an abstract analysis of the individual process elements, or help to detect deviations. In fact, the process mining combines techniques from the data mining to process modelling and analysis, as well as several other disciplines, otherwise referred to as "computational intelligence" tools to analyze the captured datasets. Perhaps, many approaches which incorporate such use of data mining techniques to interpret datasets have been proposed in the existing literature. On the one hand, the works in

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